Marking Scheme links are on each paper

Pre-Board Sample Papers

CBSE EXAM 2024 30 Sets

Class : 10th

Sub : Maths STD

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Sample Paper 01

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. Two APs have the same common difference. The first term of one of these is -1 and that of the other is -8. Then the difference between their 4th terms is

(a) -1 (b) -8

(c) 7 (d) -9

2. For the following distribution:

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

The modal class is

(a) 10-20 (b) 20-30

(c) 30-40 (d) 50-60

3. If one zero of the polynomial $(3x^2 + 8x + k)$ is the reciprocal of the other, then value of k is

(a) 3 (b) -3

(c) $\frac{1}{3}$ (d) $-\frac{1}{3}$

4. $(x^2+1)^2 - x^2 = 0$ has

(a) four real roots (b) two real roots

(c) no real roots (d) one real root

5. The LCM of smallest two digit composite number and smallest composite number is

(a) 12 (b) 4

(c) 20 (d) 44

6. Which of the following statement is false?

(a) All isosceles triangles are similar. (b) All quadrilateral are similar.

(c) All circles are similar. (d) None of the above

7. If a regular hexagon is inscribed in a circle of radius r, then its perimeter is

(a) $3r$ (b) $6r$

(c) $9r$ (d) $12r$

8. If $4\tan\theta = 3$, then $\left(\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}\right)$ is equal to

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$

(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

9. The top of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, then the length of the wire is

(a) 12 m (b) 10 m

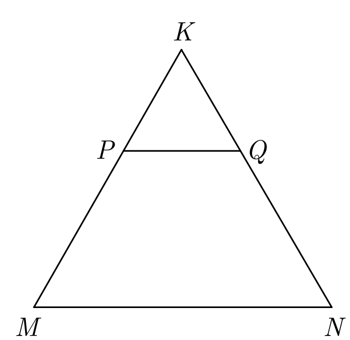
(c) 8 m (d) 6 m

10. A ladder, leaning against a wall, makes an angle of 60° with the horizontal. If the foot of the ladder is 2.5 m away from the wall, find the length of the ladder.

(a) 5 m (b) 5.5 m

(c) 2.5 m (d) 4.5 m

11. In the figure, PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and $KN = 20.4$ cm then find KQ.



(a) 4.8 cm (b) 4.6 cm

(c) 4.4 cm (d) 4.2 cm

12. Ratio of lateral surface areas of two cylinders with equal height is

(a) 1 : 2

(b) $H : h$

(c) $R : r$

(d) None of these

13. In the formula $\overline{x} = a + \frac{\sum f_i d_i}{\sum f_i}$, for finding the mean of grouped data d_i's are deviation from a of

(a) lower limits of the classes

(b) upper limits of the classes

(c) mid-points of the classes

(d) frequencies of the class marks

14. If the zeroes of the quadratic polynomial $ax^2 + bx + c$, where $c \neq 0$, are equal, then

(a) c and a have opposite signs

(b) c and b have opposite signs

(c) c and a have same sign

(d) c and b have the same sign

15. Two coins are tossed simultaneously. The probability of getting at most one head is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

16. Someone is asked to take a number from 1 to 100. The probability that it is a prime, is

(a) $\frac{8}{25}$ (b) $\frac{1}{4}$

(c) $\frac{3}{4}$ (d) $\frac{13}{50}$

17. For which value(s) of p, will the lines represented by the following pair of linear equations be parallel

$$3x - y - 5 = 0$$
$$6x - 2y - p = 0$$

(a) all real values except 10 (b) 10

(c) 5/2 (d) 1/2

18. The coordinates of a point A on y-axis, at a distance of 4 units from x-axis and below it are

(a) (4, 0) (b) (0, 4)

(c) $(-4, 0)$ (d) $(0, -4)$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

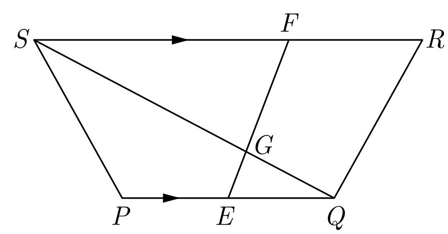
19. **Assertion :** If a wire of length 22 cm is bent in the shape of a circle, then area of the circle so formed is $40\,\text{cm}^2$.
Reason : Circumference of the circle = length of the wire.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The slant height of the frustum of a cone is 5 cm and the difference between the radii of its two circular ends is 4 cm. Then the height of the frustum is 3 cm.
Reason : Slant height of the frustum of the cone is given by $l = \sqrt{(R-r)^2 + h^2}$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

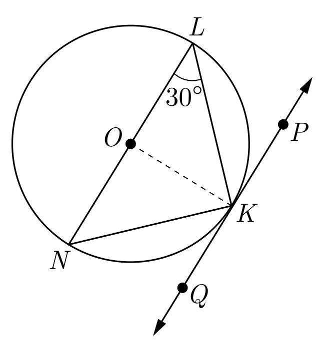
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the figure, $PQRS$ is a trapezium in which $PQ \,||\, RS$. On PQ and RS, there are points E and F respectively such that EF intersects SQ at G. Prove that $EQ \times GS = GQ \times FS$.



22. In figure, O is the centre of the circle and LN is a diameter. If PQ is a tangent to the circle at K and $\angle KLN = 30^\circ$, find $\angle PKL$.



23. Evaluate : $\dfrac{3\tan^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec} 30^\circ - \tan 45^\circ}{\cot^2 45^\circ}$

24. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting :
(i) a non face card,
(ii) a black king.

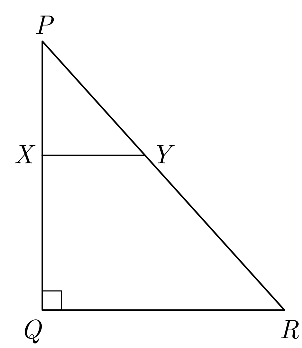
OR

In a family of two children find the probability of having at least one girl.

25. In an equilateral triangle of side 24 cm, find the length of the altitude.

OR

In the given figure, PQR is a triangle right angled at Q and $XY || QR$. If $PQ = 6$ cm, $PY = 4$ cm and $PX : XQ = 1:2$. Calculate the length of PR and QR.



Section - C

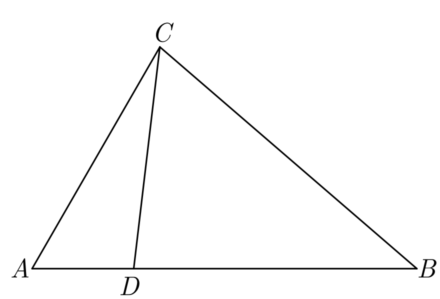
Section C consists of 6 questions of 3 marks each.

26. Verify whether 2, 3 and $\frac{1}{2}$ are the zeroes of the polynomial $p(x) = 2x^3 - 11x^2 + 17x - 6$.

27. Solve for x and y :

$\dfrac{x+1}{2} + \dfrac{y-1}{3} = 9$; $\dfrac{x-1}{3} + \dfrac{y+1}{2} = 8$.

28. In the given figure, if $\angle ACB = \angle CDA$, $AC = 6$ cm and $AD = 3$ cm, then find the length of AB.



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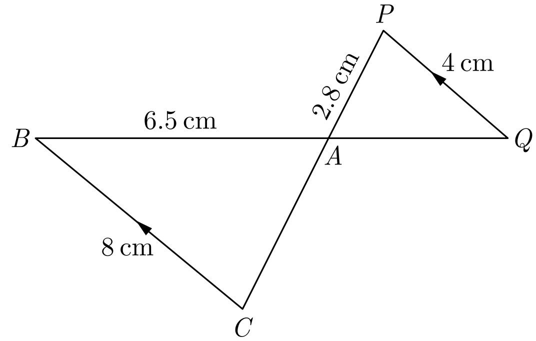
OR

In the given figure, $BC || PQ$ and $BC = 8$ cm, $PQ = 4$ cm, $BA = 6.5$ cm $AP = 2.8$ cm Find CA and AQ.



29. Prove that $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\operatorname{cosec}^2 A}{\sec^2 A - \operatorname{cosec}^2 A} = \frac{1}{1 - 2\cos^2 A}$

30. A toy is in the form of a cone radius 3.5 cm mounted on a hemisphere of same radius. If the total height of the toy is 15.5 cm, find the total surface area of the toy. Use $\pi = \frac{22}{7}$

OR

A well of diameter 4 m dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

31. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Solve for x : $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$ $x \neq -1, -2, -4$

OR

Solve for x : $4x^2 + 4bx - (a^2 - b^2) = 0$

33. A right triangle ABC, right angled at A is circumscribing a circle. If $AB = 6$ cm and $BC = 10$ cm, find the radius r of the circle.

34. Daily wages of 110 workers, obtained in a survey, are tabulated below :

Daily Wages (in ₹)	100-120	120-140	140-160	160-180	180-200	200-220	220-240
Number of Workers	10	15	20	22	18	12	13

Compute the mean daily wages an modal daily wages of these workers.

OR

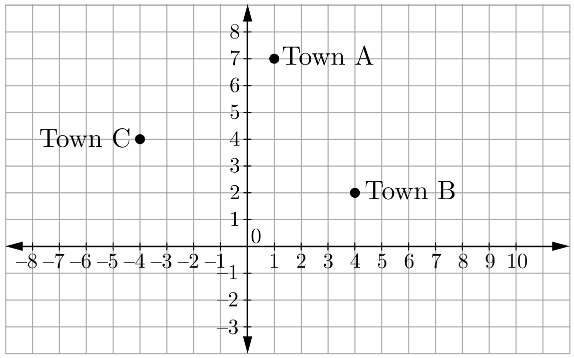
The mean of the following distribution is 18. Find the frequency of the class 19-21.

Class	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

35. Two friends Seema and Aditya work in the same office at Delhi. In the Christmas vacations, both decided to go to their hometown represented by Town A and Town B respectively in the figure given below. Town A and Town B are connected by trains from the same station C (in the given figure) in Delhi. Based on the given situation answer the following questions:



(i) Who will travel more distance, Seema or Aditya, to reach to their hometown?

(ii) Seema and Aditya planned to meet at a location D situated at a point D represented by the mid-point of the line joining the points represented by Town A and Town B. Find the coordinates of the point represented by the point D.

Section - E

Case study based questions are compulsory.

36. Cubic Coating : Frozen specimens are stored in a cubic metal box that is x inches on each side. The box is surrounded by a 2 inch thick layer of foam insulation.

(i) Find a polynomial function $V(x)$ that gives the total volume in cubic inches for the box and insulation.

(ii) Find the total volume if x is 10 inches.

(iii) Use the remainder theorem to find the total volume when x is 10 inches.

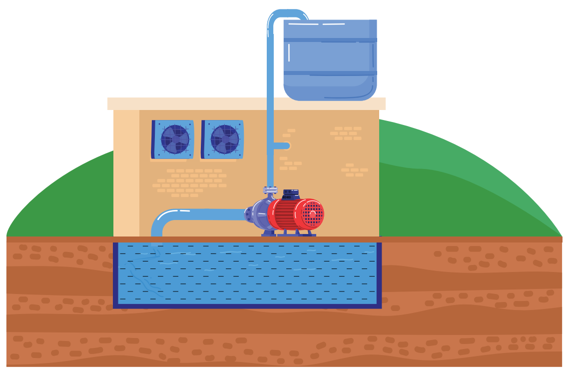
37. Wilt Chamberlain : Wilton Norman "Wilt" Chamberlain was an American basketball player, and played in the NBA during the 1960s. At 7 feet 1 inch, he was the tallest and heaviest player in the league for most of his career, and he was one of the most famous people in the game for many years. He is the first and only basketball player to score 100 points in an NBA game.

Continue on next page.....

In the 1961–1962 NBA basketball season, Wilt Chamberlain of the Philadelphia Warriors made 30 baskets. Some of the baskets were free throws (worth 1 point each) and some were field goals (worth 2 points each). The number of field goals was 10 more than the number of free throws.

(i) How many field goals did he make ?
(ii) How many free throws did he make?
(iii) What was the total number of points scored?
(iv) If Wilt Chamberlain played 5 games during this season, what was the average number of points per game?

38. Underground water tank is popular in India. It is usually used for large water tank storage and can be built cheaply using cement-like materials. Underground water tanks are typically chosen by people who want to save space. The water in the underground tank is not affected by extreme weather conditions. The underground tanks maintain cool temperatures in both winter and summer. Electric pump is used to move water from the underground tank to overhead tank.



Ramesh has build recently his house and installed a underground tank and overhead tank. Dimensions of tanks are as follows :

Underground Tank : Base 2 m $\times$ 2 m and Height 1.1 m.

Overhead tank : Radius 50 cm and Height 175 cm

(i) What is the capacity of the underground tank ?
(ii) What is the ratio of the capacity of the underground tank to the capacity of the overhead tank?
(iii) If curved part of overhead tank need to be painted to save it from corrosion, how much area need to be painted? If water is filled in the overhead tank at the rate of 11 litre per minute, the tank will be completely filled in how much time?

OR

(iv) If the amount of water in the underground tank, at an instant, is 2400 litres, find then the water level in the underground tank at that instant.

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Sample Paper 02

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. A letter of English alphabet is chosen at random, what is the probability that the letter so chosen is a consonant?

(a) $\frac{5}{26}$ (b) $\frac{21}{26}$ (c) $\frac{2}{13}$ (d) $\frac{7}{13}$

2. What is the HCF of smallest primer number and the smallest composite number?

(a) 2 (b) 4 (c) 6 (d) 8

3. If $A(5,2)$, $B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B = 90^{\circ}$, then the value of t will be

(a) 1 (b) 2 (c) 3 (d) 4

4. The sum and product of zeroes of a quadratic polynomial are 6 and 9 respectively. The quadratic polynomial will be

(a) $x^2 + 9x - 6$ (b) $x^2 + 6x + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 + 6x - 9$

5. Half the perimeter of a rectangular garden, whose length is 4 m more then its width, is 36 m. The dimensions of garden will be

(a) 20 m by 16 m (b) 36 m by 10 m (c) 16 m by 30 m (d) 20 m by 16 m

6. The quadratic equation $x^2 + x - 5 = 0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

7. Which of the following equations has 2 as a root?

(a) $x^2 - 4x + 5 = 0$ (b) $x^2 + 3x - 12 = 0$ (c) $2x^2 - 7x + 6 = 0$ (d) $3x^2 - 6x - 2 = 0$

8. What happens to value of $\cos\theta$ when θ increases from 0^o to 90^o.

(a) $\cos\theta$ decreases from 1 to 0.
(b) $\cos\theta$ increases from 0 to 1.
(c) $\cos\theta$ increases from $\frac{1}{2}$ to 1
(d) $\cos\theta$ decreases from 1 to $\frac{1}{2}$

9. The times, in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated below

Class	13.8-14	14-14.2	14.2-14.4	14.4-14.6	14.6-14.8	14.8-15
Frequency	2	4	5	71	48	20

The number of athletes who completed the race in less than 14.6 second is :

(a) 11 (b) 71 (c) 82 (d) 130

10. For what value of k, the pair of linear equations $kx - 4y = 3$, $6x - 12y = 9$ has an infinite number of solutions ?

(a) $k = 2$ (b) $k \neq 2$ (c) $k \neq 3$ (d) $k = 4$

11. The top of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, then the length of the wire is

(a) 12 m (b) 10 m (c) 8 m (d) 6 m

12. Which term of an AP, 21, 42, 63, 84, ... is 210?

(a) 9th (b) 10th (c) 11th (d) 12th

13. The perimeters of two similar triangles ΔABC and ΔPQR are 35 cm and 45 cm respectively, then the ratio of the areas of the two triangles is ....

(a) $\frac{2}{9}$ (b) $\frac{7}{9}$ (c) $\frac{49}{81}$ (d) $\frac{3}{4}$

14. $\dfrac{\tan^2\theta}{1+\tan^2\theta} + \dfrac{\cot^2\theta}{1+\cot^2\theta} = ?$

(a) 1 (b) $2\tan^2\theta$ (c) $2\cot^2\theta$ (d) $2\sec^2\theta$

15. It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park would be

(a) 10 m (b) 15 m (c) 20 m (d) 24 m

16. If two solid hemispheres of same base radius r are joined together along their bases, then curved surface area of this new solid is

(a) $4\pi r^2$ (b) $6\pi r^2$ (c) $3\pi r^2$ (d) $8\pi r^2$

17. If zeroes of the polynomial $x^2 + 4x + 2a$ are a and $\frac{2}{a}$, then the value of a is

(a) 1 (b) 2 (c) 3 (d) 4

18. If radii of two concentric circles are 4 cm and 5 cm, then the length of each of one circle which is tangent to the other circle, is

(a) 3 cm (b) 6 cm (c) 9 cm (d) 1 cm

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** Pair of linear equations : $9x+3y+12=0, 8x+6y+24=0$ have infinitely many solutions.
Reason : Pair of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ have infinitely many solutions, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If n^{th} term of an AP is $7-4n$, then its common differences is -4.
Reason : Common difference of an AP is given by $d=a_{n+1}-a_n$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. If two positive integers p and q are written as $p=a^2b^3$ and $q=a^3b$, where a and b are prime numbers than verify $\text{LCM}(p,q)\times\text{HCF}(q,q)=pq$

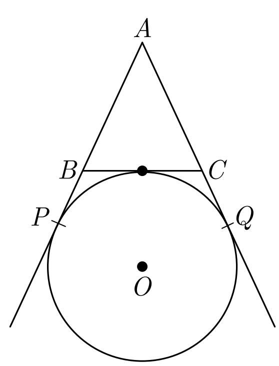
22. If the n^{th} term of an AP $-1,4,9,14,.....$ is 129. Find the value of n.

OR

Write the n^{th} term of the AP $\frac{1}{m},\frac{1+m}{m},\frac{1+2m}{m},.....$

23. If the mid-point of the line segment joining the points $A(3,4)$ and $B(k,6)$ is $P(x,y)$ and $x+y-10=0$, find the value of k.

24. In figure, AP, AQ and BC are tangents of the circle with centre O. If $AB=5$ cm, $AC=6$ cm and $BC=4$ cm, then what is the length of AP?



OR

Two chords AB and CD of a circle intersect at E such that $AE=2.4$ cm, $BE=3.2$ cm and $CE=1.6$ cm. What is the length of DE?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

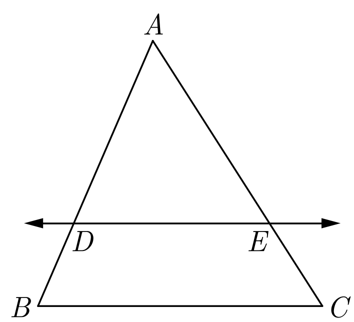
25. Two coins are tossed together. Find the probability of getting both heads or both tails.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Find HCF and LCM of 378, 180 and 420 by prime factorization method. Is HCF $\times$ LCM of these numbers equal to the product of the given three numbers?

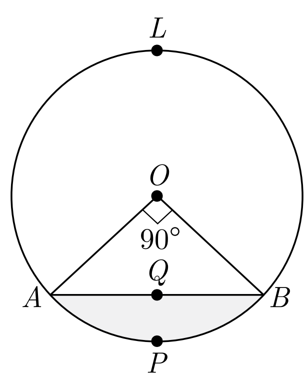
27. In Figure, in ΔABC, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of AE?



28. Prove that : $\dfrac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1} = \dfrac{1 + \cot\theta}{\sin\theta}$

29. From a point P, which is at a distant of 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR are drawn to the circle, then the area of the quadrilateral $PQOR$ (in cm^2).

30. In the given figure, a chord AB of the circle with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment $AQBP$. Hence find the area of major segment $ALBQA$. (Use $\pi = 3.14$)



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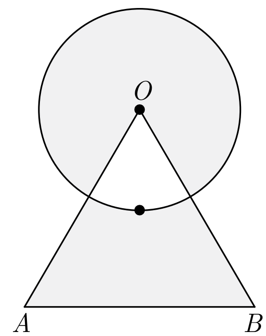
SOLUTIONS

OR

Find the area of shaded region shown in the given figure where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



31. A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6.

OR

A die is thrown twice. Find the probability that
(i) 5 will come up at least once.
(ii) 5 will not come up either time.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Solve the following pair of linear equations graphically:
$x+3y=12,\ 2x-3y=12$
Also shade the region bounded by the line $2x-3y=2$ and both the co-ordinate axes.

OR

For what values of a and b does the following pair of linear equations have infinite number of solution ?
$2x+3y=7, a(x+y)-b(x-y)=3a+b-2$

33. Show that $A(-1,0)$, $B(3,1)$, $C(2,2)$ and $D(-2,1)$ are the vertices of a parallelogram $ABCD$.

34. Sides AB and AC and median AD of a triangle ABC are respectively proportional to sides PQ and PR and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.

OR

Find the length of the second diagonal of a rhombus, whose side is 5 cm and one of the diagonals is 6 cm.

35. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pipe, given that 1 cm3 of iron has approximately 8 g mass. (Use $\pi=3.14$)

Section - E

Case study based questions are compulsory.

36. Auditorium, the part of a public building where an audience sits, as distinct from the stage, the area on which the performance or other object of the audience's attention is presented. In a large theatre an auditorium includes a number of floor levels frequently designed as stalls, private boxes, dress circle, balcony or upper circle, and gallery. A sloping floor allows the seats to be arranged to give a clear view of the stage. The walls and ceiling usually contain concealed light and sound equipment and air extracts or inlets and may be highly decorated.

In an auditorium, seats are arranged in rows and columns. The number of rows are equal to the number of seats in each row. When the number of rows are doubled and the number of seats in each row is reduced by 10, the total number of seats increases by 300.

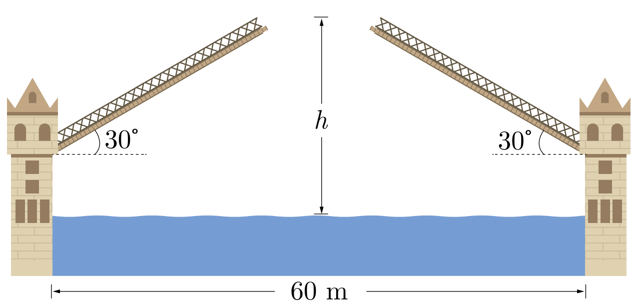
(i) If x is taken as number of row in original arrangement, write the quadratic equation that describes the situation ?

(ii) How many number of rows are there in the original arrangement?

(iii) How many number of seats are there in the auditorium in original arrangement ? How many number of seats are there in the auditorium after re-arrangement.

(iv) How many number of columns are there in the auditorium after re-arrangement?

37. Drawbridge : A drawbridge is a bridge that can be moved in order to stop or allow passage across it. Modern drawbridges are often built across large, busy waterways. They can be lifted to allow large ships to pass or lowered to allow land vehicles or pedestrians to cross.



A drawbridge is 60 metre long when stretched across a river. As shown in the figure, the two sections of the bridge can be rotated upward through an angle of 30°.

(i) If the water level is 5 metre below the closed bridge, find the height h between the end of a section and the water level when the bridge is fully open.

(ii) How far apart are the ends of the two sections when the bridge is fully opened, as shown in the figure?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

38. Life insurance is a contract between an insurance policy holder and an insurer or assurer, where the insurer promises to pay a designated beneficiary a sum of money upon the death of an insured person (often the policy holder). Depending on the contract, other events such as terminal illness or critical illness can also trigger payment. The policy holder typically pays a premium, either regularly or as one lump sum.

SBI life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

Age (in years)	Below 20	Below 25	Below 30	Below 35	Below 40	Below 45	Below 50	Below 55	Below 60
Number of policy holders	2	6	24	45	78	89	92	98	100

(i) What is the median value of age ?

(ii) What will be the upper limit of the modal class? What is the mode value of age ?

(iv) Find the mean value of age using empirical relation.

□□□□□□□

Sample Paper 03

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. What are the values of x and y for the following pair of linear equations ?
$99x + 101y = 499$ and $101x + 99y = 501$

(a) 3 and 6 (b) 3 and 2

(c) 2 and 3 (d) 6 and 3

2. If a number x is chosen at random from the numbers -3, -2, -1. 0, 1, 2, 3, then What is the probability of $x^2 < 4$?

(a) $\frac{4}{7}$ (b) $\frac{3}{7}$

(c) $\frac{1}{7}$ (d) $\frac{2}{7}$

3. The zeroes of polynomial $p(x) = ax^2 + bx + c$ are reciprocal of each other if

(a) $b = 2a$ (b) $c = b$

(c) $b = a$ (d) $c = a$

4. If -1 is a zero of the polynomial $p(x) = kx^2 - 4x + k$, the value of k is

(a) -4 (b) -2

(c) 2 (d) 4

5. If α and β are the roots of $ax^2 - bx + c = 0\,(a \neq 0)$, then value of $\alpha + \beta$ is

(a) $\frac{b}{a}$ (b) $\frac{a}{b}$

(c) $\frac{2a}{b}$ (d) $\frac{a}{2b}$

6. Which of the following value of k should be selected so that the pair of equations $x + 2y = 5$ and $3x + ky + 15 = 0$ has a unique solution ?

(a) $k \neq 5$ (b) $k \neq 6$

(c) $k = 5$ (d) $k = 6$

7. The quadratic equation $x^2 + 3x + 2\sqrt{2} = 0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

8. A ladder 10 m long reaches a window 8 m above the ground. The distance of the foot of the ladder from the base of the wall is .... m.

(a) 8 m (b) 2 m

(c) 6 m (d) 4 m

9. If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of radius R, then

(a) $R_1 + R_2 = R$ (b) $R_1 + R_2 > R$

(c) $R_1 + R_2 > R$ (d) $R_1 + R_2 < R$

10. The famous mathematician associated with finding the sum of the first 100 natural numbers is

(a) Pythagoras (b) Newton

(c) Gauss (d) Euclid

11. The value of x for which $2x, (x + 10)$ and $(3x + 2)$ are the three consecutive terms of an AP, is

(a) 6 (b) -6

(c) 18 (d) -18

12. If points $A(-3, 12)$, $B(7, 6)$ and $C(x, 9)$ are collinear, then the value of x is ....

(a) 2 (b) 3

(c) 4 (d) 5

13. The value of $\sin^2 41^o + \sin^2 49^o$ will be

(a) 1 (b) $\sqrt{2}$

(c) 2 (d) $\sqrt{3}$

14. The number $\frac{7}{75}$ will have -

(a) non-terminating repeating decimal expansion.

(b) terminating decimal expansion.

(c) non-terminating non repeating decimal expansion.

(d) terminating non repeating decimal expansion

15. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45°. The height of a tree is

(a) 10 m
(b) 14 m
(c) 8 m
(d) 15 m

16. If the perimeter of one face of a cube is 20 cm, then its surface area is

(a) $120\ \text{cm}^2$
(b) $150\ \text{cm}^2$
(c) $125\ \text{cm}^2$
(d) $400\ \text{cm}^2$

17. $\sin^2 60^\circ - 2\tan 45^\circ - \cos^2 30^\circ = ?$

(a) 2
(b) -2
(c) 1
(d) -1

18. If x_i's are the mid-points of the class intervals of grouped data, f_i's are the corresponding frequencies and $\overline{x}$ is the mean, then $\sum(f_i x_i - \overline{x})$ is equal to

(a) 0
(b) -1
(c) 1
(d) 2

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The values of x are $-\frac{a}{2}, a$ for a quadratic equation $2x^2 + ax - a^2 = 0$.
Reason : For quadratic equation $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.
Reason : A parallelogram circumscribing a circle is a rhombus.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Given that HCF (306, 1314) = 18. Find LCM (306, 1314)

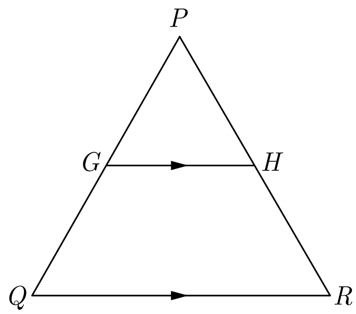
22. If α and β are the zeroes of a polynomial $x^2 - 4\sqrt{3}\,x + 3$, then find the value of $\alpha + \beta - \alpha\beta$.

OR

If one of the zeroes of the quadratic polynomial $f(x) = 14x^2 - 42k^2x - 9$ is negative of the other, find the value of 'k'.

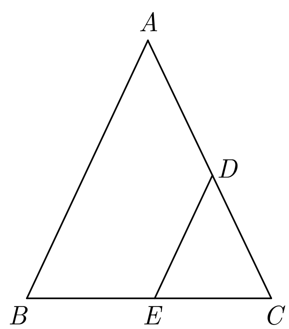
23. The mid-point of the line-segment AB is $P(0, 4)$, if the coordinates of B are $(-2, 3)$ then find the co-ordinates of A.

24. In the given figure, G is the mid-point of the side PQ of ΔPQR and $GH || QR$. Prove that H is the mid-point of the side PR or the triangle PQR.



OR

In the figure of ΔABC, the points D and E are on the sides CA, CB respectively such that $DE || AB$, $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$. Then, find x.



25. Two different dice are tossed together. Find the probability :
(i) that the number on each die is even.
(ii) that the sum of numbers appearing on the two dice is 5.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Write the smallest number which is divisible by both 306 and 657.

27. ΔABC and ΔBDE are two equilateral triangle such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is ....

28. Evaluate :

$$\frac{3\tan^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec} 30^\circ - \tan 45^\circ}{\cot^2 45^\circ}$$

29. Prove that the rectangle circumscribing a circle is a square.

30. A solid is in the shape of a cone surmounted on a hemisphere. The radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.

OR

A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How much canvas cloth is required to just cover the heap?

31. The mean of the following distribution is 48 and sum of all the frequency is 50. Find the missing frequencies x and y.

Class	20-30	30-40	40-50	50-60	60-70
Frequency	8	6	x	11	y

OR

The table below shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure on food.

Daily expenditure (in ₹)	100-150	150-200	200-250	250-300	300-350
Number of households	4	5	12	2	2

Section - D

Section D consists of 4 questions of 5 marks each.

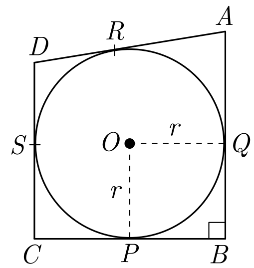
32. Find the values of k for which the equation $(3k+1)x^2 + 2(k+1)x + 1$ has equal roots. Also find the roots.

OR

A person on tour has ₹ 4200 for his expenses. If he extends his tour for 3 days, he has to cut down his daily expenses by ₹ 70. Find the original duration of the tour.

33. Prove that the point $(3,0)$, $(6,4)$ and $(-1,3)$ are the vertices of a right angled isosceles triangle.

34. In figure, a circle with centre O is inscribed in a quadrilateral $ABCD$ such that, it touches the sides BC, AB, AD and CD at points P, Q, R and S respectively. If $AB = 29$ cm, $AD = 23$ cm, $\angle B = 90^\circ$ and $DS = 5$ cm, then find the radius of the circle (in cm).



OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

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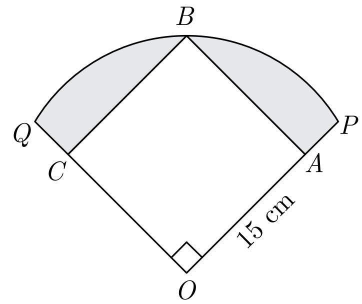
35. In Figure, a square $OABC$ is inscribed in a quadrant $OPBQ$. If $OA = 15\,\text{cm}$, find the area of the shaded region. (Use $\pi = 3.14$).



Section - E

Case study based questions are compulsory.

36. Bequests to Charity : At the time our mother left this Earth, she gave Rs 90000 to her children of birth. This we kept and each year added Rs 30000 more, as a lasting memorial from the children she bore. When Rs 4,20,000 is thusly attained, all goes to charity that her memory be maintained.

(i) What was the balance in the sixth year?

(ii) In what year was the goal of Rs 420,000 met?

37. Eiffel Tower : The Eiffel Tower is a landmark and an early example of wrought-iron construction on a gigantic scale. The lower section consists of four immense arched legs set on masonry piers. The legs curve inward until they unite in a single tapered tower. Platforms, each with an observation deck, are at three levels; on the first is also a restaurant.

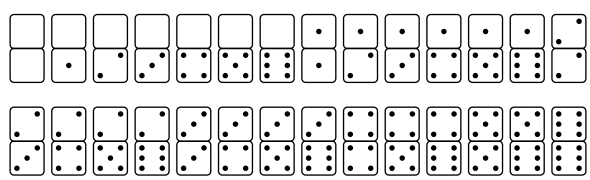
The tower, constructed of about 7000 tons of iron, has stairs and elevators. A meteorological station, a radio communications station, and a television transmission antenna, as well as a suite of rooms that were used by Eiffel are located near the top of the tower.

Continue on next page.....

(i) For a person standing 324 m from the center of the base of the Eiffel Tower, the angle of elevation to the top of the tower is 45°. How tall is the Eiffel Tower?

(ii) A car is moving at uniform speed towards the Eiffel tower. It takes 15 minutes for the angle of depression from the top of tower to the car to change from 30° to 60°. After how much time after this, the car will reach the base of the tower?

38. Double-six Dominos : It is a game played with the 28 numbered tiles shown in the diagram.



The 28 dominos are placed in a bag, shuffled, and then one domino is randomly drawn. Give the following answer.

(i) What is the probability the total number of dots on the domino is three or less ?

(ii) What is the probability the total number of dots on the domino is greater than three ?

(iii) What is the probability the total number of dots on the domino does not have a blank half ?

(iv) What is the probability the total number of dots on the domino is not a “double” (both sides the same) ?

□□□□□□□

Sample Paper 04

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. An event is very unlikely to happen. Its probability is closest to

(a) 0.0001 (b) 0.001

(c) 0.01 (d) 0.1

2. One equation of a pair of dependent linear equations $-5x+7y=2$ The second equation can be

(a) $10x+14y+4=0$ (b) $-10x-14y+4=0$

(c) $-10x+14y+4=0$ (d) $10x-14y=-4$

3. The quadratic equation $x^2+3x+2\sqrt{2}=0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

4. There are 60 terms is an AP of which the first term is 8 and the last term is 185. The 31^{st} term is

(a) 56 (b) 94

(c) 85 (d) 98

5. It is given that, $\Delta ABC \sim \Delta EDF$ such that $AB=5$ cm, $AC=7$ cm, $DF=15$ cm and $DE=12$ cm then the sum of the remaining sides of the triangles is

(a) 23.05 cm (b) 16.8 cm

(c) 6.25 cm (d) 24 cm

6. If triangle ABC is similar to triangle DEF such that $2AB=DE$ and $BC=8$ cm then find EF.

(a) 16 cm (b) 14 cm

(c) 12 cm (d) 15 cm

7. If radii of two concentric circles are 4 cm and 5 cm, then the length of each of one circle which is tangent to the other circle, is

(a) 3 cm (b) 6 cm

(c) 9 cm (d) 1 cm

8. Observations of some data are $\frac{x}{5}$, x, $\frac{x}{3}$, $\frac{2x}{3}$, $\frac{x}{4}$, $\frac{2x}{5}$ and $\frac{3x}{4}$ where $x > 0$. If the median of the data is 4, then the value of x is

(a) 5 (b) 15

(c) 9 (d) 10

9. Two concentric circles of radii a and b where $a > b$,The length of a chord of the larger circle which touches the other circle is

(a) $\sqrt{a^2+b^2}$ (b) $2\sqrt{a^2+b^2}$

(c) $\sqrt{a^2-b^2}$ (d) $2\sqrt{a^2-b^2}$

10. Which of the following equations has the sum of its roots as 3 ?

(a) $2x^2-3x+6=0$ (b) $-x^2+3x-3=0$

(c) $\sqrt{2}\,x^2-\frac{3}{\sqrt{2}}x+1=0$ (d) $3x^2-3x+3=0$

11. If $\sin\theta+\cos\theta=\sqrt{2}\cos\theta$, $(\theta\neq 90^\circ)$ then the value of $\tan\theta$ is

(a) $\sqrt{2}-1$ (b) $\sqrt{2}+1$

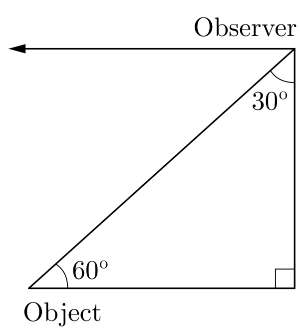
(c) $\sqrt{2}$ (d) $-\sqrt{2}$

12. The angles of elevation of the top of a tower from the points P and Q at distance of a and b respectively from the base and in the same straight line with it, are complementary. The height of the tower is

(a) ab (b) $\sqrt{ab}$

(c) $\sqrt{\frac{a}{b}}$ (d) $\sqrt{\frac{b}{a}}$

13. In the given figure, the positions of the observer and the object are mentioned, the angle of depression is



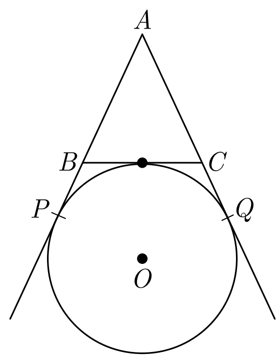
(a) 30° (b) 90°

(c) 60° (d) 45°

14. In a circle of radius 14 cm, an arc subtends an angle of 45° at the centre, then the area of the sector is
(a) 71 cm^2 (b) 76 cm^2
(c) 77 cm^2 (d) 154 cm^2

15. During conversion of a solid from one shape to another, the volume of the new shape will
(a) increase (b) decrease
(c) remain unaltered (d) be doubled

16. In figure, AP, AQ and BC are tangents of the circle with centre O. If $AB = 5\text{ cm}$, $AC = 6$ cm and $BC = 4$ cm, then the length of AP (in cm) is



(a) 15 (b) 10
(c) 9 (d) 7.5

17. If X, M and Z are denoting mean, median and mode of a data and $X : M = 9 : 8$, then the ratio $M : Z$ is
(a) 3 : 4 (b) 4 : 9
(c) 4 : 3 (d) 2 : 5

18. There are 1000 sealed envelopes in a box. 10 of them contain a cash prize of ₹ 100 each, 100 of them contain a cash prize of ₹ 50 each and 200 of them contain a cash prize of ₹ 10 each and rest do not contain any cash prize. If they are well-shuffled and an envelope is picked up out, then the probability that is contains no cash prize is
(a) 0.65 (b) 0.69
(c) 0.54 (d) 0.57

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $p(x) = 14x^3 - 2x^2 + 8x^4 + 7x - 8$ is a polynomial of degree 3.
Reason : The highest power of x in the polynomial $p(x)$ is the degree of the polynomial.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Continue on next page.....

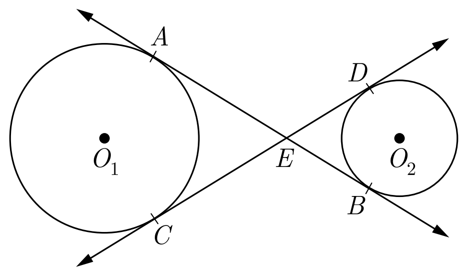
20. **Assertion :** $\sin^2 67° + \cos^2 67° = 1$
Reason : For any value of $\theta, \sin^2\theta + \cos^2\theta = 1$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Find the 21st term of the AP $-4\frac{1}{2}, -3, -1\frac{1}{2}, ...$

22. In Figure, common tangents AB and CD to the two circle with centres O_1 and O_2 intersect at E. Prove that $AB = CD$.



23. If $A(5,2)$, $B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B = 90°$, then find the value of t.

24. Show that any positive even integer can be written in the form $6q, 6q+2$ or $6q+4$, where q is an integer.

OR

Find the smallest natural number by which 1200 should be multiplied so that the square root of the product is a rational number.

25. If five times the fifth term of an AP is equal to eight times its eighth term, show that its 13^{th} term is zero.

OR

Find the values of a, b and c, such that the numbers a, 10, b, c, 31 are in AP

Section - C

Section C consists of 6 questions of 3 marks each.

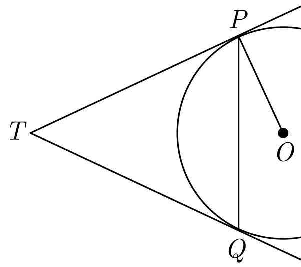
26. For what value of p will the following system of equations have no solution ?

$$(2p-1)x + (p-1)y = 2p+1; \; y + 3x - 1 = 0$$

27. Solve the following quadratic equation for x :

$$x^2+\left(\frac{a}{a+b}+\frac{a+b}{a}\right)x+1=0$$

28. In figure, two tangents TP and TQ are drawn to circle with centre O from an external point T. Prove that $\angle PTQ=2\angle OPQ$.

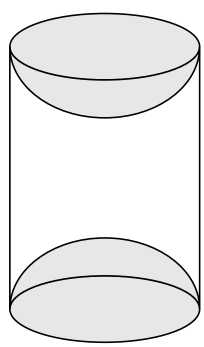


OR

A circle is inscribed in a ΔABC, with sides AC, AB and BC as 8 cm, 10 cm and 12 cm respectively. Find the length of AD, BE and CF.

29. A boy, flying a kite with a string of 90 m long, which is making an angle θ with the ground. Find the height of the kite. (Given $\tan\theta=\frac{45}{8}$)

30. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



OR

A wooden toy was made by scooping out a hemisphere of same radius from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the volume of wood in the toy. Use $\pi=\frac{22}{7}$

31. A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game.

Section - D

Section D consists of 4 questions of 5 marks each.

32. If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, find the values of

(i) $\alpha^2 + \beta^2$

(ii) $\frac{1}{\alpha} + \frac{1}{\beta}$

(iii) $(\alpha - \beta)^2$

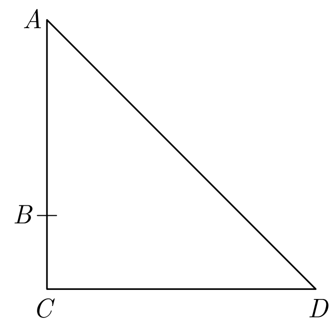
(iv) $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$

(v) $\alpha^2 + \beta^2$

OR

If α and β are the zeroes of the polynomial $p(x) = 2x^2 + 5x + k$ satisfying the relation, $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of k.

33. In the right triangle, B is a point on AC such that $AB + AD = BC + CD$. If $AB = x, BC = h$ and $CD = d$, then find x (in term of h and d).



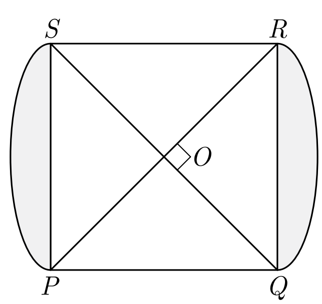
34. Find A and B if $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos(A + 4B) = 0$, where A and B are acute angles.

OR

Evaluate the following :

$$\frac{2\cos^2 60^\circ + 3\sec^2 30^\circ - 2\tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 45^\circ}$$

35. In figure, $PQRS$ is square lawn with side $PQ = 42$ metre. Two circular flower beds are there on the sides PS and QR with centre at O, the intersection of its diagonals. Find the total area of the two flower beds (shaded parts).



Section - E

Case study based questions are compulsory.

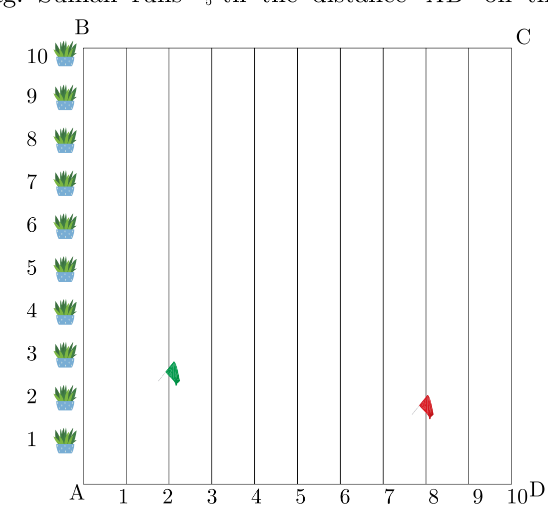
36. Salary Cut : Our personal and professional lives have taken quite a turn in the light of the coronavirus pandemic. Worklife has been revamped across the globe, in that working from home has become the norm for those employees and organizations that continue to carry on with their operations and functioning in the lockdown. Increments, incentives, businesses have all been impacted.

The Covid-19 pandemic has stalled economic activity at an unprecedented scale globally, raising the spectre of job losses and salary cuts. Most of companies decided to bring down the salary by upto 50 %.
The following table shows the salaries (in percent) received by 80 employee during lockdown.

Salary Received (in %)	40-50	50-60	60-70	70-80	80-90	90-100
Number of employee	4	10	14	20	24	8

Based on the above information, answer the following questions.
(i) What is the mean salary (in %) received ?
(ii) How many employee received more than 70 % salary ?
(iii) Find the total number of employee whose salary is reduced by more than 40 % ?
(iv) What is the lower limit of mode class of salary (in %) received?

37. To conduct sports day activities, in a rectangular shaped school ground $ABCD$, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AB, as shown in figure. Nishtha runs $\frac{1}{4}$th the distance AB on the 2nd line and posts a green flag. Suman runs $\frac{1}{5}$th the distance AB on the 8th line and posts a red flag.



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(i) What is the position of green flag ?
(ii) What is the position of red flag ?
(iii) What is the distance between both the flags?
(iv) What is the distance of red flag from point A ?

38. The Prime Minister's Citizen Assistance and Relief in Emergency Situations Fund was created on 28 March 2020, following the COVID-19 pandemic in India. The fund will be used for combating, and containment and relief efforts against the coronavirus outbreak and similar pandemic like situations in the future.

The allotment officer is trying to come up with a method to calculate fair division of funds across various affected families so that the fund amount and amount received per family can be easily adjusted based on daily revised numbers. The total fund allotted for a village is $x^3 + 6x^2 + 20x + 9$. The officer has divided the fund equally among families of the village and each family receives an amount of $x^2 + 2x + 2$. After distribution, some amount is left.
(i) How many families are there in the village?
(ii) If an amount of ₹ 1911 is left after distribution, what is value of x?
(iii) How much amount does each family receive?
(iv) What is the amount of fund allocated?

□□□□□□□

Sample Paper 5

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If the distance between the points $A(4, p)$ and $B(1, 0)$ is 5 units then the value(s) of p is(are)

(a) 4 only (b) -4 only

(c) ± 4 (d) 0

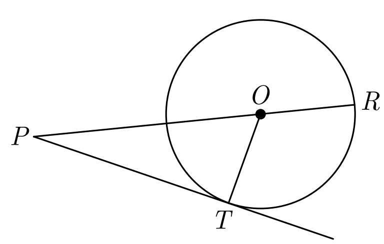
2. For which value(s) of p, will the lines represented by the following pair of linear equations be parallel

$$3x - y - 5 = 0$$
$$6x - 2y - p = 0$$

(a) all real values except 10 (b) 10

(c) 5/2 (d) 1/2

3. In figure, on a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, then the length of PR is



(a) 30 cm (b) 28 cm

(c) 32 cm (d) 25 cm

4. Each root of $x^2 - bx + c = 0$ is decreased by 2. The resulting equation is $x^2 - 2x + 1 = 0$, then

(a) $b = 6, c = 9$ (b) $b = 3, c = 5$

(c) $b = 2, c = -1$ (d) $b = -4, c = 3$

5. The centroid of the triangle whose vertices are $(3, -7), (-8, 6)$ and $(5, 10)$ is

(a) (0, 9) (b) (0, 3)

(c) (1, 3) (d) (3, 5)

6. If the sum of the zeroes of the quadratic polynomial $kx^2 + 2x + 3k$ is equal to their product, then k equals

(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

7. The n^{th} term of the AP $a, 3a, 5a, ...$ is

(a) na (b) $(2n-1)a$

(c) $(2n+1)a$ (d) $2na$

8. In an AP, if $a = 3.5$, $d = 0$ and $n = 101$, then a_n will be

(a) 0 (b) 3.5

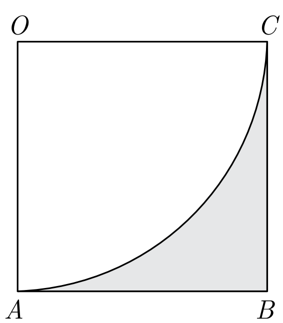
(c) 103.5 (d) 104.5

9. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10 (b) -10

(c) -7 (d) -2

10. In the adjoining figure, $OABC$ is a square of side 7 cm. OAC is a quadrant of a circle with O as centre. The area of the shaded region is



(a) 10.5 cm^2 (b) 38.5 cm^2

(c) 49 cm^2 (d) 11.5 cm^2

11. The value of the expression
$\text{cosec}(75° + \theta) - \sec(15° - \theta) - \tan(55° + \theta) + \cot(35° - \theta)$ is

(a) -1 (b) 0

(c) 1 (d) $\frac{3}{2}$

12. If the angle of depression of an object from a 75 m high tower is 30°, then the distance of the object from the tower is

(a) $25\sqrt{3}$ m (b) $50\sqrt{3}$ m

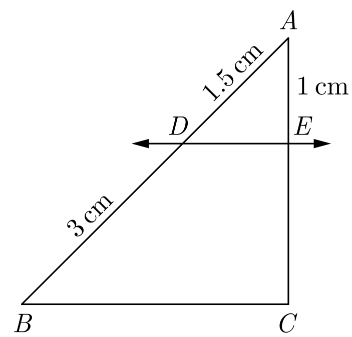
(c) $75\sqrt{3}$ m (d) 150 m

13. The 2 digit number which becomes $\frac{5}{6}$th of itself when its digits are reversed. The difference in the digits of the number being 1, then the two digits number is

(a) 45 (b) 54

(c) 36 (d) None of these

14. In the given figure, $DE \parallel BC$. The value of EC is



(a) 1.5 cm (b) 3 cm

(c) 2 cm (d) 1 cm

15. If the radius of the sphere is increased by 100%, the volume of the corresponding sphere is increased by

(a) 200% (b) 500%

(c) 700% (d) 800%

16. The median and mode respectively of a frequency distribution are 26 and 29, Then its mean is

(a) 27.5 (b) 24.5

(c) 28.4 (d) 25.8

17. An event is very unlikely to happen. Its probability is closest to

(a) 0.0001 (b) 0.001

(c) 0.01 (d) 0.1

18. $(x^2+1)^2 - x^2 = 0$ has

(a) four real roots (b) two real roots

(c) no real roots (d) one real root

Continue on next page.....

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The value of y is 6, for which the distance between the points $P(2,-3)$ and $Q(10,y)$ is 10.
Reason : Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given,

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

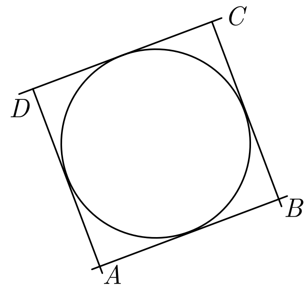
20. **Assertion :** $\frac{13}{3125}$ is a terminating decimal fraction.
Reason : If $q = 2^m 5^n$ where m, n are non-negative integers, then $\frac{p}{q}$ is a terminating decimal fraction.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. In $\Delta ABC, AD \perp BC$, such that $AD^2 = BD \times CD$. Prove that ΔABC is right angled at A.

22. In figure, a circle touches all the four sides of a quadrilateral $ABCD$. If $AB = 6$ cm, $BC = 9$ cm and $CD = 8$ cm, then find the length of AD.



23. If $\tan 2A = \cot(A - 18°)$, where $2A$ is an acute angle, find the value of A.

24. Find the mean the following distribution :

Class	3-5	5-7	7-9	9-11	11-13
Frequency	5	10	10	7	8

Continue on next page.....

OR

Find the mode of the following data :

Class	0-20	20-40	40-60	60-80	80-100	100-120	120-140
Frequency	6	8	10	12	6	5	3

25. Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

OR

Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.

Section - C

Section C consists of 6 questions of 3 marks each.

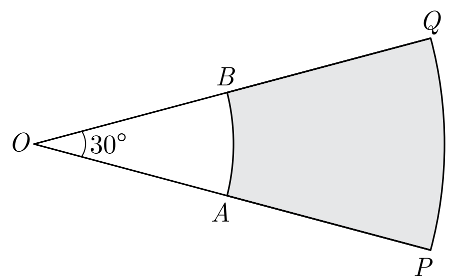
26. The sum of four consecutive number in AP is 32 and the ratio of the product of the first and last term to the product of two middle terms is 7 : 15. Find the numbers.

27. Prove that : $\dfrac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1} = \dfrac{1 + \cot\theta}{\sin\theta}$

28. A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road.

OR

In Figure, PQ and AB are two arcs of concentric circles of radii 7 cm and 3.5 cm respectively, with centre O. If $\angle POQ = 30^\circ$, then find the area of shaded region.



29. Compute the mode for the following frequency distribution:

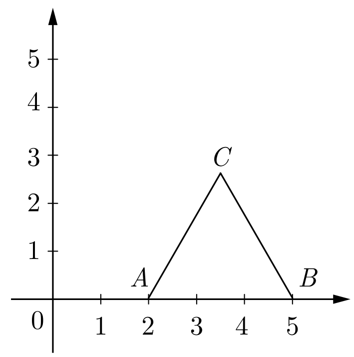
Size of items (in cm)	0- 4	4- 8	8- 12	12-16	16-20	20-24	24-28
Frequency	5	7	9	17	12	10	6

Continue on next page.....

30. Find the ratio in which $P(4, m)$ divides the segment joining the points $A(2,3)$ and $B(6, -3)$. Hence find m.

OR

In the given figure ΔABC is an equilateral triangle of side 3 units. Find the co-ordinates of the other two vertices.



31. Given that $\sqrt{5}$ is irrational, prove that $2\sqrt{5} - 3$ is an irrational number.

Section - D

Section D consists of 4 questions of 5 marks each.

32. For what value of k, which the following pair of linear equations have infinitely many solutions:
$2x + 3y = 7$ and $(k+1)x + (2k-1)y = 4k+1$

OR

The cost of 2 kg of apples and 1kg of grapes on a day was found to be Rs. 160. After a month, the cost of 4kg of apples and 2kg of grapes is Rs. 300. Represent the situations algebraically and geometrically.

33. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

34. The angles of depression of the top and bottom of an 8 m tall building from top of a multi-storeyed building are 30^o and 45^o, respectively. Find the height of multi-storey building and distance between two buildings.

OR

Two poles of equal heights are standing opposite to each other on either side of a road, which is 80 m wide. From a point between them on the road, angles of elevation of their top are 30° and 60°. Find the height of the poles and distance of point from poles.

35. A solid is in the form of a cylinder with hemispherical end. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. (Use $\pi = \frac{22}{7}$)

Continue on next page.....

Section - E

Case study based questions are compulsory.

36. Maximum Profit : An automobile manufacturer can produce up to 300 cars per day. The profit made from the sale of these vehicles can be modelled by the function $P(x) = -x^2 + 350x - 6600$ where $P(x)$ is the profit in thousand Rupees and x is the number of automobiles made and sold. Answer the following questions based on this model:

(i) When no cars are produce what is a profit/loss?

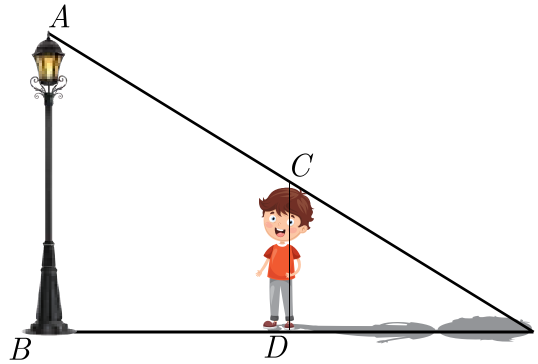
(ii) What is the break even point ? (Zero profit point is called break even) ?

(iii) What is the profit/loss if 175 cars are produced ?

OR

What is the profit if 400 cars are produced ?

37. Rohan is very intelligent in maths. He always try to relate the concept of maths in daily life. One day he is walking away from the base of a lamp post at a speed of 1 m/s. Lamp is 4.5 m above the ground.



(i) If after 2 second, length of shadow is 1 meter, what is the height of Rohan ?

(ii) What is the minimum time after which his shadow will become larger than his original height?

OR

What is the distance of Rohan from pole at this point ?

(iii) What will be the length of his shadow after 4 seconds?

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38. Political survey questions are questions asked to gather the opinions and attitudes of potential voters. Political survey questions help you identify supporters and understand what the public needs. Using such questions, a political candidate or an organization can formulate policies to gain support from these people.

A survey of 100 voters was taken to gather information on critical issues and the demographic information collected is shown in the table. One out of the 100 voters is to be drawn at random to be interviewed on the India Today News on prime time.

	Women	Men	Totals
Republican	17	20	37
Democrat	22	17	39
Independent	8	7	15
Green Party	6	3	5
Totals	53	47	100

(i) What is the probability the person is a woman or a Republican ?

OR

What is the probability the person is a Democrat ?

(ii) What is the probability the person is a Independent men ?

(iii) What is the probability the person is a Independent men or green party men ?

Sample Paper 06

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. There are 30 cards of the same size in a bag in which the numbers 1 to 30 are written. One card is taken out of the bag at random. What is the probability that the number on the selected card is not divisible by 3?

(a) $\frac{1}{15}$ (b) $\frac{2}{3}$ (c) $\frac{1}{10}$ (d) $\frac{1}{3}$

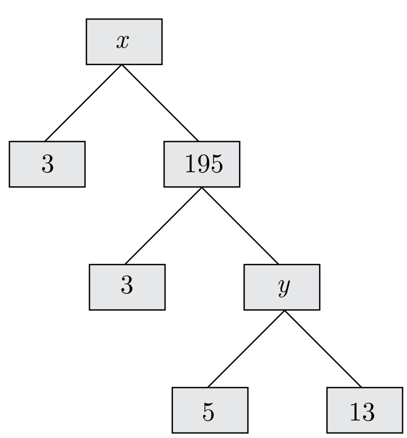
2. If the mid-point of the line segment joining the points $A(3,4)$ and $B(k,6)$ is $P(x,y)$ and $x+y-10=0$, the value of k will be

(a) 4 (b) 5 (c) 6 (d) 7

3. In an AP, if $a=3.5$, $d=0$ and $n=101$, then a_n will be

(a) 0 (b) 3.5 (c) 103.5 (d) 104.5

4. In the given factor tree what is the composite number x?



(a) 65 (b) 585 (c) 130 (d) 195

5. A tree is broken by the wind. The top struck the ground at an angle of 30° and at distance of 10 m from its root. The whole height of the tree is $(\sqrt{3} = 1.732)$
(a) $10\sqrt{3}$ m (b) $3\sqrt{10}$ m (c) $20\sqrt{3}$ m (d) $3\sqrt{20}$ m

6. The zeroes of the polynomial $p(x) = 4x^2 - 12x + 9$ will be
(a) $\frac{3}{2}$ and $\frac{3}{2}$ (b) $\frac{2}{3}$ and $\frac{1}{3}$ (c) $\frac{2}{3}$ and $\frac{1}{3}$ (d) $\frac{1}{3}$ and $\frac{1}{3}$

7. If the equations $kx - 2y = 3$ and $3x + y = 5$ represent two intersecting lines at unique point, then the value of k is ....
(a) $k = -6$ (b) $k \neq -6$ (c) $k = 4$ (d) $k \neq 4$

8. What do you say about the lines represented by ?
$2x + 3y - 9 = 0$ and $4x + 6y - 18 = 0$
(a) lines are parallel (b) lines are coincident (c) lines are intersecting (d) can't say anything

9. What are the values of x and y for the following system of equations.
$\frac{21}{x} + \frac{47}{y} = 110$, $\frac{47}{x} + \frac{21}{y} = 162$, $x, y \neq 0$
(a) $\frac{1}{3}$ and $\frac{1}{2}$ (b) $\frac{1}{3}$ and 1 (c) $\frac{1}{2}$ and $\frac{1}{3}$ (d) $\frac{1}{2}$ and 1

10. If $\Delta ABC \sim \Delta PQR$, and $\frac{AB}{PQ} = \frac{1}{3}$, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} = ?$
(a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{8}{9}$ (d) $\frac{5}{9}$

11. The quadratic equation $x^2 - 4x - 3\sqrt{2} = 0$ has
(a) two distinct real roots (b) two equal real roots (c) no real roots (d) more than 2 real roots

12. The quadratic equation $x^2 + 4x - 3\sqrt{2} = 0$ has
(a) two distinct real roots (b) two equal real roots (c) no real roots (d) more than 2 real roots

13. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is
(a) 6 cm (b) 12 cm (c) 18 cm (d) 9 cm

14. Consider the following frequency distribution

Class	0-5	6-11	12-17	18-23	24-29
Frequency	13	10	15	8	11

The upper limit of the median class is
(a) 17 (b) 17.5 (c) 18 (d) 18.5

15. If $\sec\theta \cdot \sin\theta = 0$, then value of θ will be
(a) 0 (b) 90° (c) 45° (d) ∞

16. $\tan^4\theta + \tan^2\theta = ?$
(a) $\sec^2\theta - 2\sec^4\theta$ (b) $2\sec^2\theta - \sec^4\theta$ (c) $\sec^2\theta - \sec^4\theta$ (d) $\sec^4\theta - \sec^2\theta$

17. Ratio of volumes of two cylinders with equal height is
(a) $H:h$ (b) $R:r$ (c) $R^2:r^2$ (d) None of these

18. Which of the following are the zeroes of the polynomial $p(x) = 2x^3 - 11x^2 + 17x - 6$.
(a) 2 (b) 3 (c) $\frac{1}{2}$ (d) Above all

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** Common difference of the AP -5, -1, 3, 7, ... is 4.
Reason : Common difference of the AP $a, a+d, a+2d,$.......... is given by $d = a_2 - a_1$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If the circumference of a circle is 176 cm, then its radius is 28 cm.
Reason : Circumference $= 2\pi \times$ radius
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Show that $5\sqrt{6}$ is an irrational number.

22. Find the sum of first ten multiple of 5.

OR

If the sum of n terms of an AP is $2n^2 + 5n$, then find the 4^{th} term.

23. If the points $A(4,3)$ and $B(x,5)$ are on the circle with centre $O(2,3)$, then what is the value of x?

24. From an external point Q, the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. What is the radius of circle?

OR

QP is a tangent to a circle with centre O at a point P on the circle. If $\Delta\, OPQ$ is isosceles, then find $\angle OQR$?

25. A bag contains 3 red, 4 green and 5 white candles, one candle is drawn at random from the bag, find the probability that candle is not red.

Section - C

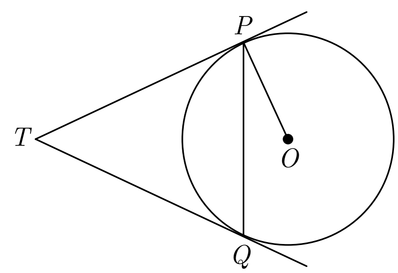
Section C consists of 6 questions of 3 marks each.

26. Find HCF and LCM of 16 and 36 by prime factorization and check your answer.

27. In ΔABC, if X and Y are points on AB and AC respectively such that $\frac{AX}{XB} = \frac{3}{4}$, $AY = 5$ and $YC = 9$, then state whether XY and BC parallel or not.

28. Prove that : $\sqrt{\frac{1-\cos A}{1+\cos A}} = \operatorname{cosec} A - \cot A$

29. In figure, two tangents TP and TQ are drawn to circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.



30. A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road.

OR

Three horses are tied each with 7 m long rope at three corners of a triangular field having sides 20 m, 34 m and 42 m. Find the area of the plot which can be grazed by the horses.

31. An integer is chosen between 70 and 100. Find the probability that it is
(i) a prime number (ii) divisible by 7

OR

Find the probability that 5 Sundays occur in the month of November of a randomly selected year.

Section - D

Section D consists of 4 questions of 5 marks each.

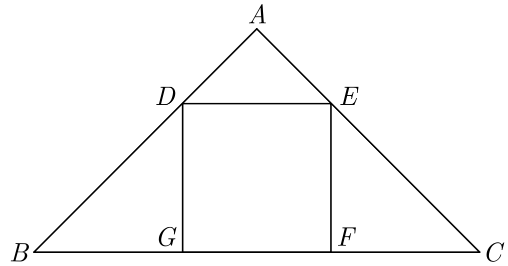
32. Determine graphically the coordinates of the vertices of triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$.

OR

Aftab tells his daughter, '7 years ago, I was seven times as old as you were then. Also, 3 years from now, I shall be three times as old as you will be.' Represent this situation algebraically and graphically.

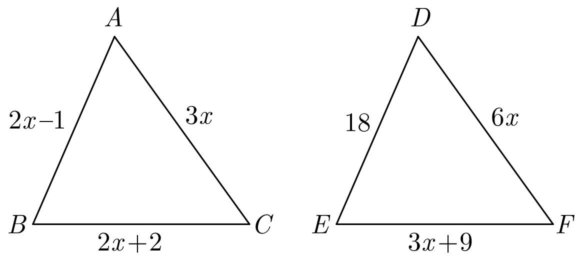
33. Show that the points (a, a), $(-a, -a)$ and $\left(-\sqrt{3}\,a, \sqrt{3}\,a\right)$ are the vertices of an equilateral triangle.

34. In the given figure, $DEFG$ is a square and $\angle BAC = 90^{\circ}$. Show that $FG^2 = BG \times FC$.



OR

In Figure, if $\Delta ABC \sim \Delta DEF$ and their sides of lengths (in cm) are marked along them, then find the lengths of sides of each triangle.



35. A toy is in the form of a cylinder of diameter $2\sqrt{2}$ m and height 3.5 m surmounted by a cone whose vertical angle is 90°. Find total surface area of the toy.

Section - E

Case study based questions are compulsory.

36. John and Priya went for a small picnic. After having their lunch Priya insisted to travel in a motor boat. The speed of the motor boat was 20 km/hr. Priya being a Mathematics student wanted to know the speed of the current. So she noted the time for upstream and downstream.

She found that for covering the distance of 15 km the boat took 1 hour more for upstream than downstream.

(i) Let speed of the current be x km/hr. What will be the speed of the motorboat in upstream ? What is the relation between speed distance and time?

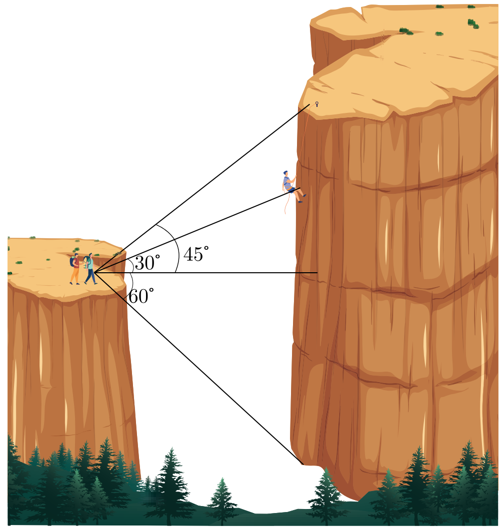
(ii) Write the correct quadratic equation for the speed of the current ?

(iii) What is the speed of current ? How much time boat took in downstream ?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

37. Height of a Climber : Himalayan Trekking Club has just hiked to the south rim of a large canyon, when they spot a climber attempting to scale the taller northern face. Knowing the distance between the sheer walls of the northern and southern faces of the canyon is approximately 150 meter, they attempt to compute the distance remaining for the climbers to reach the top of the northern rim.



Using a homemade transit, they sight an angle of depression of 60° to the bottom of the north face, and angles of elevation of 30° and 45° to the climbers and top of the northern rim respectively.

(i) How high is the southern rim of the canyon?
(ii) How high is the northern rim?
(iii) How much farther until the climber reaches the top?

38. Electric scooters are plug-in electric vehicles with two or three wheels. The electricity is stored on board in a rechargeable battery, which drives one or more electric motors. Leading manufacturer of electric scooter, Hero Scooter Pvt Ltd wants to declare the mileage of their electric scooters. For this, they recorded the mileage (km/charge) of 50 scooters of the same model. Details of which are given in the following table.

Mileage (km/charge)	100-120	120-140	140-160	160-180
Number of scooters	7	12	18	13

Based on the above information, answer the following questions.

(i) What is the average mileage.
(ii) What is the modal value of mileage ?
(iii) What is the median value of mileage ?
(iv) What about the mileage can be claimed by the manufacturer for his scooter ?

□□□□□□□□

Sample Paper 07

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. An observer, 1.5 m tall is 20.5 away from a tower $22\,\text{m}$ high, then the angle of elevation of the top of the tower from the eye of observer is

(a) 30° (b) 45° (c) 60° (d) 90°

2. What is the ratio in which the point $P(\frac{3}{4}, \frac{5}{12})$ divides the line segment joining the point $A\ (\frac{1}{2}, \frac{3}{2})$ and $(2, -5)$

(a) 4 : 7 (b) 3 : 7 (c) 1 : 5 (d) 2 : 5

3. If HCF(336, 54) $= 6$, LCM(336, 54) will be

(a) 2024 (b) 3024 (c) 1012 (d) 1512

4. Consider the following distribution :

Marks obtained	**Number of students**
More than or equal to 0	63
More than or equal to 10	58
More than or equal to 20	55
More than or equal to 30	51
More than or equal to 40	48
More than or equal to 50	42

the frequency of the class 30-40 is :

(a) 3 (b) 4 (c) 48 (d) 51

5. Zeroes of $f(x) = x^2 - 2x$ are

(a) 2 and 4 (b) 1 and 3 (c) 0 and 2 (d) 0 and 4

6. Harpreet tosses two different coins simultaneously. What is the probability that she gets at least one head ?
(a) $\frac{1}{4}$ (b) $\frac{2}{4}$ (c) $\frac{3}{4}$ (d) 1

7. For what value of p will the following system of equations have no solution ?

$$(2p-1)x+(p-1)y = 2p+1;\ y+3x-1=0$$

(a) $p=2$ (b) $p \neq 2$ (c) $p=4$ (d) $p \neq 4$

8. The quadratic equation $x^2+3x+2\sqrt{2}=0$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

9. A right circular cylinder of radius r and height h (where, $h>2r$) just encloses a sphere of diameter
(a) r (b) $2r$ (c) h (d) $2h$

10. If the common difference of an AP is 5, then what is $a_{18}-a_{13}$?
(a) 5 (b) 20 (c) 25 (d) 30

11. For what value of k, the system of equations $kx+3y=1$, $12x+ky=2$ has no solution.
(a) $k=-6$ (b) $k\neq-6$ (c) $k=4$ (d) $k=-4$

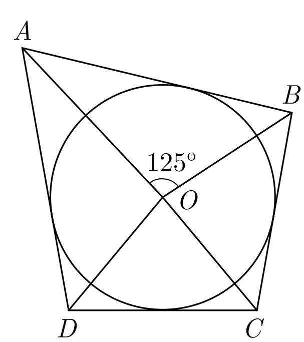
12. If $\Delta ABC \sim \Delta PQR$, $\frac{AB}{PQ}=\frac{1}{3}$, then $\frac{\text{ar}\,\Delta ABC}{\text{ar}\,\Delta PQR}$ will be
(a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{8}{9}$ (d) $\frac{5}{9}$

13. If A and B are acute angles and $\sin A=\cos B$, then the value of $A+B$ is
(a) $60°$ (b) $180°$ (c) $90°$ (d) $120°$

14. $\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}=?$
(a) 1 (b) $2\sec^2\theta$ (c) $2\sin^2\theta$ (d) $2\cos^2\theta$

15. Which of the following equations has the sum of its roots as 3 ?
(a) $2x^2-3x+6=0$ (b) $-x^2+3x-3=0$ (c) $\sqrt{2}x^2-\frac{3}{\sqrt{2}}x+1=0$ (d) $3x^2-3x+3=0$

16. In figure, if $\angle AOB=125°$, then $\angle COD$ is equal to



(a) $62.5°$ (b) $45°$ (c) $35°$ (d) $55°$

17. If the perimeter of a circle is equal to that of a square, then the ratio of their areas is
(a) 22:7 (b) 14:11 (c) 7:22 (d) 11:14

18. Select the quadratic polynomial whose sum and product of a the zeroes are $\frac{21}{8}$ and $\frac{5}{16}$ respectively

(a) $16x^2-42x+5$ (b) $\frac{1}{16}(16x^2-42x+5)$ (c) $\frac{1}{12}(16x^2+42x+5)$ (d) $\frac{1}{12}(16x^2+42x-5)$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $x+y-4=0$ and $2x+ky-3=0$ has no solution if $k=2$.
Reason : $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ are consistent if $\frac{a_1}{a_2}\neq\frac{k_1}{k_2}$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If sum of the first n terms of an AP is given by $S_n=3n^2-4n$. Then its n^{th} term is $a_n=6n-7$.
Reason : n^{th} term of an AP, whose sum to n terms is S_n, is given by $a_n=S_n-S_{n-1}$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Prove that $3+\sqrt{5}$ is an irrational number.

22. If S_n denotes the sum of n terms of an AP whose common difference is d and first term is a, find $S_n-2S_{n-1}+S_{n-2}$.

OR

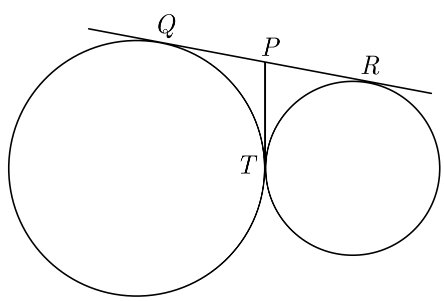
Find the sum of first 15 multiples of 8.

23. The ordinate of a point A on y-axis is 5 and B has co-ordinates $(-3,1)$. Find the length of AB.

24. Two circles of radii 20 cm and 37 cm intersect in A and B. If O_1 and O_2 are their centres and $AB=24$ cm, then find the distance O_1O_2.

OR

In the figure, QR is a common tangent to given circle which meet at T. Tangent at T meets QR at P. If $QP=3.8$ cm, then find length of QR.



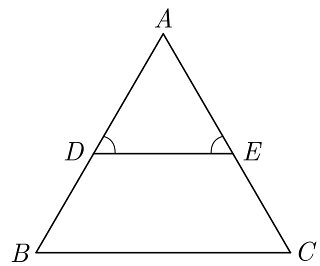
25. One card is drawn from a well shuffled deck of 52 cards. Find the probability of getting :
(i) a non face card,
(ii) a black king.

Section - C

Section C consists of 6 questions of 3 marks each.

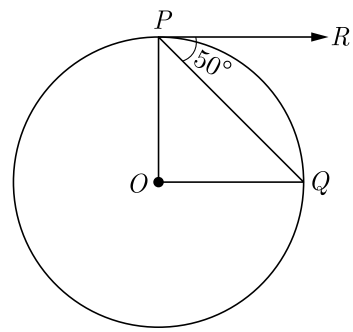
26. State Fundamental theorem of Arithmetic. Find LCM of numbers 2520 and 10530 by prime factorization.

27. In Figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that ΔBAC is an isosceles triangle.



28. Prove that $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

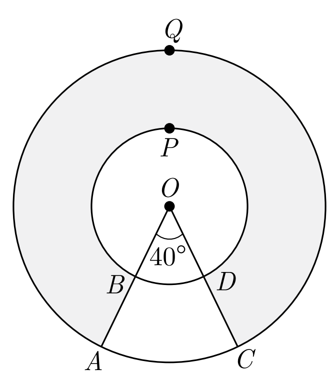
29. If O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find $\angle POQ$.



30. Find the area of minor segment of a circle of radius 14 cm, when its centre angle is 60°. Also find the area of corresponding major segment. Use $\pi = \frac{22}{7}$.

OR

In the given figure, find the area of the shaded region, enclosed between two concentric circles of radii 7 cm and 14 cm where $\angle AOC = 40^\circ$. Use $\pi = \frac{22}{7}$.



31. Two different dice are tossed together. Find the probability:
(i) of getting a doublet
(ii) of getting a sum 10, of the numbers on the two dice.

OR

An integer is chosen at random between 1 and 100. Find the probability that it is:
(i) divisible by 8.
(ii) not divisible by 8.

Section - D

Section D consists of 4 questions of 5 marks each.

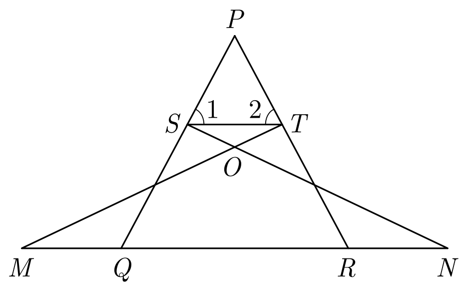
32. Solve the following pair of linear equations graphically:
$x - y = 1$, $2x + y = 8$
Also find the co-ordinates of the points where the lines represented by the above equation intersect $y-$ axis.

OR

Find the value of p and q for which the system of equations represent coincident lines $2x + 3y = 7$, $(p+q+1)x + (p+2q+2)y = 4(p+q)+1$

33. If $P(2,-1)$, $Q(3,4)$, $R(-2,3)$ and $S(-3,-2)$ be four points in a plane, show that $PQRS$ is a rhombus but not a square.

34. In given figure $\angle 1 = \angle 2$ and $\Delta NSQ \sim \Delta MTR$, then prove that $\Delta PTS \sim \Delta PRO$.



OR

Prove that in a right triangle, the square of the hypotenuse is equal to sum of squares of other two sides. Using the above result, prove that, in rhombus $ABCD$, $4AB^2 = AC^2 + BD^2$.

35. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volume of the cylinder and toy. (Use $\pi = 3.14$)

Section - E

Case study based questions are compulsory.

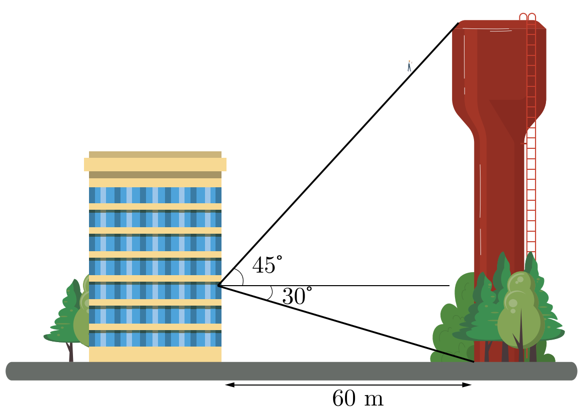
36. Raju and his classmates planned a picnic in zoo. The total budget for picnic was Rs 2000 but 5 students failed to attend the picnic and thus the contribution for each student was increased by Rs 20.

The expanse of different item was as follows.

S. No.	**Article**	**Cost per student**
1	Entry ticket	Rs 5
2	Coffee	Rs 10
3	Food	Rs 25
4	Travelling cost	Rs 50
5	Ice-cream	Rs 15

(i) If x is the number of students planned for picnic, find the quadratic equation that describe the situation.
(ii) What is the number of students planned for picnic ?
(iii) What is the number of students who attended the picnic? What is the total expanse for this picnic ?
(iv) How much money they spent for travelling ?

37. Water Tower : A water tower is a building that is used to hold and give out water. It is almost always built on a high place. It works because a pump gives water to the tower, and gravity makes the saved water go out to the places that need water. Those places are connected to the tower by pipes. A water tower is good when there is no power because it uses gravity to send out the water.



A water tower is located 60 meter from a building (see the figure). From a window in the building, an observer notes that the angle of elevation to the top of the tower is 60° and that the angle of depression to the bottom of the tower is 30°.
(i) How tall is the tower?
(ii) How high is the window?

38. The Kendriya Vidyalaya Sangathan is a system of premier central government schools in India that are instituted under the aegis of the Ministry of Education (MHRD), Government of India. As of October 2020, it has a total of 1239 schools. It is one of the world's largest chains of schools. The system came into being in 1963 under the name 'Central Schools'. Later, the name was changed to Kendriya Vidyalaya. Its schools are all affiliated to the Central Board of Secondary Education (CBSE). The objective of KVS is to cater to the educational needs of the children of transferable Central Government employees including Defence and Para-Military personnel by providing a common programme of education.

Commissioner of Regional office Jaipur prepare a table of the marks obtained of 100 students which is given below

Marks obtained	0-20	20-40	40-60	60-80	80-100
Number of students	15	18	21	29	p

He was told that mean marks of a student is 53.

(i) How many students got marks between 80-100?

(ii) What is the lower limit of model class ? What is the value of model marks ?

(iii) What is the value of median marks ? What is the upper limit of median class ?

□□□□□□□□

Sample Paper 08

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

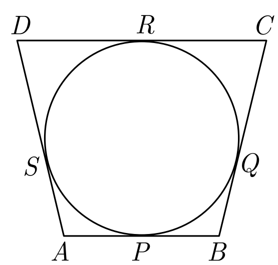
Section A consists of 20 questions of 1 mark each.

1. If $x = a$ and $y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then the values of a and b are, respectively

(a) 3 and 5 (b) 5 and 3

(c) 3 and 1 (d) -1 and -3

2. In the given figure, a circle touches all the four sides of quadrilateral $ABCD$ with $AB = 6$ cm, $BC = 7$ cm and $CD = 4$ cm, then length of AD is



(a) 3 cm (b) 4 cm

(c) 5 cm (d) 6 cm

3. The quadratic equation $5x^2 - 3x + 1 = 0$ has

(a) two distinct real roots

(b) two equal real roots

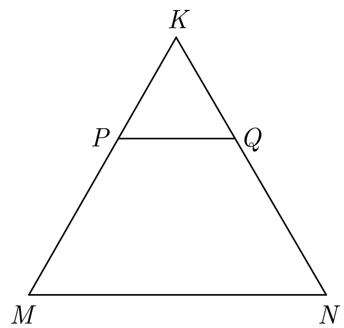
(c) no real roots

(d) more than 2 real roots

4. The area of a right angled triangle is 40 sq cm and its perimeter is 40 cm. The length of its hypotenuse is

(a) 16 cm
(b) 18 cm
(c) 17 cm
(d) data insufficient

5. In the figure, PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and $KN = 20.4$ cm then find KQ.



(a) 4.8 cm
(b) 4.6 cm
(c) 4.4 cm
(d) 4.2 cm

6. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 min and summarised in the table give below.

Number of cars	**Frequency**
0-10	7
10-20	14
20-30	13
30-40	12
40-50	20
50-60	11
60-70	15
70-80	08

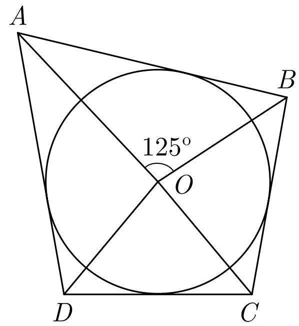
Then, the mode of the data is

(a) 34.7
(b) 44.7
(c) 54.7
(d) 64.7

7. The zeroes of the quadratic polynomial $x^2 + 99x + 127$ are

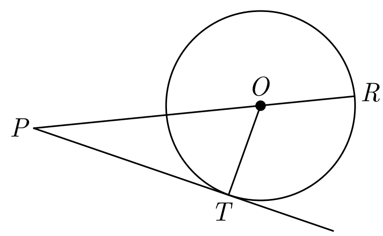
(a) both positive
(b) both negative
(c) one positive and one negative
(d) both equal

8. In figure, if $\angle AOB = 125^\circ$, then $\angle COD$ is equal to



(a) 62.5°
(b) 45°
(c) 35°
(d) 55°

9. In figure, on a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, then the length of PR is



(a) 30 cm
(b) 28 cm
(c) 32 cm
(d) 25 cm

10. If $\cos A = \frac{4}{5}$, then the value of $\tan A$ is

(a) $\frac{3}{5}$
(b) $\frac{3}{4}$
(c) $\frac{4}{3}$
(d) $\frac{5}{3}$

11. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively, then the height of the tower is

(a) 14.64 m
(b) 28.64 m
(c) 38.64 m
(d) 19.64 m

12. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then

(a) $R_1 + R_2 = R$
(b) $R_1^2 + R_2^2 = R^2$
(c) $R_1 + R_2 < R$
(d) $R_1^2 + R_2^2 < R^2$

13. A solid piece of iron in the form of a cuboid of dimensions $49\,\text{cm} \times 33\,\text{cm} \times 24\,\text{cm}$, is moulded to form a solid sphere. The radius of the sphere is

(a) 21 cm
(b) 23 cm
(c) 25 cm
(d) 19 cm

14. If the mean of the squares of first n natural numbers is 105, then the first n natural numbers is

(a) 8 (b) 9

(c) 10 (d) 11

15. The $P(A)$ denotes the probability of an event A, then

(a) $P(A) < 0$ (b) $P(A) > 1$

(c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$

16. A tree is broken by the wind. The top struck the ground at an angle of 30° and at distance of 10 m from its root. The whole height of the tree is $(\sqrt{3} = 1.732)$

(a) $10\sqrt{3}$ m (b) $3\sqrt{10}$ m

(c) $20\sqrt{3}$ m (d) $3\sqrt{20}$ m

17. A fair die is thrown once. The probability of getting a composite number less than 5 is

(a) $\frac{1}{3}$ (b) $\frac{1}{6}$

(c) $\frac{2}{3}$ (d) 0

18. If α and β are the zeroes of the polynomial $2x^2 - 13x + 6$, then $\alpha + \beta$ is equal to

(a) -3 (b) 3

(c) $\frac{13}{2}$ (d) $-\frac{13}{2}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** If sum of the first n terms of an AP is given by $S_n = 3n^2 - 4n$. Then its n^{th} term is $a_n = 6n - 7$.
Reason : n^{th} term of an AP, whose sum to n terms is S_n, is given by $a_n = S_n - S_{n-1}$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** $\sin^2 67^\circ + \cos^2 67^\circ = 1$
Reason : For any value of $\theta, \sin^2\theta + \cos^2\theta = 1$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. If the sum of first n terms of an AP is n^2, then find its 10th term.

22. Two tangents PA and PB are drawn from an external point P to a circle inclined to each other at an angle of 70°, then what is the value of $\angle PAB$?

23. Find the ratio in which the point $P(\frac{3}{4}, \frac{5}{12})$ divides the line segment joining the point A $(\frac{1}{2}, \frac{3}{2})$ and $(2, -5)$.

24. If two positive integers p and q are written as $p = a^2 b^3$ and $q = a^3 b$, where a and b are prime numbers than verify LCM$(p, q) \times$ HCF$(q, q) = pq$

OR

Prove that $3 + \sqrt{5}$ is an irrational number.

25. The fifth term of an AP is 20 and the sum of its seventh and eleventh terms is 64. Find the common difference.

OR

For AP show that $a_p + a_{p+2q} = 2a_{p+q}$.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Solve for x and y :

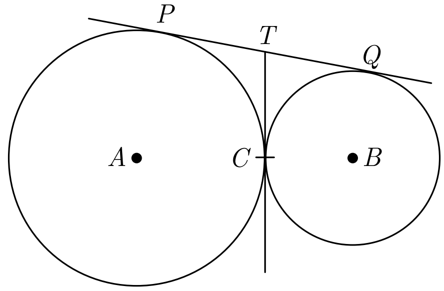
$$\frac{x}{2} + \frac{2y}{3} = -1$$

$$x - \frac{y}{3} = 3$$

27. Solve for x :

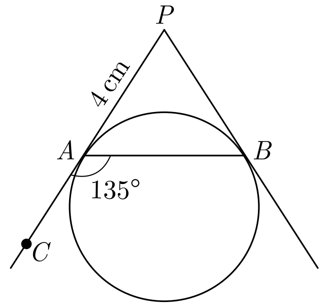
$$\frac{1}{(x-1)(x-2)} + \frac{1}{(x-2)(x-3)} = \frac{2}{3}; x \neq 1,2,3$$

28. In given figure, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q.



OR

In the given figure, PA and PB are tangents to a circle from an external point P such that $PA = 4$ cm and $\angle BAC = 135^o$. Find the length of chord AB.



29. A 7 m long flagstaff is fixed on the top of a tower standing on the horizontal plane. From point on the ground, the angles of elevation of the top and bottom of the flagstaff are 60° and 45° respectively. Find the height of the tower correct to one place of decimal.(Use $\sqrt{3} = 1.73$)

30. Water in a canal, 6 m wide and 1.5 m deep, is flowing with a speed of 10 km/hour. How much area will it irrigate in 30 minutes; if 8 cm standing water is needed?

OR

The radii of two right circular cylinders are in the ratio of 2 : 3 and their height are in the ratio of 5 : 4. Calculate the ratio of their curved surface area and radio of their volumes.

31. A die is thrown once. Find the probability of getting a number which (i) is a prime number (ii) lies between 2 and 6.

Section - D

Section D consists of 4 questions of 5 marks each.

32. If α and β are zeroes of the polynomial $p(x) = 6x^2 - 5x + k$ such that $\alpha - \beta = \frac{1}{6}$, Find the value of k.

OR

Polynomial $x^4 + 7x^3 + 7x^2 + px + q$ is exactly divisible by $x^2 + 7x + 12$, then find the value of p and q.

33. Prove that in a right triangle, the square of the hypotenuse is equal to sum of squares of other two sides.

OR

Prove that in a right triangle, the square of the hypotenuse is equal to sum of squares of other two sides. Using the above result, prove that, in rhombus $ABCD$, $4AB^2 = AC^2 + BD^2$.

34. Given that $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$, find the values of $\tan 75^o$ and $\tan 90^o$ by taking suitable values of A and B.

OR

Prove that : $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \tan\theta + \cot\theta$.

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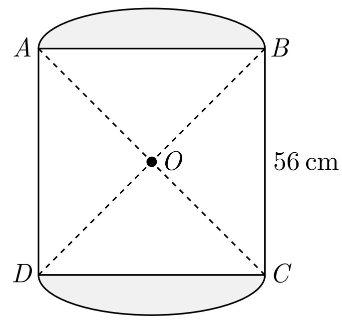
SOLUTIONS

35. In fig., two circular flower beds have been shown on two sides of a square lawn $ABCD$ of side 56 m. If the centre of each circular flower bed is the point of intersection O of the diagonals of the square lawn, find the sum of the areas of the lawn and flower beds.



Section - E

Case study based questions are compulsory.

36. Traffic Management : A traffic enforcement camera is a camera which may be mounted beside or over a road or installed in an enforcement vehicle to detect motoring offenses, including speeding, vehicles going through a red traffic light. A worldwide review of studies found that speed cameras led to a reduction of 11% to 44% for fatal and serious injury crashes. The British Medical Journal recently reported that speed cameras were effective at reducing accidents and injuries in their vicinity and recommended wider deployment.

In order to monitor reckless driving on Mumbai road, special cameras have been installed at many traffic light. The following table shows a frequency distribution table for the speed of 100 vehicles passing through a particular spot on a day.

Speed (in km/h)	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Number of Vehicles	1	3	7	16	35	29	7	2

Based on the above information, answer the following questions.

(i) Find the number of vehicles whose speed is more than 70 km/h and find the number of vehicles whose speed is less than 50 km/h ?

(ii) What is the mode value of speed ?

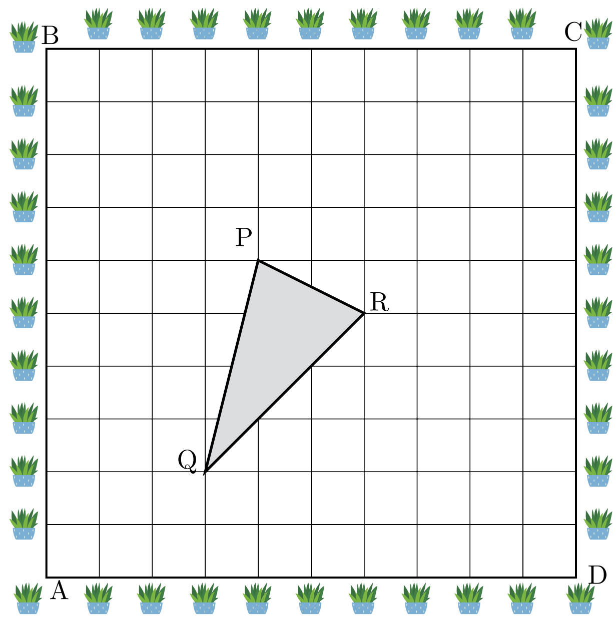
(iii) What is the median value of speed ?

Continue on next page.....

OR

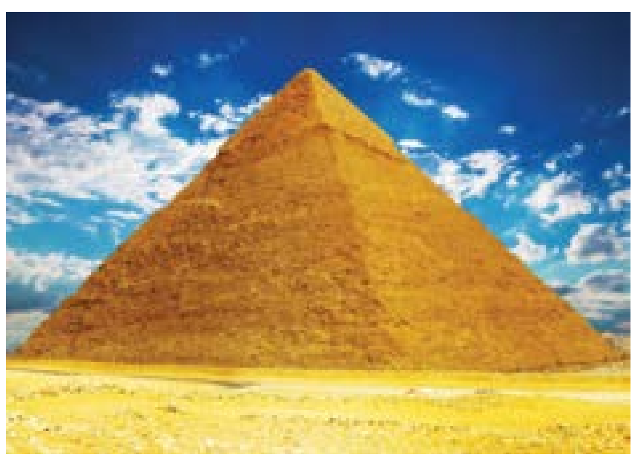
(iv) Find the mean value of speed using empirical relation.

37. A garden is in the shape of rectangle. Gardener grew sapling of Ashoka tree on the boundary of garden at the distance of 1 meter from each other. He want to decorate the garden with rose plants. He choose triangular region inside the park to grow rose plants. On the above situation, gardener took help from the students of class 10th. They made a chart for it which looks as the above figure.



(i) If A is taken as origin, What are the coordinates of triangle PQR ?
(ii) If C is taken as origin, what is the co-ordinate of point P ?
(iii) If B is taken as origin, what are the co-ordinate of P ?
(iv) What is distance between P and Q if origin is taken A?

38. Pyramid, in architecture, a monumental structure constructed of or faced with stone or brick and having a rectangular base and four sloping triangular sides meeting at an apex. Pyramids have been built at various times in Egypt, Sudan, Ethiopia, western Asia, Greece, Cyprus, Italy, India, Thailand, Mexico, South America, and on some islands of the Pacific Ocean. Those of Egypt and of Central and South America are the best known.



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The volume and surface area of a pyramid with a square base of area a^2 and height h is given by

$V = \frac{ha^2}{3}$ and $S = a^2 + 2a\sqrt{(\frac{a}{2})^2 + h^2}$

A pyramid has a square base and a volume of $3y^3 + 18y^2 + 27y$ cubic units.

(i) If its height is y, then what polynomial represents the length of a side of the square base ?

(ii) If area of base is 576 metre, what is the side of base?

(iii) What is the height of pyramid at above area of base ? What is the ratio of length of side to the height ?

OR

(iv) What is surface area of pyramid ?

□□□□□□□

Sample Paper 9

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is

(a) $x^2 + 5x + 6$ (b) $x^2 - 5x + 6$ (c) $x^2 - 5x - 6$ (d) $-x^2 + 5x + 6$

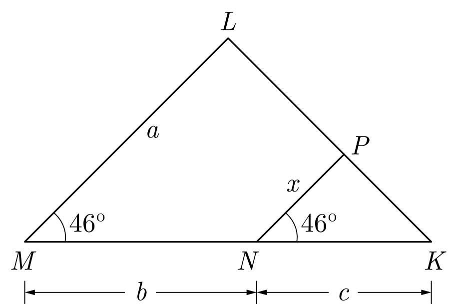
2. If the point $P(k,\ 0)$ divides the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ in the ratio 1 : 2, then the value of k is

(a) 1 (b) 2 (c) -2 (d) -1

3. In a number of two digits, unit's digit is twice the tens digit. If 36 be added to the number, the digits are reversed. The number is

(a) 36 (b) 63 (c) 48 (d) 84

4. In the given figure, x is



(a) $\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$

(c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$

5. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then value of $x+y$ is

(a) 10 (b) 11

(c) 12 (d) 13

6. If ½ is a root of the equation $x^2+kx-\frac{5}{4}=0$, then the value of k is

(a) 2 (b) -2

(c) $\frac{1}{4}$ (d) $\frac{1}{2}$

7. If α and β are the zeroes of the polynomial x^2+2x+1, then $\frac{1}{\alpha}+\frac{1}{\beta}$ is equal to

(a) -2 (b) 2

(c) 0 (d) 1

8. The real roots of the equation $x^{2/3}+x^{1/3}-2=0$ are

(a) 1, 8 (b) $-1,-8$

(c) $-1,8$ (d) $1,-8$

9. Which term of an AP, 21, 42, 63, 84, ... is 210?

(a) 9th (b) 10th

(c) 11th (d) 12th

10. If the height and length of the shadow of a man are equal, then the angle of elevation of the sun is,

(a) 45° (b) 60°

(c) 90° (d) 120°

11. The area of a circular ring formed by two concentric circles whose radii are 5.7 cm and 4.3 cm respectively is (Take $\pi=3.1416$)

(a) 44 sq. cm. (b) 66 sq. cm.

(c) 22 sq. cm. (d) 33 sq. cm.

12. A sphere is melted and half of the melted liquid is used to form 11 identical cubes, whereas the remaining half is used to form 7 identical smaller spheres. The ratio of the side of the cube to the radius of the new small sphere is

(a) $\left(\frac{4}{3}\right)^{1/3}$ (b) $\left(\frac{8}{3}\right)^{1/3}$

(c) $(3)^{1/3}$ (d) 2

13. The $P(A)$ denotes the probability of an event A, then

(a) $P(A)<0$ (b) $P(A)>1$

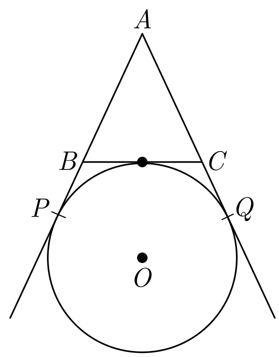
(c) $0\leq P(A)\leq 1$ (d) $-1\leq P(A)\leq 1$

14. If $\sin\theta=\frac{a}{b}$, then $\cos\theta$ is equal to

(a) $\frac{b}{\sqrt{b^2-a^2}}$ (b) $\frac{b}{a}$

(c) $\frac{\sqrt{b^2-a^2}}{b}$ (d) $\frac{a}{\sqrt{b^2-a^2}}$

15. In figure, AP, AQ and BC are tangents of the circle with centre O. If $AB = 5\,\text{cm}$, $AC = 6$ cm and $BC = 4$ cm, then the length of AP (in cm) is



(a) 15 (b) 10
(c) 9 (d) 7.5

16. The cumulative frequency table is useful in determining
(a) Mean (b) Median
(c) Mode (d) All of these

17. The ratio in which the point $(2, y)$ divides the join of $(-4, 3)$ and $(6, 3)$, hence the value of y is
(a) $2:3, y = 3$ (b) $3:2, y = 4$
(c) $3:2, y = 3$ (d) $3:2, y = 2$

18. If the points $A(4, 3)$ and $B(x, 5)$ are on the circle with centre $O(2, 3)$, then the value of x is
(a) 0 (b) 1
(c) 2 (d) 3

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** 34.12345 is a terminating decimal fraction.
Reason : Denominator of 34.12345, when expressed in the form $\frac{p}{q}$, $q \neq 0$, is of the form $2^m \times 5^n$, where m and n are non-negative integers.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

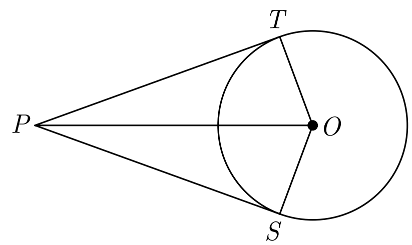
20. **Assertion :** Common difference of the AP -5, -1, 3, 7, ... is 4.
Reason : Common difference of the AP $a, a + d, a + 2d, \dots\dots\dots$ is given by $d = a_2 - a_1$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. In an equilateral triangle of side 24 cm, find the length of the altitude.

22. In the given figure, from a point P, two tangents PT and PS are drawn to a circle with centre O such that $\angle SPT = 120^\circ$, Prove that $OP = 2PS$.



23. Evaluate :

$$\frac{3\tan^2 30^\circ + \tan^2 60^\circ + \operatorname{cosec} 30^\circ - \tan 45^\circ}{\cot^2 45^\circ}$$

24. The mode of the following frequency distribution is 36. Find the missing frequency f.

Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	f	16	12	6	7

OR

Find the median for the given frequency distribution :

Class	40-45	45-50	50-55	55-60	60-65	65-70	70-75
Frequency	2	3	8	6	6	3	2

25. Given that HCF (306, 1314) = 18. Find LCM (306, 1314)

OR

Check whether 4^n can end with the digit 0 for any natural number n.

Section - C

Section C consists of 6 questions of 3 marks each.

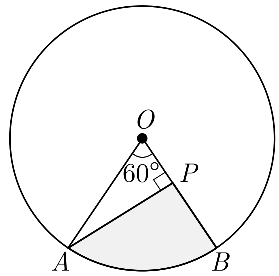
26. The sum of the first 7 terms of an AP is 63 and that of its next 7 terms is 161. Find the AP.

27. If $\sin\theta + \cos\theta = \sqrt{2}$ prove that $\tan\theta + \cot\theta = 2$

28. Three horses are tied each with 7 m long rope at three corners of a triangular field having sides 20 m, 34 m and 42 m. Find the area of the plot which can be grazed by the horses.

OR

In the given figure, AOB is a sector of angle 60° of a circle with centre O and radius 17 cm. If $AP \perp OB$ and $AP = 15$ cm, find the area of the shaded region.



29. The mean of the following frequency distribution is 18. The frequency f in the class interval 19-21 is missing. Determine f.

Class interval	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

30. If the point $C(-1,2)$ divides internally the line segment joining $A(2,5)$ and $B(x,y)$ in the ratio 3 :4 find the coordinates of B.

OR

Prove that the diagonals of a rectangle $ABCD$, with vertices $A(2,\ -1), B(5,\ -1), C(5,\ 6)$ and $D(2,6)$ are equal and bisect each other.

31. Given that $\sqrt{2}$ is irrational, prove that $(5+3\sqrt{2})$ is an irrational number.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find c if the system of equations $cx+3y+(3-c)=0; 12x+cy-c=0$ has infinitely many solutions?

OR

Solve for x and y :

$$2x-y+3 = 0$$
$$3x-5y+1 = 0$$

33. Prove that tangent drawn at any point of a circle perpendicular to the radius through the point contact.

34. The angle of elevation of an aeroplane from a point on the ground is 60^o. After a flight of 30 seconds the angle of elevation becomes 30^o. If the aeroplane is flying at a constant height of $3000\sqrt{3}$ m, find the speed of the aeroplane.

OR

Amit, standing on a horizontal plane, find a bird flying at a distance of 200 m from him at an elevation of 30°. Deepak standing on the roof of a 50 m high building, find the angle of elevation of the same bird to be 45°. Amit and Deepak are on opposite sides of the bird. Find the distance of the bird from Deepak.

35. The weight of two spheres of same metal are 1 kg and 7 kg. The radius of the smaller sphere is 3 cm. The two spheres are melted to form a single big sphere. Find the diameter of the new sphere.

Section - E

Case study based questions are compulsory.

36. Model Rocketry : A model rocket is a small rocket designed to reach low altitudes and be recovered by a variety of means. Flying model rockets is a relatively safe and inexpensive way for person to learn the basics of forces and the response of a vehicle to external forces. Like an airplane, a model rocket is subjected to the forces of weight, thrust, and aerodynamics during its flight.

Shalvi is a member of first rocket club of India named STAR Club. She launches her latest rocket from a large field. At the moment its fuel is exhausted, the rocket has a velocity of 240 ft/sec and an altitude of 544 ft. After t sec, its height $h(t)$ above the ground is given by the function $h(t) = -16t^2 + 240t + 544$.

(i) How high is the rocket 5 sec after the fuel is exhausted?

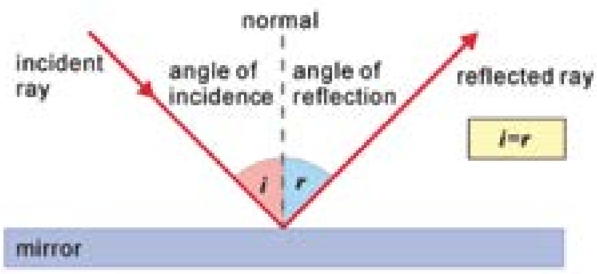
(ii) How high is the rocket 10 sec after the fuel is exhausted?

(iii) What is the maximum height attained by the rocket?

OR

How many seconds was the rocket airborne after its fuel was exhausted?

37. The law of reflection states that when a ray of light reflects off a surface, the angle of incidence is equal to the angle of reflection.



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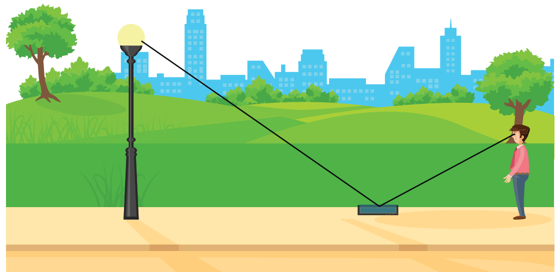
SOLUTIONS

Ramesh places a mirror on level ground to determine the height of a pole (with traffic light fired on it). He stands at a certain distance so that he can see the top of the pole reflected from the mirror. Ramesh's eye level is 1.5 m above the ground. The distance of Ramesh and the pole from the mirror are 1.8 m and 6 m respectively.

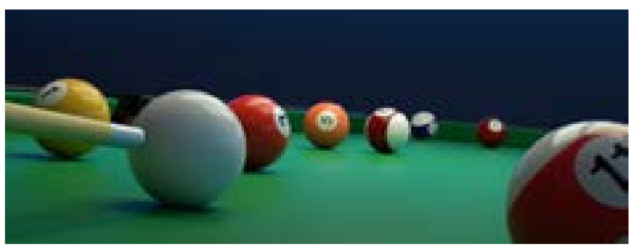


(i) Which criterion of similarity is applicable to similar triangles?
(ii) What is the height of the pole?
(iii) If angle of incidence is i , find tan i .

OR

Now Ramesh move behind such that distance between pole and Ramesh is 13 meters. He place mirror between him and pole to see the reflection of light in right position. What is the distance between mirror and Ramesh ?

38. Eight Ball : This is a game played on a pool table with 15 balls numbered 1 through 15 and a cue ball that is solid white. Of the 15 numbered balls, 8 are a solid (nonwhite) color and numbered 1 through 8, and seven are striped balls numbered 9 through 15.



The fifteen numbered pool balls (no cueball) are placed in a large bowl and mixed, then one is drawn out.
(i) What is the probability of drawing the eight ball ?
(ii) What is the probability of drawing a number greater than fifteen ?
(iii) What is the probability of drawing an even number ?
(iv) What is the probability of drawing a multiple of three ?

OR

What is the probability of drawing a solid color and an even number ?

□□□□□□□

Sample Paper 10

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If α and β are the zeroes of the polynomial $x^2 + 2x + 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to

(a) -2 (b) 2

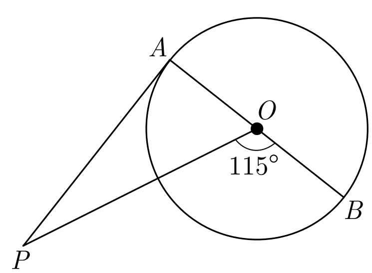
(c) 0 (d) 1

2. The roots of the quadratic equation $x^2 - 0.04 = 0$ are

(a) ± 0.2 (b) ± 0.02

(c) 0.4 (d) 2

3. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 115^\circ$, then perimeter of $\angle APO$ is



(a) 25° (b) 20°

(c) 30° (d) 65°

4. In an AP, if $d = -4$, $n = 7$ and $a_n = 4$, then a is equal to

(a) 6 (b) 7

(c) 20 (d) 28

5. A bag contains 3 red and 2 blue marbles. If a marble is drawn at random, then the probability of drawing a blue marble is:

(a) $\frac{2}{5}$ (b) $\frac{1}{4}$

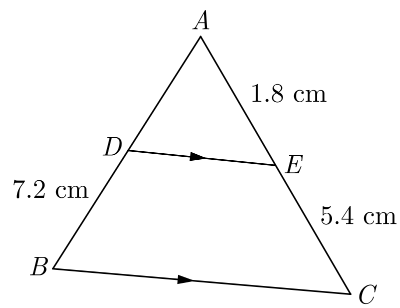
(c) $\frac{3}{5}$ (d) $\frac{2}{3}$

6. 225 can be expressed as

(a) 5×3^2 (b) $5^2 \times 3$

(c) $5^2 \times 3^2$ (d) $5^3 \times 3$

7. In Figure, $DE || BC$. Find the length of side AD, given that $AE = 1.8$ cm, $BD = 7.2$ cm and $CE = 5.4$ cm.



(a) 2.4 cm (b) 2.2 cm

(c) 3.2 cm (d) 3.4 cm

8. Consider the following distribution :

Marks obtained	Number of students
More than or equal to 0	63
More than or equal to 10	58
More than or equal to 20	55
More than or equal to 30	51
More than or equal to 40	48
More than or equal to 50	42

the frequency of the class 30-40 is :

(a) 3 (b) 4

(c) 48 (d) 51

9. If $\cos 9\alpha = \sin\alpha$ and $9\alpha < 90°$, then the value of $\tan 5\alpha$ is

(a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$

(c) 1 (d) 0

10. From the top of a 7 m high building the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°, then the height of the tower is

(a) 14.124 m (b) 17.124 m

(c) 19.124 m (d) 15.124 m

11. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. If the angle made by the rope with the ground level is 30°, then what is the height of pole?

(a) 20 m (b) 8 m

(c) 10 m (d) 6 m

12. The maximum number of zeroes a cubic polynomial can have, is

(a) 1 (b) 4

(c) 2 (d) 3

13. If triangle ABC is similar to triangle DEF such that $2AB = DE$ and $BC = 8$ cm then find EF.

(a) 16 cm (b) 14 cm

(c) 12 cm (d) 15 cm

14. A sphere is melted and half of the melted liquid is used to form 11 identical cubes, whereas the remaining half is used to form 7 identical smaller spheres. The ratio of the side of the cube to the radius of the new small sphere is

(a) $\left(\frac{4}{3}\right)^{1/3}$ (b) $\left(\frac{8}{3}\right)^{1/3}$

(c) $(3)^{1/3}$ (d) 2

15. Ratio of volumes of two cones with same radii is

(a) $h_1 : h_2$ (b) $s_1 : s_2$

(c) $r_1 : r_2$ (d) None of these

16. In the formula $\overline{x} = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$, for finding the mean of grouped frequency distribution, u_i is equal to

(a) $\frac{x_i + a}{h}$ (b) $h(x_i - a)$

(c) $\frac{x_i - a}{h}$ (d) $\frac{a - x_i}{h}$

17. If the probability of an event is p, then the probability of its complementary event will be

(a) $p - 1$ (b) p

(c) $1 - p$ (d) $1 - \frac{1}{p}$

18. The distance of the point $P(-3, -4)$ from the x-axis (in units) is

(a) 3 (b) -3

(c) 4 (d) 5

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** Pair of linear equations : $9x+3y+12=0, 8x+6y+24=0$ have infinitely many solutions.
Reason : Pair of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ have infinitely many solutions, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If the circumference of a circle is 176 cm, then its radius is 28 cm.
Reason : Circumference $= 2\pi \times$ radius

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

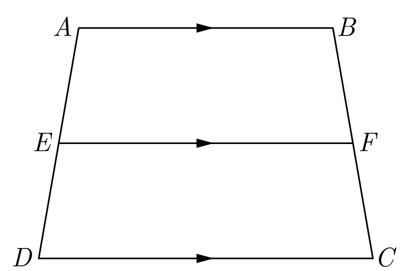
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

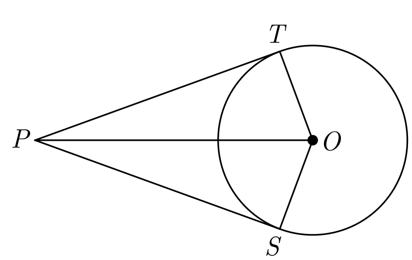
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the given figure, if $ABCD$ is a trapezium in which $AB \,||\, CD \,||\, EF$, then prove that $\frac{AE}{ED}=\frac{BF}{FC}$



22. In the given figure, from a point P, two tangents PT and PS are drawn to a circle with centre O such that $\angle SPT = 120^\circ$, Prove that $OP = 2PS$.



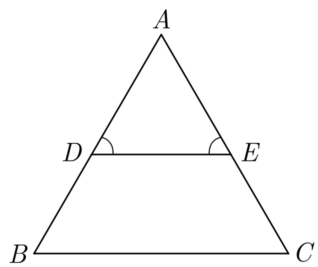
23. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^{\circ} < \theta < 90^{\circ}$, find the value of θ.

24. A box contains cards numbered 11 to 123. A card is drawn at random from the box. Find the probability that the number of the drawn card is
(i) A perfect square number
(ii) A multiple of 7.

OR

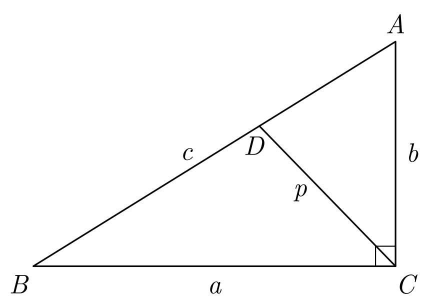
A letter of English alphabet is chosen at random, find the probability that the letter so chosen is :
(i) a vowel,
(ii) a consonant.

25. In Figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that ΔBAC is an isosceles triangle.



OR

ABC is a right triangle right angled at C. Let $BC = a$, $CA = b, AB = c$ $PQR, ST || QR$and p be the length of perpendicular from C to AB. Prove that $cp = ab$.



Section - C

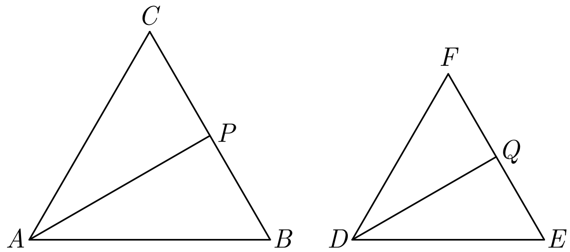
Section C consists of 6 questions of 3 marks each.

26. Quadratic polynomial $2x^2 - 3x + 1$ has zeroes as α and β. Now form a quadratic polynomial whose zeroes are 3α and 3β.

27. Find whether the following pair of linear equations has a unique solutions. If yes, find the solution :

$$7x - 4y = 49, 5x - 6y = 57.$$

28. In given figure $\Delta ABC \sim \Delta DEF$. AP bisects $\angle CAB$ and DQ bisects $\angle FDE$.



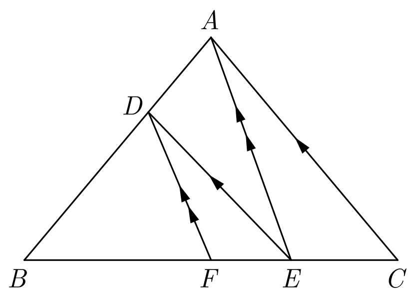
Prove that :

(1) $\dfrac{AP}{DQ} = \dfrac{AB}{DE}$

(2) $\Delta CAP \sim \Delta FDQ$.

OR

In the given figure, $DE || AC$ and $DF || AE$. Prove that $\dfrac{BE}{FE} = \dfrac{BE}{EC}$.



29. If $\cos(40^{\circ} + x) = \sin 30^{\circ}$, find the value of x.

30. A conical vessel, with base radius 5 cm height 24 cm, is full of water. This water emptied into a cylindrical vessel, of base radius 10 cm. Find the height to which the water will rise in the cylindrical vessel. Use $\pi = \frac{22}{7}$

OR

504 cones, each of diameter 3.5 cm and height 3 cm, are melted and recast into a metallic sphere. Find the diameter of the sphere and hence find its surface area. Use $\pi = \frac{22}{7}$

31. Three bells toll at intervals of 9, 12, 15 minutes respectively. If they start tolling together, after what time will they next toll together?

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find for x : $\dfrac{1}{x-2} + \dfrac{2}{x-1} = \dfrac{6}{x}$; $x \neq 0, 1, 2$

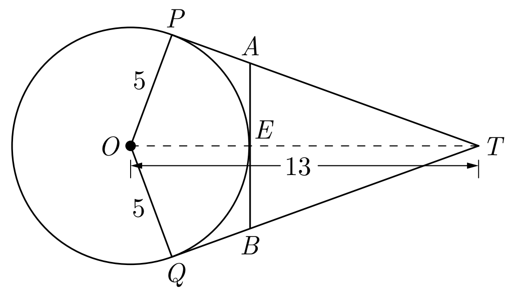
OR

Find the values of k for which the equation $(3k+1)x^2 + 2(k+1)x + 1$ has equal roots. Also find the roots.

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

33. In figure O is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.



34. Find the mode of the following frequency distribution

Class Interval	25-30	30-35	35-40	40-45	45-50	50-55
Frequency	25	34	50	42	38	14

OR

On the sports day of a school, 300 students participated. Their ages are given in the following distribution :

Age (in years)	5-7	7-9	9-11	11-13	13-15	15-17	17-19
Number of students	67	33	41	95	36	13	15

Find the mean and mode of the data.

35. Find the ratio in which the line $x - 3y = 0$ divides the line segment joining the points $(-2, -5)$ and $(6, 3)$. Find the coordinates of the point of intersection.

Section - E

Case study based questions are compulsory.

36. Volume of a Bird Cage. A company makes rectangular shaped bird cages with height b inches and square bottoms. The volume of these cages is given by the function $V = b^3 - 6b^2 + 9b$.

(i) Find an expression for the length of each side of the square bottom.

(ii) Use the function to find the volume of a cage with a height of 18 inches.

(iii) Use the remainder theorem to find the volume of a cage with a height of 15 inches.

(iv) Verify the result of (iii) using function ?

Continue on next page.....

37. Dipesh bought 3 notebooks and 2 pens for Rs. 80. His friend Ramesh said that price of each notebook could be Rs. 25. Then three notebooks would cost Rs.75, the two pens would cost Rs. 5 and each pen could be for Rs. 2.50. Another friend Amar felt that Rs. 2.50 for one pen was too little. It should be at least Rs. 16. Then the price of each notebook would also be Rs.16.

Aditya also bought the same types of notebooks and pens as Dipesh. He paid 110 for 4 notebooks and 3 pens.

(i) Whether the estimation of Ramesh and Amar is applicable for Aditya?

(ii) Let the cost of one notebook be x and that of pen be y. Which of the following set describe the given problem ?

(iii) What is the exact cost of the notebook?

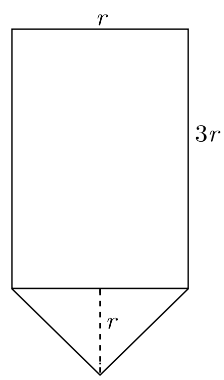
(iv) What is the exact cost of the pen? What is the total cost if they purchase the same type of 15 notebooks and 12 pens.

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

38. Conical Tank : The advantages of cone bottom tanks are found in nearly every industry, especially where getting every last drop from the tank is important. This type of tank has excellent geometry for draining, especially with high solids content slurries as these cone tanks provide a better full-drain solution. The conical tank eliminates many of the problems that flat base tanks have as the base of the tank is sloped towards the centre giving the greatest possible full-drain system in vertical tank design.

Rajesh has been given the task of designing a conical bottom tank for his client. Height of conical part is equal to its radius. Length of cylindrical part is the 3 times of its radius. Tank is closed from top. The cross section of conical tank is given below.



(i) If radius of cylindrical part is taken as 3 meter, what is the volume of above conical tank ?

(ii) What is the area of metal sheet used to make this conical tank ? Assume that tank is covered from top.

(iii) What is the ratio of volume of cylindrical part to the volume of conical part?

(iv) The cost of metal sheet is Rs 2000 per square meter and fabrication cost is 1000 per square meter. What is the total cost of tank ?

Sample Paper 11

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. The distance between the points $(a\cos\theta + b\sin\theta,\ 0)$, and $(0,\ a\sin\theta - b\cos\theta)$ is

(a) $a^2 + b^2$ (b) $a^2 - b^2$

(c) $\sqrt{a^2 + b^2}$ (d) $\sqrt{a^2 - b^2}$

2. If one zero of the polynomial $(3x^2 + 8x + k)$ is the reciprocal of the other, then value of k is

(a) 3 (b) -3

(c) $\frac{1}{3}$ (d) $-\frac{1}{3}$

3. If $3x + 4y : x + 2y = 9 : 4$, then $3x + 5y : 3x - y$ is equal to

(a) 4 : 1 (b) 1 : 4

(c) 7 : 1 (d) 1 : 7

4. The value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent is

(a) $-\frac{14}{3}$ (b) $\frac{2}{5}$

(c) 5 (d) 10

5. If α and β are the zeroes of the polynomial $2x^2 - 13x + 6$, then $\alpha + \beta$ is equal to

(a) -3 (b) 3

(c) $\frac{13}{2}$ (d) $-\frac{13}{2}$

6. The roots of the quadratic equation $x^2 - 0.04 = 0$ are

(a) ± 0.2 (b) ± 0.02

(c) 0.4 (d) 2

7. If the common difference of an AP is 5, then what is $a_{18} - a_{13}$?

(a) 5 (b) 20

(c) 25 (d) 30

8. ΔABC is an equilateral triangle with each side of length $2p$. If $AD \perp BC$ then the value of AD is

(a) $\sqrt{3}$ (b) $\sqrt{3}\,p$

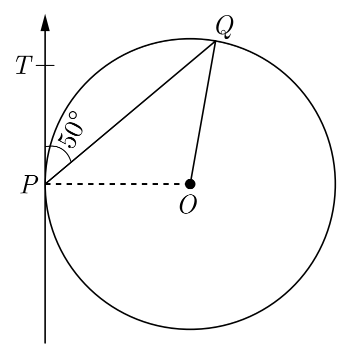
(c) $2p$ (d) $4p$

9. The base radii of a cone and a cylinder are equal. If their curved surface areas are also equal, then the ratio of the slant height of the cone to the height of the cylinder is

(a) 2 : 1 (b) 1 : 2

(c) 1 : 3 (d) 3 : 1

10. In figure, O is the centre of circle. PQ is a chord and PT is tangent at P which makes an angle of 50° with $PQ \angle POQ$ is



(a) 130° (b) 90°

(c) 100° (d) 75°

11. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45°. The height of a tree is

(a) 10 m (b) 14 m

(c) 8 m (d) 15 m

12. The quadratic equation $2x^2 - \sqrt{5}\,x + 1 = 0$ has

(a) two distinct real roots

(b) two equal real roots

(c) no real roots

(d) more than 2 real roots

13. A sector is cut from a circular sheet of radius 100 cm, the angle of the sector being 240°. If another circle of the area same as the sector is formed, then radius of the new circle is

(a) 79.5 cm (b) 81.5 cm

(c) 83.4 cm (d) 88.5 cm

14. In a frequency distribution, the mid value of a class is 10 and the width of the class is 6. The lower limit of the class is

(a) 6 (b) 7

(c) 8 (d) 12

15. If a card is selected from a deck of 52 cards, then the probability of its being a red face card is

(a) $\frac{3}{26}$ (b) $\frac{3}{13}$

(c) $\frac{2}{13}$ (d) $\frac{1}{2}$

16. If $\cos(\alpha+\beta)=0$, then $\sin(\alpha-\beta)$ can be reduced to

(a) $\cos\beta$ (b) $\cos 2\beta$

(c) $\sin\alpha$ (d) $\sin 2\alpha$

17. The point P on x-axis equidistant from the points $A(-1,0)$ and $B(5,0)$ is

(a) (2, 0) (b) (0, 2)

(c) (3, 0) (d) $(-3,5)$

18. The point on the x-axis which is equidistant from the points $A(-2,3)$ and $B(5,4)$ is

(a) (0, 2) (b) (2, 0)

(c) (3, 0) (d) $(-2,0)$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** When a positive integer a is divided by 3, the values of remainder can be 0, 1 or 2.
Reason : According to Euclid's Division Lemma $a=bq+r$, where $0 \leq r < b$ and r is an integer.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** Sum of first 10 terms of the arithmetic progression -0.5, -1.0, -1.5, ... is 31.
Reason : Sum of n terms of an AP is given as $S_n=\frac{n}{2}[2a+(n-1)d]$ where a is first term and d common difference.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

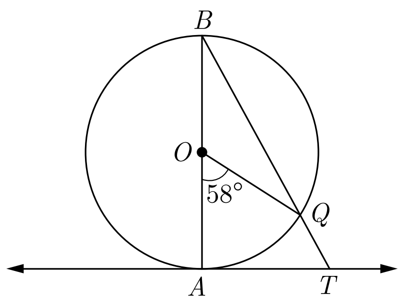
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. $ABCD$ is a trapezium in which $AB || CD$ and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

22. In given figure, AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58°$, find $\angle ATQ$.



23. Find the value of $\cos 2\theta$, if $2\sin 2\theta = \sqrt{3}$.

24. Find the mean of the following distribution :

Class	10-25	25-40	40-55	55-70	70-85	85-100
Frequency	2	3	7	6	6	6

OR

Find the mean of the following data :

Class	0- 20	20-40	40-60	60-80	80-100	100-120
Frequency	20	35	52	44	38	31

25. Show that $5\sqrt{6}$ is an irrational number.

OR

Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

Section - C

Section C consists of 6 questions of 3 marks each.

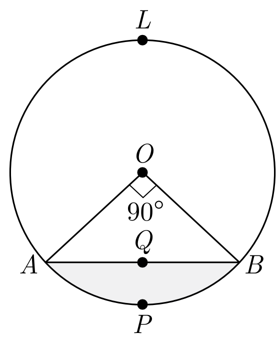
26. Which term of the AP 20, $19\frac{1}{4}$, $18\frac{1}{2}$, $17\frac{3}{4}$, ... is the first negative term.

27. If $1 + \sin^2\theta = 3\sin\theta\cos\theta$, prove that $\tan\theta = 1$ or ½.

28. A horse is tethered to one corner of a rectangular field of dimensions $70\,\text{m}\times 52\,\text{m}$, by a rope of length 21 m. How much area of the field can it graze?

OR

In the given figure, a chord AB of the circle with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment $AQBP$. Hence find the area of major segment $ALBQA$. (Use $\pi = 3.14$)



29. Find the mode of the following frequency distribution :

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	3	8	9	10	3	2

30. Find the ratio in which the segment joining the points $(1,-3)$ and $(4,5)$ is divided by x-axis? Also find the coordinates of this point on x-axis.

OR

The vertices of ΔABC are $A(6,-2), B(0,-6)$ and $C(4,8)$. Find the co-ordinates of mid-points of AB, BC and AC.

31. Write the smallest number which is divisible by both 306 and 657.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Determine graphically the coordinates of the vertices of triangle, the equations of whose sides are given by $2y-x=8$, $5y-x=14$ and $y-2x=1$.

OR

Draw the graphs of the equations $x-y+1=0$ and $3x+2y-12=0$. Determine the co-ordinates of the vertices of the triangle formed by these lines and the X-axis and shade the triangular region.

Continue on next page.....

33. Two tangents PA and PB are drawn from an external point P to a circle with centre O, such that $\angle APB = \angle x$ and $\angle AOB = y$. Prove that opposite angles are supplementary.

34. The person standing on the bank of river observes that the angle of elevation of the top of a tree standing on opposite bank is 60°. When he moves 30 m away from the bank, he finds the angle of elevation to be 30°. Find the height of tree and width of the river.

OR

As observed from the top of a 100 m high light house from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the light house, find the distance between the two ships [Use $\sqrt{3} = 1.732$]

35. A hemispherical depression is cut from one face of a cubical block, such that diameter l of hemisphere is equal to the edge of cube. Find the surface area of the remaining solid.

Section - E

Case study based questions are compulsory.

36. Maximum Profit : A kitchen utensils manufacturer can produce up to 200 utensils per day. The profit made from the sale of these utensils can be modelled by the function $P(x) = -0.5x + 175x - 330$, where $P(x)$ is the profit in Rupees, and x is the number of utensils made and sold. Based on this model,

(i) Find the y-intercept and explain what it means in this context.

(ii) Find the x-intercepts and explain what they mean in this context.

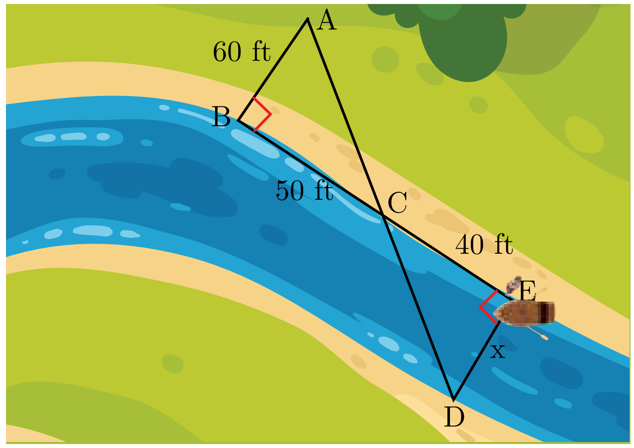
(iii) How many utensils should be sold to maximize profit?

OR

What is the maximum profit?

Continue on next page.....

37. Tania is very intelligent in maths. She always try to relate the concept of maths in daily life. One day she plans to cross a river and want to know how far it is to the other side. She takes measurements on her side of the river and make the drawing as shown below.



(i) Which similarity criterion is used in solving the above problem ?

(ii) Consider the following statement :

$S_1 : \angle ACB = \angle DCE$

$S_2 : \angle BAC = \angle CDE$

Which of the above statement is/are correct.

(a) S_1 and S_2 both (b) S_1

(c) S_2 (d) None

(iii) Consider the following statement :

$S_3 : \frac{AB}{DE} = \frac{CA}{CD}$

$S_4 : \frac{BC}{CE} = \frac{AB}{DE}$

$S_5 : \frac{CA}{CD} = \frac{DE}{AB}$

Which of the above statements are correct ?

(a) S_3 and S_5 (b) S_4 and S_5

(c) S_3 and S_4 (d) All three

(iv) What is the distance x across the river?

OR

What is the approximate length of AD shown in the figure?

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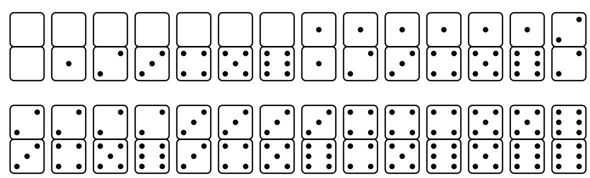
38. Double-six Dominos : It is a game played with the 28 numbered tiles shown in the diagram.



The 28 dominos are placed in a bag, shuffled, and then one domino is randomly drawn. Give the following answer.

(i) What is the probability the total number of dots on the domino is three or less ?

(ii) What is the probability the total number of dots on the domino is greater than three ?

(iii) What is the probability the total number of dots on the domino does not have a blank half ?

OR

What is the probability the total number of dots on the domino is not a "double" (both sides the same) ?

□□□□□□□

Sample Paper 12

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. What do you say about the solution of the pair of linear equations $y = 0$ and $y = -5$?
(a) no solution (b) unique solution (c) infinitely solution (d) can't say anything

2. The HCF and LCM of 378, 180 and 420 of will be
(a) 6 and 3980 (b) 12 and 3780 (c) 6 and 3780 (d) 12 and 3980

3. The quadratic equation $x^2 - 4x - 3\sqrt{2} = 0$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

4. The 11th term of an AP $-5, \frac{-5}{2}, 0, \frac{5}{2}$, ..., is
(a) -20 (b) 20 (c) -30 (d) 30

5. If $\tan 2A = \cot(A + 60^\circ)$, where $2A$ is an acute angle, the value of A will be
(a) 20° (b) 30° (c) 60° (d) 10°

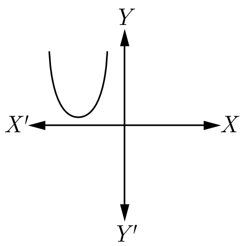
6. If -1 is a zero of the polynomial $f(x) = x^2 - 7x - 8$, then other zero is
(a) 4 (b) 8 (c) 1 (d) –4

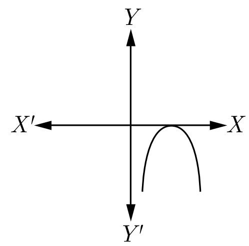
7. Given the linear equation $3x + 4y = 9$. Select another linear equation in these two variables such that the geometrical representation of the pair so formed is intersecting lines.
(a) $3x - 5y = 10$ (b) $6x + 8y = 18$ (c) $8x + 12y = 18$ (d) above all

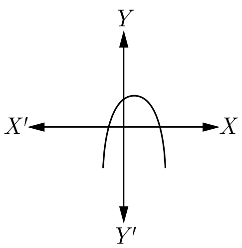
8. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator. The fraction will be

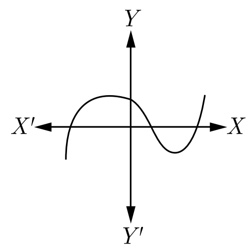
(a) $\frac{7}{15}$ (b) $\frac{8}{15}$ (c) $\frac{6}{15}$ (d) $\frac{9}{15}$

9. Which of the following is not the graph of a quadratic polynomial?

(a)


(b)


(c)


(d)


10. If the point $P(x, y)$ is equidistant from the points $Q(a+b, b-a)$ and $R(a-b, a+b)$ then,

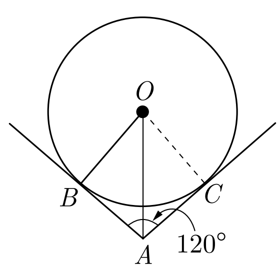
(a) $2ay = xy$ (b) $bx = ay$ (c) $ab = xy$ (d) $by = ax$

11. The quadratic equation $3x^2 + 4\sqrt{3}\,x + 4$ has

(a) two distinct real roots (b) two equal real roots

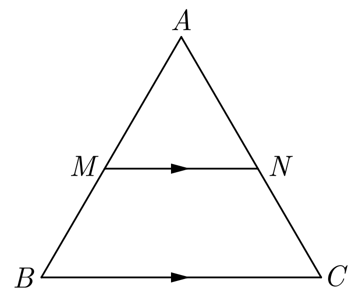
(c) no real roots (d) more than 2 real roots

12. In the given figure, two tangents AB and AC are drawn to a circle with centre O such that $\angle BAC = 120°$, then OA is equal to that



(a) $2AB$ (b) $3AB$ (c) $4AB$ (d) $5AB$

13. In figure, $MN \parallel BC$ and $AM : MB = 1:2$, then $\frac{ar(\Delta AMN)}{ar(\Delta ABC)} = \dots\dots\dots\dots\dots\dots.$



(a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{8}{9}$ (d) $\frac{5}{9}$

14. $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = ?$

(a) $\sin\theta - \cos\theta$ (b) $\sec\theta - \tan\theta$ (c) $\sec\theta + \tan\theta$ (d) $\sin\theta + \cos\theta$

15. Two different dice are tossed together. What is the probability that the number on each die is even ?

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{3}{4}$ (d) $\frac{1}{6}$

16. A circle artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground, then the height of pole, if the angle made by the rope with the ground level is 30°, is

(a) 5 m (b) 10 m

(c) 15 m (d) 20 m

17. Ratio of volumes of two cones with same radii is

(a) $h_1 : h_2$ (b) $s_1 : s_2$ (c) $r_1 : r_2$ (d) None of these

18. For the following distribution:

Marks	**Number of students**
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

The modal class is

(a) 10-20 (b) 20-30 (c) 30-40 (d) 50-60

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** Sum of first 10 terms of the arithmetic progression -0.5, -1.0, -1.5, ... is 31.
Reason : Sum of n terms of an AP is given as $S_n = \frac{n}{2}[2a + (n-1)d]$ where a is first term and d common difference.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If the outer and inner diameter of a circular path is 10 m and 6 m then area of the path is $16\pi\, m^2$.
Reason : If R and r be the radius of outer and inner circular path, then area of path is $\pi(R^2 - r^2)$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

22. Find the sum of first 16 terms of the AP 10, 6, 2, ...

OR

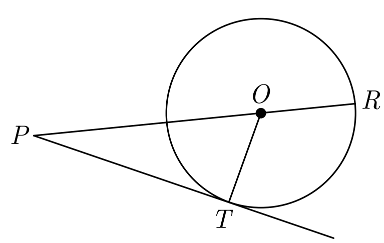
What is the sum of five positive integer divisible by 6.

23. If three points (0, 0), $(3, \sqrt{3})$ and $(3, \lambda)$ form an equilateral triangle, then what is the value of λ?

24. A chord of a circle of radius 10 cm, subtends a right angle at its centre. What is the length of the chord?

OR

In figure, on a circle of radius 7 cm, tangent PT is drawn from a point P such that $PT = 24$ cm. If O is the centre of the circle, then what is the length of PR ?



25. In a family of two children find the probability of having at least one girl.

Section - C

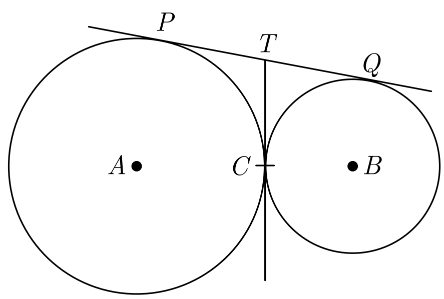
Section C consists of 6 questions of 3 marks each.

26. The length, breadth and height of a room are 8 m 50 cm, 6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rod that can measure the dimensions of the room exactly.

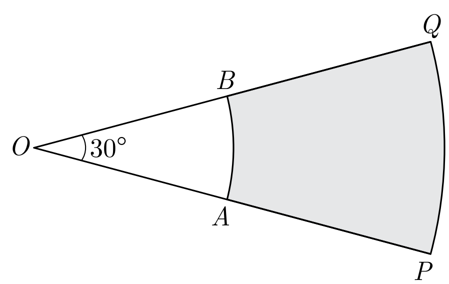
27. If triangle ABC is similar to triangle DEF such that $2AB = DE$ and $BC = 8$ cm then find EF.

28. If θ be an acute angle and $5\operatorname{cosec}\theta = 7$, then evaluate $\sin\theta + \cos^2\theta - 1$.

29. In given figure, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q.



30. In Figure, PQ and AB are two arcs of concentric circles of radii 7 cm and 3.5 cm respectively, with centre O. If $\angle POQ = 30^\circ$, then find the area of shaded region.



OR

A horse is tethered to one corner of a rectangular field of dimensions $70\,\text{m} \times 52\,\text{m}$, by a rope of length 21 m. How much area of the field can it graze?

31. Two dice are tossed simultaneously. Find the probability of getting
(i) an even number on both dice.
(ii) the sum of two numbers more than 9.

OR

In a family of three children, find the probability of having at least two boys.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Determine graphically whether the following pair of linear equations :

$$3x - y = 7$$
$$2x + 5y + 1 = 0 \text{ has :}$$

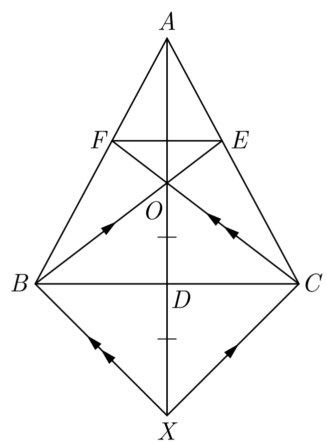
(a) unique solution
(b) infinitely many solutions or
(c) no solution.

OR

For Uttarakhand flood victims two sections A and B of class contributed Rs. 1,500. If the contribution of X-A was Rs. 100 less than that of X-B, find graphically the amounts contributed by both the sections.

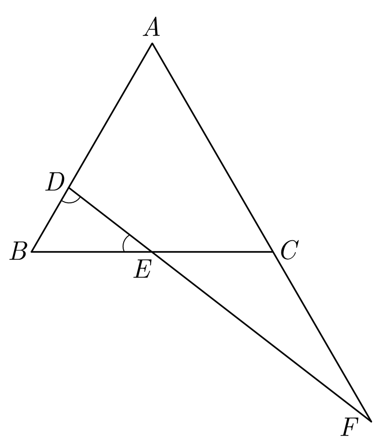
33. If the mid-point of the line segment joining $A\left[\frac{x}{2}, \frac{y+1}{2}\right]$ and $B(x+1, y-3)$ is $C(5, -2)$, find x, y.

34. In ΔABC, AD is a median and O is any point on AD. BO and CO on producing meet AC and AB at E and F respectively. Now AD is produced to X such that $OD = DX$ as shown in figure.
Prove that :
(1) $EF \| BC$
(2) $AO : AX = AF : AB$



OR

In the figure, $\angle BED = \angle BDE$ and E is the mid-point of BC. Prove that $\frac{AF}{CF} = \frac{AD}{BE}$.



35. A milk tanker cylindrical in shape having diameter 2 m and length 4.2 m supplies milk to the two booths in the ratio of 3 : 2. One of the milk booths has cuboidal vessel having base area 3.96 sq. m. and the other has a cylindrical vessel having radius 1 m. Find the level of milk in each of the vessels. Use $\pi = \frac{22}{7}$

Section - E

Case study based questions are compulsory.

36. Nidhi and Ria are very close friends. Nidhi's parents own a Maruti Alto. Ria's parents own a Toyota Liva. Both the families decide to go for a picnic to Somnath temple in Gujrat by their own cars.

Nidhi's car travels x km/h while Ria's car travels 5 km/h more than Nidhi's car. Nidhi's car took 4 hrs more than Ria's car in covering 400 km.

(i) What will be the distance covered by Ria's car in two hour? Write the quadratic equation that describe the speed of Nidhi's car?

(ii) What is the speed of Nidhi's car?

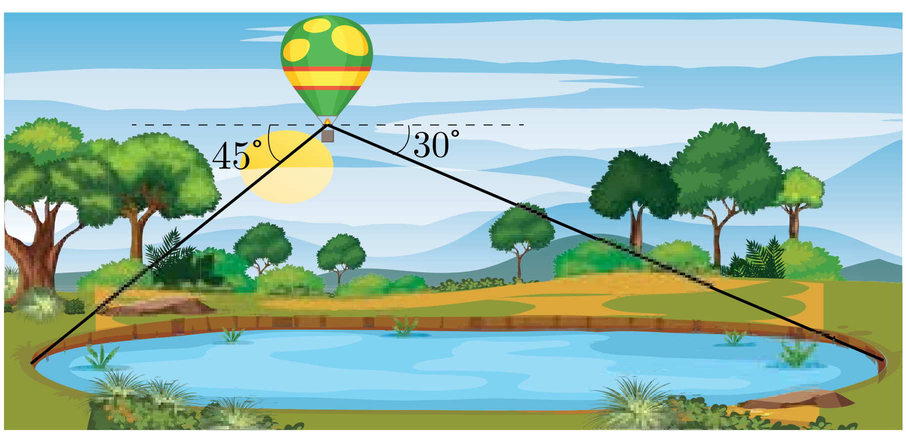
(iii) How much time did Ria take to travel 400 km?

(iv) How much time did Nidhi take to travel 400 km?

37. Width of a Lake : The angle of depression to one side of a lake, measured from a balloon 300 meter above the lake as shown in the accompanying figure, is 45°. The angle of depression to the opposite side of the lake is 30°.

(i) Find the width of the lake.

(ii) Find the ground distance of balloon from sides of lake.



38. Transport department of a Jaipur wants to buy some Electric buses for the city. For which they wants to analyse the distance travelled by existing public transport buses in a day.

The following data shows the distance travelled by 60 existing public transport buses in a day.

Daily distance travelled (in km)	200-209	210-219	220-229	230-239	240-249
Number of buses	4	14	26	10	6

Base on the above information, answer the following questions.

(i) Find the median class of daily distance travelled ?

(ii) What is the cumulative frequency of the class preceding the median class ? Find the median of the distance travelled.

(iii) If the mode of the distance travelled is 223.78 km, find the mean of the distance travelled by the bus .

□□□□□□□

Sample Paper 13

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. Consider the following frequency distribution of the heights of 60 students of a class

Height (in cm)	150-155	155-160	160-165	165-170	170-175	175-180
Number of students	15	13	10	8	9	5

The upper limit of the median class in the given data is

(a) 165 (b) 155 (c) 160 (d) 170

2. If one zero of a quadratic polynomial $(kx^2 + 3x + k)$ is 2, then the value of k is

(a) $\frac{5}{6}$ (b) $-\frac{5}{6}$ (c) $\frac{6}{5}$ (d) $-\frac{6}{5}$

3. The centroid of the triangle whose vertices are $(3,-7),(-8,6)$ and $(5, 10)$ is

(a) (0, 9) (b) (0, 3) (c) (1, 3) (d) (3, 5)

4. The zeroes of the polynomial $x^2 - 3x - m(m+3)$ are

(a) $m, m+3$ (b) $-m, m+3$ (c) $m, -(m+3)$ (d) $-m, -(m+3)$

5. The value of k for which the system of equations $x + y - 4 = 0$ and $2x + ky = 3$, has no solution, is

(a) -2 (b) $\neq 2$ (c) 3 (d) 2

6. If one root of the quadratic equation $ax^2 + bx + c = 0$ is the reciprocal of the other, then

(a) $b = c$ (b) $a = b$

(c) $ac = 1$ (d) $a = c$

7. The pair of equations $3^{x+y} = 81$, $81^{x-y} = 3$ has
(a) no solution (b) unique solution
(c) infinitely many solutions (d) $x = 2\frac{1}{8}, y = 1\frac{7}{8}$

8. What is the common difference of an AP in which $a_{18} - a_{14} = 32$?
(a) 8 (b) -8 (c) -4 (d) 4

9. Two chords AB and CD of a circle intersect at E such that $AE = 2.4$ cm, $BE = 3.2$ cm and $CE = 1.6$ cm. The length of DE is
(a) 1.6 cm (b) 3.2 cm (c) 4.8 cm (d) 6.4 cm

10. If $\cos 9\alpha = \sin \alpha$ and $9\alpha < 90^\circ$, then the value of $\tan 5\alpha$ is
(a) $\frac{1}{\sqrt{3}}$ (b) $\sqrt{3}$ (c) 1 (d) 0

11. The first term of AP is p and the common difference is q, then its 10th term is
(a) $q + 9p$ (b) $p - 9q$ (c) $p + 9q$ (d) $2p + 9q$

12. The ratio of the length of a rod and its shadow is $1 : \sqrt{3}$ then the angle of elevation of the sun is
(a) 90° (b) 45° (c) 30° (d) 75°

13. If a circular grass lawn of 35 m in radius has a path 7 m wide running around it on the outside, then the area of the path is
(a) 1450 m^2 (b) 1576 m^2 (c) 1694 m^2 (d) 3368 m^2

14. Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their foot is 12 m, then distance between their tops is
(a) 12 m (b) 14 m (c) 13 m (d) 11 m

15. If the perimeter of one face of a cube is 20 cm, then its surface area is
(a) 120 cm^2 (b) 150 cm^2 (c) 125 cm^2 (d) 400 cm^2

16. A card is drawn from a deck of 52 cards. The event E is that card is not an ace of hearts. The number of outcomes favourable to E is
(a) 4 (b) 13 (c) 48 (d) 51

17. The co-ordinates of the point which is reflection of point $(-3, 5)$ in x-axis are
(a) (3, 5) (b) $(3, -5)$
(c) $(-3, -5)$ (d) $(-3, 5)$

18. C is the mid-point of PQ, if P is $(4, x)$, C is $(y, -1)$ and Q is $(-2, 4)$, then x and y respectively are
(a) -6 and 1 (b) -6 and 2
(c) 6 and -1 (d) 6 and -2

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The HCF of two numbers is 5 and their product is 150, then their LCM is 30
Reason : For any two positive integers a and b, HCF (a, b) + LCM $(a, b) = a \times b$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

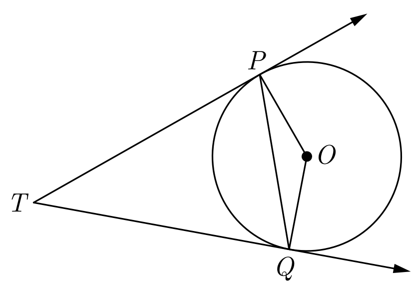
20. **Assertion :** $4x^2 - 12x + 9 = 0$ has repeated roots.
Reason : The quadratic equation $ax^2 + bx + c = 0$ have repeated roots if discriminant $D > 0$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. In a rectangle $ABCD, E$ is a point on AB such that $AE = \frac{2}{3}AB$. If $AB = 6$ km and $AD = 3$ km, then find DE.

22. In the given figure PQ is chord of length 6 cm of the circle of radius 6 cm. TP and TQ are tangents to the circle at points P and Q respectively. Find $\angle PTQ$.



23. Find the value of $\sin 30^o \cos 60^o + \cos 30^o \sin 60^o$ is it equal to $\sin 90^o$ or $\cos 90^o$?

24. Find the mode of the following frequency distribution.

Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	8	10	10	16	12	6	7

OR

The data regarding marks obtained by 48 students of a class in a class test is given below. Calculate the modal marks of students.

Marks obtained	0-5	5- 10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Number of students	1	0	2	0	0	10	25	7	2	1

25. Show that 571 is a prime number.

OR

If two positive integers p and q are written as $p = a^2b^3$ and $q = a^3b$, where a and b are prime numbers than verify $\text{LCM}(p, q) \times \text{HCF}(q, q) = pq$

Section - C

Section C consists of 6 questions of 3 marks each.

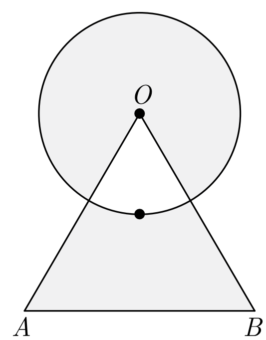
26. Find the middle term of the AP 7, 13, 19, ..., 247.

27. Prove that $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

28. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle. Use $\pi = \frac{22}{7}$.

OR

Find the area of shaded region shown in the given figure where a circular arc of radius 6 cm has been drawn with vertex O of an equilateral triangle OAB of side 12 cm as centre.



29. The marks obtained by 110 students in an examination are given below

Marks	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Number of Students	14	16	28	23	18	8	3

Find the mean marks of the students.

30. If the point $C(-1,2)$ divides internally the line segment joining the points $A(2,5)$ and $B(x,y)$ in the ratio 3:4, find the value of $x^2 + y^2$.

OR

Find the ratio in which the point $(-3,p)$ divides the line segment joining the points $(-5,-4)$ and $(-2,3)$.Hence find the value of p.

31. 144 cartons of Coke cans and 90 cartons of Pepsi cans are to be stacked in a canteen. If each stack is of the same height and if it equal contain cartons of the same drink, what would be the greatest number of cartons each stack would have?

Section - D

Section D consists of 4 questions of 5 marks each.

32. Determine graphically whether the following pair of linear equations :

$$3x - y = 7$$
$$2x + 5y + 1 = 0 \text{ has :}$$

unique solution
infinitely many solutions or
no solution.

OR

Solve the following pair of linear equations graphically:
$x + 3y = 12,\ 2x - 3y = 12$
Also shade the region bounded by the line $2x - 3y = 2$ and both the co-ordinate axes.

33. a, b and c are the sides of a right triangle, where c is the hypotenuse. A circle, of radius r, touches the sides of the triangle. Prove that $r = \frac{a+b-c}{2}$.

34. A vertical tower stands on horizontal plane and is surmounted by a vertical flag-staff of height 6 m. At a point on the ground, angle of elevation of the bottom and top of the flag-staff are 30° and 45° respectively. Find the height of the tower. (Take $\sqrt{3} = 1.73$)

OR

From the top of tower, 100 m high, a man observes two cars on the opposite sides of the tower with the angles of depression 30° and 45° respectively. Find the distance between the cars. (Use $\sqrt{3} = 1.73$)

35. The internal and external diameters of a hollow hemispherical vessel are 16 cm and 12 cm respectively. If the cost of painting 1 cm^2 of the surface area is Rs. 5.00, find the total cost of painting the vessel all over. (Use $\pi = 3.14$)

Section - E

Case study based questions are compulsory.

36. Riya has a lawn with a flowerbed and grass land. The grass land is in the shape of rectangle while flowerbed is in the shape of square. The length of the grassland is found to be 3 m more than twice the length of the flowerbed. Total area of the whole lawn is 1260 m^2.

(i) If the length of the flowerbed is x m then what is the total length of the lawn ?
(ii) What is the value of x if the area of total lawn is 1260 m^2 ?
(iii) What is the area of grassland ?

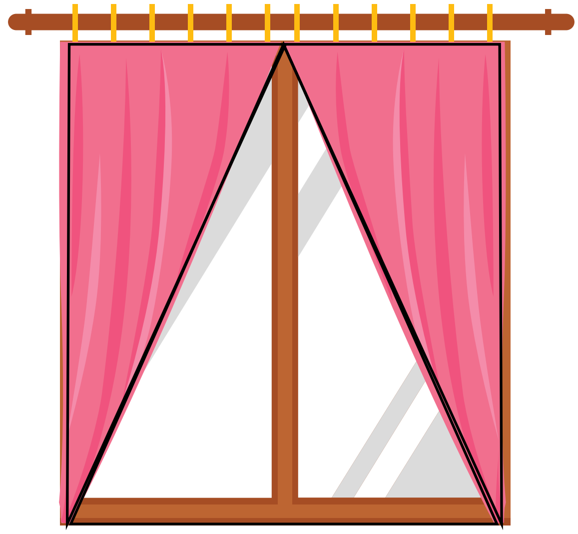
OR

What is the ratio of area of flowerbed to area of grassland ?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

37. Rani wants to make the curtains for her window as shown in the figure. The window is in the shape of a rectangle, whose width and height are in the ratio $2:3$. The area of the window is 9600 square cm.



(i) What is the shape of the window that is uncovered?
(ii) What will be the ratio of two sides of each curtain (other than hypotenuse) ?
(iii) What are the dimensions of the window ?

OR

How much window area is covered by the curtains?

38. Family Structures : For a recent year, 51% of the families in the United States had no children under the age of 18; 20% had one child; 19% had two children; 7% had three children; and 3% had four or more children.

If a family is selected at random, find the following probability.
(i) Find the probability that the family has two or three children.
(ii) Find the probability that the family has more than one child.
(iii) Find the probability that the family has less than three children.

OR

Find the probability that the family has more than three children.

□□□□□□□

Sample Paper 14

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

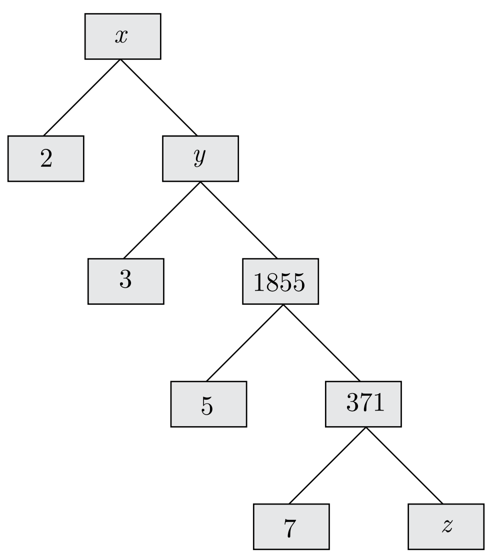
1. Consider the data:

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	13	20	14	7	4

The difference of the upper limit of the median class and the lower limit of the modal class is

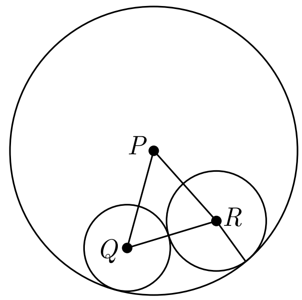
(a) 0 (b) 19 (c) 20 (d) 38

2. In the given factor tree what is the composite number x?



(a) 53 (b) 11130 (c) 5565 (d) 19438

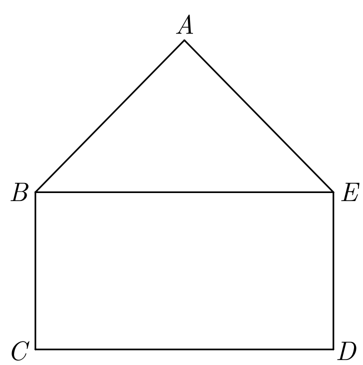
3. In the given figure, three circles with centres P, Q and R are drawn, such that the circles with centres Q and R touch each other externally and they touch the circle with centre P, internally. If $PQ = 10\,\text{cm}$, $PR = 8\,\text{cm}$ and $QR = 12\,\text{cm}$, then the diameter of the largest circle is:



(a) 30 cm (b) 20 cm (c) 10 cm (d) None of these

4. If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, the value of $\alpha^2 + \beta^2$ is
(a) -7 (b) 1 (c) -1 (d) -6

5. In the figure, $ABCDE$ is a pentagon with $BE \parallel CD$ and $BC \parallel DE$. BC is perpendicular to CD. $AB = 5\,\text{cm}$, $AE = 5$ cm, $BE = 7$ cm, $BC = x - y$ and $CD = x + y$. If the perimeter of $ABCDE$ is 27 cm. The value of x and y, will be



(a) 3 and 2 (b) 2 and 3 (c) 1 and 6 (d) 6 and 1

6. If $\tan(3x + 30^\circ) = 1$ then the value of x. will be

(a) 5° (b) 10° (c) 20° (d) 30°

7. If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$ is

(a) $\frac{4}{25}$ (b) $-\frac{4}{25}$ (c) $\frac{4}{5}$ (d) $-\frac{4}{5}$

8. In an AP, if $a = 3.5$, $d = 0$ and $n = 101$, then a_n will be
(a) 0 (b) 3.5 (c) 103.5 (d) 104.5

9. If $am = bl$, then what do you say about the solution of the pair of linear equations $ax + by = c$ and $lx + my = n$?
(a) no solution (b) unique solution (c) infinitely solution (d) can't say anything

10. For what value of p does the pair of linear equations given below has unique solution ?
$4x + py + 8 = 0$ and $2x + 2y + 2 = 0$.
(a) $p = 1$ (b) $p = 2$ (c) $p \neq 4$ (d) $p \neq 2$

11. The quadratic equation $2x^2 - 3\sqrt{2}\,x + \frac{9}{4} = 0$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

12. The quadratic equation $3x^2 + 4\sqrt{3}\,x + 4$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

13. The corresponding sides of two similar triangles are in the ratio 3 : 4, then the ratio of the areas of triangles is ....
(a) $\frac{1}{3}$ (b) $\frac{1}{9}$ (c) $\frac{9}{16}$ (d) $\frac{3}{4}$

14. The points $(3,0)$, $(6,4)$ and $(-1,3)$ are the vertices of a
(a) equilateral triangle (b) scalene triangle
(c) isosceles triangle (d) right angled isosceles triangle

15. $\dfrac{1-\tan^2\theta}{1+\tan^2\theta} = ?$
(a) 1 (b) $\cos^2\theta - \sin^2\theta$ (c) $\sin^2\theta$ (d) $\cos^2\theta$

16. The length of a string between a kite and a point on the ground is 85 m. If the string makes an angle θ with level ground such that $\tan\theta = \frac{15}{8}$, then the height of kite is
(a) 75 m (b) 78.05 m (c) 226 m (d) None of these

17. From a solid circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base is removed, then the volume of remaining solid is
(a) $280\,\pi\text{cm}^3$ (b) $330\,\pi\text{cm}^3$ (c) $240\,\pi\text{cm}^3$ (d) $440\,\pi\text{ cm}^3$

18. A letter of English alphabet is chosen at random, what is the probability that the letter so chosen is a vowel ?
(a) $\frac{5}{26}$ (b) $\frac{21}{26}$ (c) $\frac{2}{13}$ (d) $\frac{7}{13}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP.
Reason : Common difference $d = a_n - a_{n-1}$ is constant or independent of n.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If a wire of length 22 cm is bent in the shape of a circle, then area of the circle so formed is 40 cm^2.
Reason : Circumference of the circle = length of the wire.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Show that 571 is a prime number.

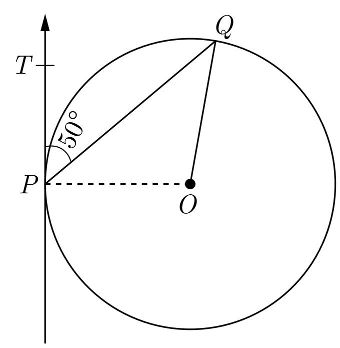
22. If the sum of first k terms of an AP is $3k^2 - k$ and its common difference is 6. What is the first term?

OR

Which term of the AP $8, 14, 20, 26, ...$ will be 72 more than its 41^{st} term.

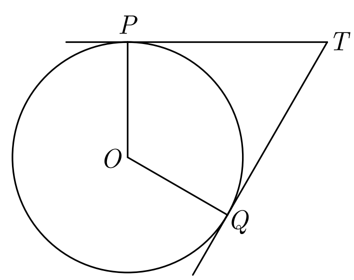
23. The co-ordinate of the point dividing the line segment joining the points $A(1,3)$ and $B(4,6)$ in the ratio 2 : 1 is ....

24. In figure, O is the centre of circle. PQ is a chord and PT is tangent at P which makes an angle of 50° with PQ. Find the angle $\angle POQ$.



OR

In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110^\circ$, then find the angle $\angle PTQ$.



25. Find the probability that a leap year has 53 Sundays

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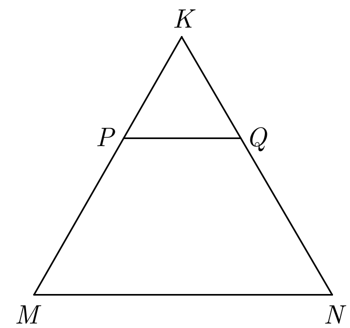
SOLUTIONS

Section - C

Section C consists of 6 questions of 3 marks each.

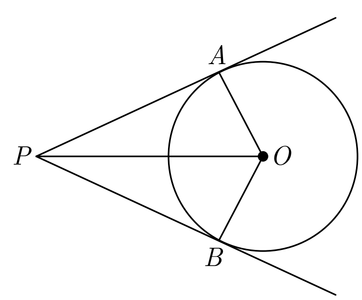
26. Prove that $\sqrt{3}$ is an irrational number.

27. In the figure, PQ is parallel to MN. If $\frac{KP}{PM} = \frac{4}{13}$ and $KN = 20.4$ cm then find KQ.



28. Show that : $\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1$

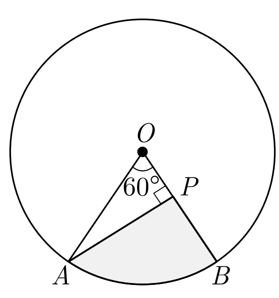
29. In the given figure, OP is equal to the diameter of a circle with centre O and PA and PB are tangents. Prove that ABP is an equilateral triangle.



30. The circumference of a circle exceeds the diameter by 16.8 cm. Find the radius of the circle. Use $\pi = \frac{22}{7}$.

OR

In the given figure, AOB is a sector of angle 60° of a circle with centre O and radius 17 cm. If $AP \perp OB$ and $AP = 15$ cm, find the area of the shaded region.



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SOLUTIONS

31. A child has a die whose six faces show the letters as shown below:
$\boxed{A}$ $\boxed{A}$ $\boxed{B}$ $\boxed{C}$ $\boxed{C}$ $\boxed{C}$
The die is thrown once. What is the probability of getting (i) A, (ii) C?

OR

A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, find the probability of losing the game.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the co-ordinates of the vertices of the triangle formed by these lines and the X-axis and shade the triangular region.

OR

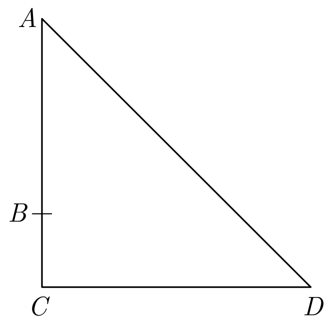
The cost of 2 kg of apples and 1kg of grapes on a day was found to be Rs. 160. After a month, the cost of 4kg of apples and 2kg of grapes is Rs. 300. Represent the situations algebraically and geometrically.

33. Show that $A(6,4)$, $B(5,-2)$ and $C(7,-2)$ are the vertices of an isosceles triangle.

34. In $\Delta ABC, AD$ is the median to BC and in $\Delta PQR, PM$ is the median to QR. If $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM}$. Prove that $\Delta ABC \sim \Delta PQR$.

OR

In the right triangle, B is a point on AC such that $AB + AD = BC + CD$. If $AB = x, BC = h$ and $CD = d$, then find x (in term of h and d).



35. A right triangle whose sides are 20 cm and 15 cm is made to revolve about its hypotenuse. Find the volume and the surface area of the double cone so formed. (Use $\pi = 3.14$)

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SOLUTIONS

Section - E

Case study based questions are compulsory.

36. Optimal Pricing Strategy : The director of the National School of Drama must decide what to charge for a ticket to the comedy drama. If the price is set too low, the theatre will lose money; and if the price is too high, people won't come. From past experience she estimates that the profit P from sales (in hundreds) can be approximated by $P(x) = -x^2 + 22x - 40$ where x is the cost of a ticket and $0 \leq x \leq 25$ hundred rupees.

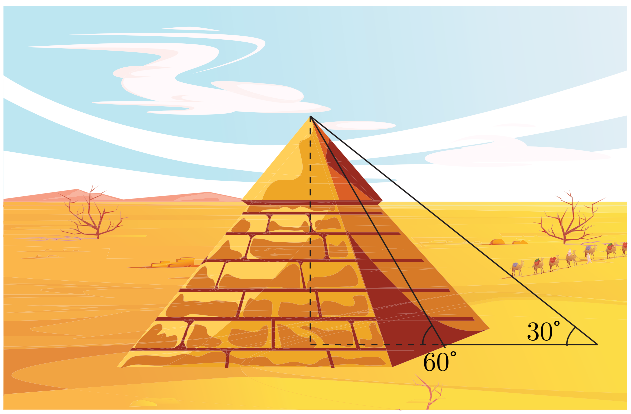
(i) What is the lowest cost of a ticket that would allow the theatre to break even? What is the highest cost that the theatre can charge to break even?

(ii) If theatre charge Rs 4 hundred for each ticket, what is the profit/loss ?

(iii) If theatre charge Rs 25 hundred for each ticket, what is the profit/loss ?

(iv) What is the maximum profit which can be earned by theatre ?

37. Height of a Pyramid : The angle of elevation to the top of the Egyptian pyramid of Cheops is 30° measured from a point 50 meter from the base of the pyramid. The angle of elevation from the base of a face of the pyramid is 60°.



(i) Find the height of the Cheops pyramid.

(ii) Find the side of base of pyramid.

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SOLUTIONS

38. An inspector in an enforcement squad of electricity department visit to a locality of 100 families and record their monthly consumption of electricity, on the basis of family members, electronic items in the house and wastage of electricity, which is summarise in the following table.

Monthly Consumption (in kwh)	**Number of families**
0-100	2
100-200	5
200-300	x
300-400	12
400-500	17
500-600	20
600-700	y
700-800	9
800-900	7
900-1000	4

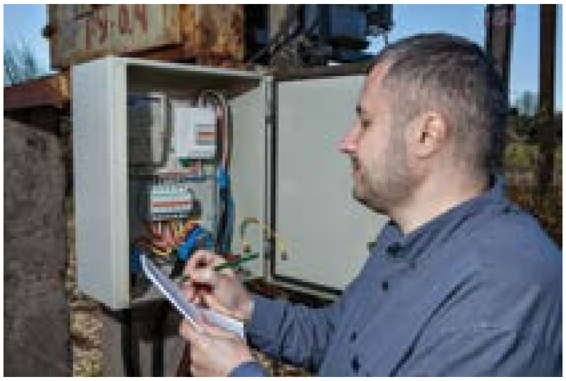
Inspector calculated that median of the above data is 525 and after that he lost two data which is given as x and y in table.

Based on the above information, answer the following questions.

(i) What is the value of lost data x ?

(ii) What is the value of lost data y ?

(iii) What will be the upper limit of the modal class?



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Sample Paper 15

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. Ramesh buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random a tank containing 5 male fish and 9 female fish. Then, the probability that the fish taken out is a male fish, is

(a) $\frac{5}{13}$ (b) $\frac{5}{14}$

(c) $\frac{6}{13}$ (d) $\frac{7}{13}$

2. A quadratic polynomial, whose zeroes are -3 and 4, is

(a) $x^2 - x + 12$ (b) $x^2 + x + 12$

(c) $\frac{x^2}{2} - \frac{x}{2} - 6$ (d) $2x^2 + 2x - 24$

3. A number x is selected from the numbers 1, 2, 3 and then a second number y is randomly selected from the numbers 1, 4, 9 then the probability that the product xy of the two numbers will be less than 9 is

(a) $\frac{3}{7}$ (b) $\frac{4}{9}$

(c) $\frac{5}{9}$ (d) $\frac{7}{9}$

4. The value of c for which the pair of equations $cx - y = 2$ and $6x - 2y = 3$ will have is

(a) 3 (b) -3

(c) -12 (d) no value

5. If the common difference of an AP is 5, then what is $a_{18} - a_{13}$?

(a) 5 (b) 20

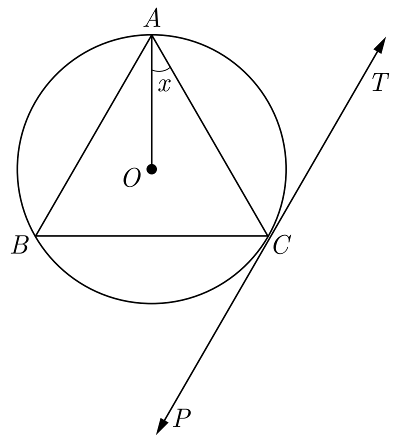
(c) 25 (d) 30

6. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, then the corresponding side of second triangle is ....

(a) 5.4 cm (b) 5.2 cm

(c) 4.9 cm (d) 5.1 cm

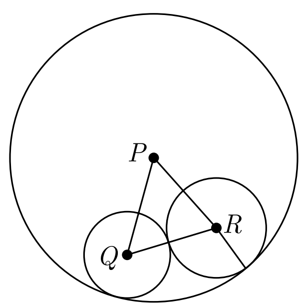
7. In the adjoining figure, PT is a tangent at point C of the circle. O is the circumference of ΔABC. If $\angle ACP = 118^\circ$, then the measure of $\angle x$ is



(a) 28° (b) 32°

(c) 42° (d) 38°

8. In the given figure, three circles with centres P, Q and R are drawn, such that the circles with centres Q and R touch each other externally and they touch the circle with centre P, internally. If $PQ = 10\,\text{cm}$, $PR = 8\,\text{cm}$ and $QR = 12\,\text{cm}$, then the diameter of the largest circle is:



(a) 30 cm (b) 20 cm

(c) 10 cm (d) None of these

9. If ΔABC is right angled at C, then the value of $\sec(A+B)$ is

(a) 0 (b) 1

(c) $\frac{2}{\sqrt{3}}$ (d) not defined

10. The quadratic equation $x^2 + x - 5 = 0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

11. If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, than $x^2 + y^2$ is equal to

(a) 0 (b) 1/2

(c) 1 (d) 3/2

12. From the top of a 7 m high building the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°, then the height of the tower is

(a) 14.124 m (b) 17.124 m

(c) 19.124 m (d) 15.124 m

13. In a right angled ΔABC right angled at B, if P and Q are points on the sides AB and BC respectively, then

(a) $AQ^2 + CP^2 = 2(AC^2 + PQ^2)$

(b) $2(AQ^2 + CP^2) = AC^2 + PQ^2$

(c) $AQ^2 + CP^2 = AC^2 + PQ^2$

(d) $AQ + CP = \frac{1}{2}(AC + PQ)$

14. A circle artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground, then the height of pole, if the angle made by the rope with the ground level is 30°, is

(a) 5 m (b) 10 m

(c) 15 m (d) 20 m

15. If the perimeter of a semi-circular protractor is 36 cm, then its diameter is

(a) 10 cm (b) 14 cm

(c) 12 cm (d) 16 cm

16. A right circular cylinder of radius r and height h (where, $h > 2r$) just encloses a sphere of diameter

(a) r (b) $2r$

(c) h (d) $2h$

17. The mean and median of the data a, b and c are 50 and 35 respectively, where $a < b < c$. If $c - a = 55$, then $(b - a)$ is

(a) 8 (b) 7

(c) 3 (d) 5

18. For the following distribution

Marks	**Number of Students**	**Marks**	**Number of students**
Below 10	3	Below 40	57
Below 20	12	Below 50	75
Below 30	28	Below 60	80

The modal class is

(a) 0-20 (b) 20-30

(c) 30-40 (d) 50-60

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary.
Reason : If discriminant $D = b^2 - 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

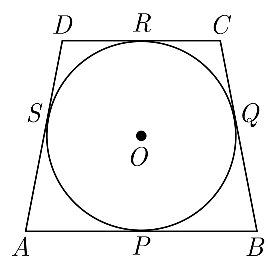
20. **Assertion :** PA and PB are two tangents to a circle with centre O. Such that $\angle AOB = 110°$, then $\angle APB = 90°$.
Reason : The length of two tangents drawn from an external point are equal.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. If S_n the sum of first n terms of an AP is given by $S_n = 3n^2 - 4n$, find the n^{th} term.

22. In Figure a quadrilateral $ABCD$ is drawn to circumscribe a circle, with centre O, in such a way that the sides AB, BC, CD, and DA touch the circle at the points P, Q, R and S respectively. Prove that. $AB + CD = BC + DA$.



23. Prove that the point $(3,0)$, $(6,4)$ and $(-1,3)$ are the vertices of a right angled isosceles triangle.

24. Check whether 4^n can end with the digit 0 for any natural number n.

25. The 8^{th} term of an AP is zero. Prove that its 38^{th} term is triple of its 18^{th} term.

OR

If the number $x + 3, 2x + 1$ and $x - 7$ are in AP find the value of x.

Continue on next page.....

Section - C

Section C consists of 6 questions of 3 marks each.

26. Determine the values of m and n so that the following system of linear equation have infinite number of solutions :

$$(2m-1)x+3y-5=0$$
$$3x+(n-1)y-2=0$$

27. Solve for x :

$$\frac{2x}{x-3}+\frac{1}{2x+3}+\frac{3x+9}{(x-3)(2x+3)}=0, x\neq 3, -\frac{3}{2}$$

28. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that $AQ=\frac{1}{2}(BC+CA+AB)$

OR

In ΔABD, $AB=AC$. If the interior circle of ΔABC touches the sides AB, BC and CA at D, E and F respectively. Prove that E bisects BC.

29. An aeroplane, when flying at a height of 4000 m from the ground passes vertically above another aeroplane at an instant when the angles of elevation of the two planes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the aeroplanes at that instant. (Use $\sqrt{3}=1.73$)

30. A hemispherical bowl of internal diameter 36 cm contains liquid is filled into 72 cylindrical bottles of diameter 6 cm. Find the height of the each bottle, if 10% liquid is wasted in this transfer.

OR

A hollow cylindrical pipe is made up of copper. It is 21 dm long. The outer and inner diameters of the pipe are 10 cm and 6 cm respectively. Find the volume of copper used in making the pipe.

31. A child has a die whose six faces show the letters as shown below:

$\boxed{A}$ $\boxed{A}$ $\boxed{B}$ $\boxed{C}$ $\boxed{C}$ $\boxed{C}$

The die is thrown once. What is the probability of getting (i) A, (ii) C?

Section - D

Section D consists of 4 questions of 5 marks each.

32. If β and $\frac{1}{\beta}$ are zeroes of the polynomial $(a^2+a)x^2+61x+6a$. Find the value of β and α.

OR

Find the zeroes of the quadratic polynomial $7y^2-\frac{11}{3}y-\frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.

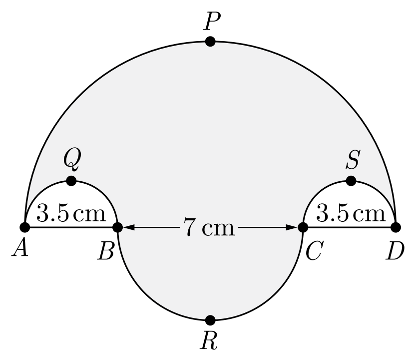
33. In ΔABC, AD is the median to BC and in ΔPQR, PM is the median to QR. If $\frac{AB}{PQ}=\frac{BC}{QR}=\frac{AD}{PM}$. Prove that $\Delta ABC \sim \Delta PQR$.

34. Prove that: $\dfrac{\sin\theta}{\cot\theta+\operatorname{cosec}\theta}=2+\dfrac{\sin\theta}{\cot\theta-\operatorname{cosec}\theta}$

OR

If $\sqrt{3}\cot^2\theta-4\cot\theta+\sqrt{3}=0$, then find the value of $\cot^2\theta+\tan^2\theta$.

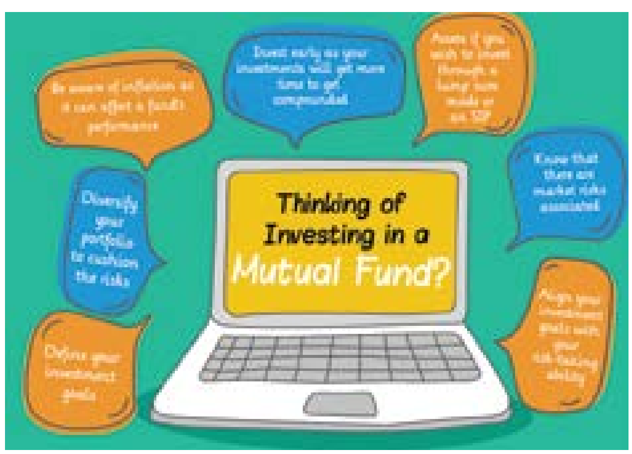
35. Find the area of the shaded region in Figure, $\overset{\frown}{APD}, \overset{\frown}{AQB}, \overset{\frown}{BRC}$ and $\overset{\frown}{CSD}$, are semi-circles of diameter 14 cm, 3.5 cm, 7 cm and 3.5 cm respectively. Use $\pi=\frac{22}{7}$.



Section - E

Case study based questions are compulsory.

36. Mutual Fund : A mutual fund is a type of financial vehicle made up of a pool of money collected from many investors to invest in securities like stocks, bonds, money market instruments, and other assets. Mutual funds are operated by professional money managers, who allocate the fund's assets and attempt to produce capital gains or income for the fund's investors.



Net asset value (NAV) represents a fund's per share market value. It is the price at which investors buy ("bid price") fund shares from a fund company and sell them ("redemption price") to a fund company.
The following table below shows the net asset value (NAV) per unit of mutual funds of ICICI mutual funds.

Continue on next page.....

NAV (Rs)	No. of mutual funds
0-5	13
6-10	16
11-15	22
16-20	18
21-25	11

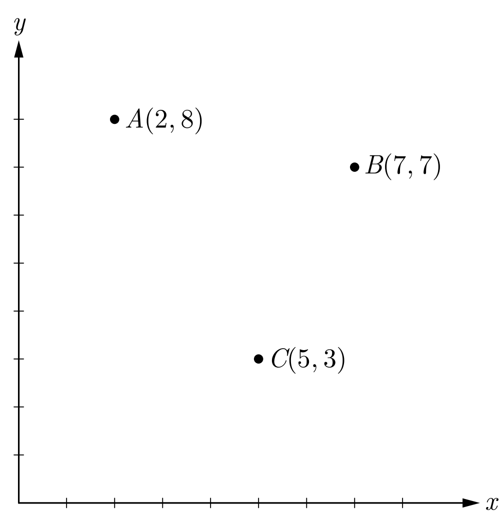
Based on the above information, answer the following questions.
(i) What is the lower limit of model class of NAV?
(ii) What is the mode NAV of mutual funds ?
(iii) What is the mean NAV of mutual funds ?

OR

(iv) What is the median NAV of mutual funds ?

37. Carpooling : It is the sharing of car journeys so that more than one person travels in a car, and prevents the need for others to have to drive to a location themselves. By having more people using one vehicle, carpooling reduces each person's travel costs such as: fuel costs, tolls, and the stress of driving. Carpooling is also a more environmentally friendly and sustainable way to travel as sharing journeys reduces air pollution, carbon emissions, traffic congestion on the roads, and the need for parking spaces.

Three friends Amar, Bandhu and Chakradev lives in societies represented by the points A, B and C respectively. They all work in offices located in a same building represented by the point O. Since they all go to same building everyday, they decided to do carpooling to save money on petrol. Based on the above information, answer the following questions.



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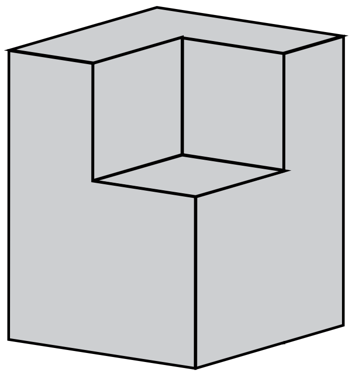
(i) Which society is nearest to the office?
(ii) What is the distance between A and C?
(iii) Find the least distance between AB, OA and BC ?
(iv) If Bandhu and Chakradev planned to meet at a club situated at the mid-point of the line joining the points B and C, find the coordinates of this point.

38. Volume of Solid : A cuboidal solid of base x by $x+1$ is shown in figure. Height of original solid is $x+2$. A small cuboidal solid of base $x-2$ by $x-2$ and height 2 is cut from this solid as shown in figure.



(i) Find the polynomial for the volume of remaining solid.
(ii) Use the remainder theorem to determine the volume of remaining solid at $x=8$ inch.
(iii) Use the polynomial to determine the volume at $x=8$ inch and verify the result in (ii).

OR

Use the remainder theorem to determine the volume at $x=10$ inch.

□□□□□□□

Sample Paper 16

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. The linear factors of the quadratic equation $x^2 + kx + 1 = 0$ are

(a) $k \geq 2$ (b) $k \leq 2$

(c) $k \geq -2$ (d) $2 \leq k \leq -2$

2. The maximum number of zeroes a cubic polynomial can have, is

(a) 1 (b) 4

(c) 2 (d) 3

3. A fraction becomes 4 when 1 is added to both the numerator and denominator and it becomes 7 when 1 is subtracted from both the numerator and denominator. The numerator of the given fraction is

(a) 2 (b) 3

(c) 5 (d) 15

4. The sum of exponents of prime factors in the prime-factorisation of 196 is

(a) 3 (b) 4

(c) 5 (d) 2

5. The pair of linear equations $2kx + 5y = 7$, $6x - 5y = 11$ has a unique solution, if

(a) $k \neq -3$ (b) $k \neq \frac{2}{3}$

(c) $k \neq 5$ (d) $k \neq \frac{2}{9}$

6. In an AP, if $d = -4$, $n = 7$ and $a_n = 4$, then a is equal to
(a) 6 (b) 7
(c) 20 (d) 28

7. The 4th term from the end of an AP $-11, -8, -5, \ldots, 49$ is
(a) 37 (b) 40
(c) 43 (d) 58

8. A chord of a circle of radius 10 cm, subtends a right angle at its centre. The length of the chord (in cm) is
(a) $\frac{5}{\sqrt{2}}$ (b) $5\sqrt{2}$
(c) $10\sqrt{2}$ (d) $10\sqrt{3}$

9. If ΔABC is right angled at C, then the value of$\cos(A+B)$ is
(a) 0 (b) 1
(c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

10. If $x - 2y + k = 0$ is a median of the triangle whose vertices are at points $A(-1, 3)$, $B(0, 4)$ and $C(-5, 2)$,then the value of k is
(a) 2 (b) 4
(c) 6 (d) 8

11. A circle artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground, then the height of pole, if the angle made by the rope with the ground level is $30°$, is
(a) 5 m (b) 10 m
(c) 15 m (d) 20 m

12. If the area of a semi-circular field is 15400 sq m, then perimeter of the field is
(a) $160\sqrt{2}$ m (b) $260\sqrt{2}$ m
(c) $360\sqrt{2}$ m (d) $460\sqrt{2}$ m

13. In a right angled ΔABC right angled at B, if P and Q are points on the sides AB and BC respectively, then
(a) $AQ^2 + CP^2 = 2(AC^2 + PQ^2)$ (b) $2(AQ^2 + CP^2) = AC^2 + PQ^2$
(c) $AQ^2 + CP^2 = AC^2 + PQ^2$ (d) $AQ + CP = \frac{1}{2}(AC + PQ)$

14. Ratio of lateral surface areas of two cylinders with equal height is
(a) 1 : 2 (b) $H : h$
(c) $R : r$ (d) None of these

15. For finding the popular size of readymade garments, which central tendency is used?
(a) Mean (b) Median
(c) Mode (d) Both Mean and Mode

16. When a die is thrown, the probability of getting an odd number less than 3 is

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$

(c) $\frac{1}{2}$ (d) 0

17. If the point P (6, 2) divides the line segment joining $A(6,5)$ and $B(4,y)$ in the ratio $3:1$ then the value of y is

(a) 4 (b) 3

(c) 2 (d) 1

18. The ratio in which the point $(2,y)$ divides the join of $(-4,3)$ and (6, 3), hence the value of y is

(a) $2:3, y=3$ (b) $3:2, y=4$

(c) $3:2, y=3$ (d) $3:2, y=2$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $(2-\sqrt{3})$ is one zero of the quadratic polynomial then other zero will be $(2+\sqrt{3})$.

Reason : Irrational zeros (roots) always occurs in pairs.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The equation $x^2+3x+1=(x-2)^2$ is a quadratic equation.

Reason : Any equation of the form $ax^2+bx+c=0$ where $a\neq 0$, is called a quadratic equation.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

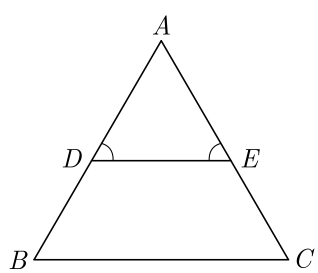
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

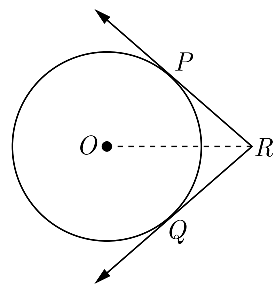
Section - B

Section B consists of 5 questions of 2 marks each.

21. In Figure $\angle D=\angle E$ and $\frac{AD}{DB}=\frac{AE}{EC}$, prove that ΔBAC is an isosceles triangle.



22. In figure, two tangents RQ and RP are drawn from an external point R to the circle with centre O. If $\angle PRQ = 120^\circ$, then prove that $OR = PR + RQ$.



23. If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^\circ < \theta < 90^\circ$, find the value of θ.

24. Find the value of λ, if the mode of the following data is 20 :
15, 20, 25, 18, 13, 15, 25, 15, 18, 17, 20, 25, 20, λ, 18.

OR

The mean and median of 100 observation are 50 and 52 respectively. The value of the largest observation is 100. It was later found that it is 110. Find the true mean and median.

25. Prove that $3+\sqrt{5}$ is an irrational number.

OR

Show that any positive even integer can be written in the form $6q, 6q+2$ or $6q+4$, where q is an integer.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Show that the sum of all terms of an AP whose first term is a, the second term is b and last term is c, is equal to $\frac{(a+c)(b+c-2a)}{2(b-a)}$

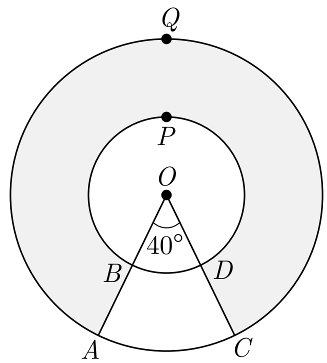
27. Prove that $(1+\cot A - \operatorname{cosec} A)(1+\tan A+\sec A) = 2$

28. Sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.

Continue on next page.....

OR

In the given figure, find the area of the shaded region, enclosed between two concentric circles of radii 7 cm and 14 cm where $\angle AOC = 40^\circ$. Use $\pi = \frac{22}{7}$.



29. The mean of the following distribution is 48 and sum of all the frequency is 50. Find the missing frequencies x and y.

Class	20-30	30-40	40-50	50-60	60-70
Frequency	8	6	x	11	y

30. If the co-ordinates of points A and B are $(-2,-2)$ and $(2,-4)$ respectively, find the co-ordinates of P such that $AP = \frac{3}{7}AB$, where P lies on the line segment AB.

OR

Find the co-ordinates of the points of trisection of the line segment joining the points $A(1,-2)$ and $B(-3,4)$.

31. Three bells toll at intervals of 9, 12, 15 minutes respectively. If they start tolling together, after what time will they next toll together?

Section - D

Section D consists of 4 questions of 5 marks each.

32. Aftab tells his daughter, '7 years ago, I was seven times as old as you were then. Also, 3 years from now, I shall be three times as old as you will be.' Represent this situation algebraically and graphically.

OR

Solve the following pair of linear equations graphically:
$x - y = 1$, $2x + y = 8$
Also find the co-ordinates of the points where the lines represented by the above equation intersect $y-$ axis.

33. From a point T outside a circle of centre O, tangents TP and TQ are drawn to the circle. Prove that OT is the right bisector of line segment PQ.

34. From a point on the ground, the angles of elevation of the bottom and the top of a tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.

OR

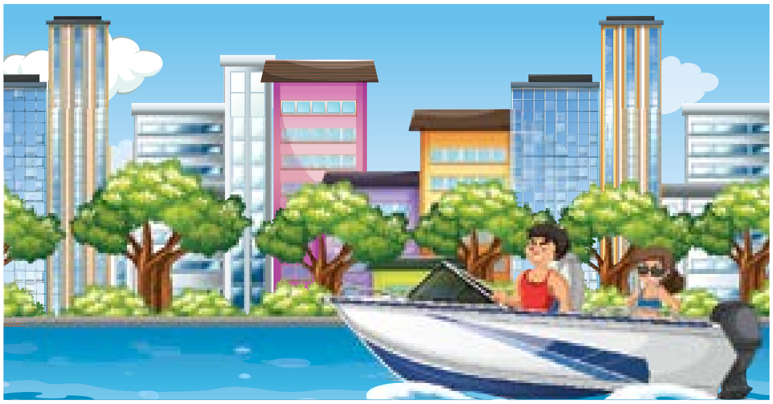
The angle of elevation of the top B of a tower AB from a point X on the ground is 60°. At point Y, 40 m vertically above X, the angle of elevation of the top is 45°. Find the height of the tower AB and the distance XB.

35. Water is flowing through a cylindrical pipe, of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the rise in level of water in the tank in half an hour.

Section - E

Case study based questions are compulsory.

36. John and Priya went for a small picnic. After having their lunch Priya insisted to travel in a motor boat. The speed of the motor boat was 20 km/hr. Priya being a Mathematics student wanted to know the speed of the current. So she noted the time for upstream and downstream.



She found that for covering the distance of 15 km the boat took 1 hour more for upstream than downstream.

(i) Let speed of the current be x km/hr. then speed of the motorboat in upstream will be

(ii) What is the relation between speed distance and time?

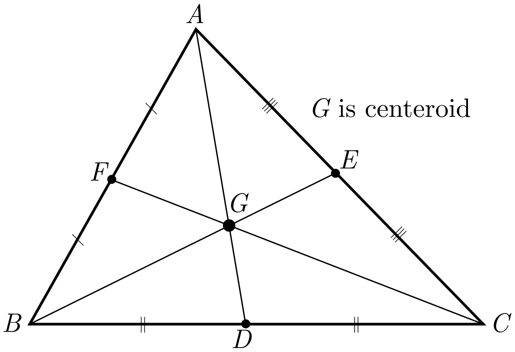
(iii) Write the correct quadratic equation for the speed of the current ?

OR

(iv) What is the speed of current ?

37. The centroid is the centre point of the object. It is also defined as the point of intersection of all the three medians. The median is a line that joins the midpoint of a side and the opposite vertex of the triangle. The centroid of the triangle separates the median in the ratio of 2 : 1. It can be found by taking the average of x- coordinate points and y-coordinate points of all the vertices of the triangle.

See the figure given below



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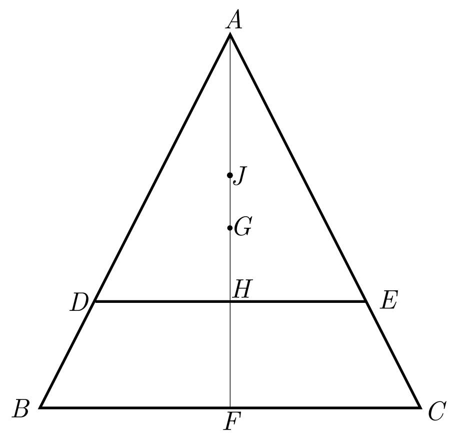
Here D, E and F are mid points of sides BC, AC and AB in same order. G is centroid, the centroid divides the median in the ratio 2 : 1 with the larger part towards the vertex. Thus $AG:GD = 2:1$

On the basis of above information read the question below.

If G is Centroid of $\triangle ABC$ with height h and J is centroid of $\triangle ADE$. Line DE parallel to BC, cuts the $\triangle ABC$ at a height $\frac{h}{4}$ from BC. $HF = \frac{h}{4}$.



(i) What is the length of AH ?

(ii) What is the distance of point A from point G?

(iii) What is the distance of point A from point J?

OR

(iv) What is the distance GJ ?

38. Abhinav Bindra is retired sport shooter and currently India's only individual Olympic gold medalist. His gold in the 10-meter air rifle event at the 2008 Summer Olympics was also India's first Olympic gold medal since 1980. He is the first Indian to have held concurrently the world and Olympic titles for the men's 10-meter air rifle event, having earned those honors at the 2008 Summer Olympics and the 2006 ISSF World Shooting Championships. Bindra has also won nine medals at the Commonwealth Games and three gold medals at the Asian Games.

A circular dartboard has a total radius of 8 inch, with circular bands that are 2 inch wide, as shown in figure. Abhinav is still skilled enough to hit this board 100% of the time so he always score at least two points each time he throw a dart. Assume the probabilities are related to area, on the next dart that he throw.

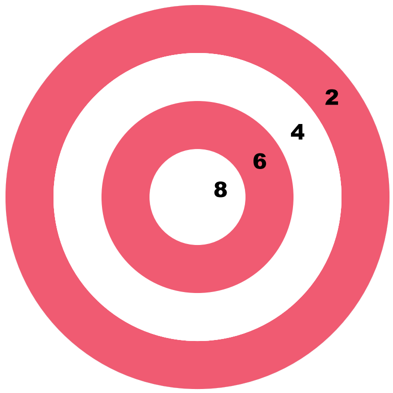
(i) What is the probability that he score at least 4 ?

(ii) What is the probability that he score at least 6 ?

(iii) What is the probability that he hit bull's eye ?

OR

(iv) What is the probability that he score exactly 4 points ?



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Sample Paper 17

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

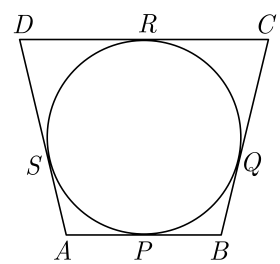
General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. In the given figure, a circle touches all the four sides of quadrilateral $ABCD$ with $AB = 6$ cm, $BC = 7$ cm and $CD = 4$ cm, then length of AD is



(a) 3 cm (b) 4 cm (c) 5 cm (d) 6 cm

2. If sum of the zeroes of the quadratic polynomial $3x^2 - kx + 6$ is 3, then the value of k will be

(a) 1 (b) 4 (c) 6 (d) 9

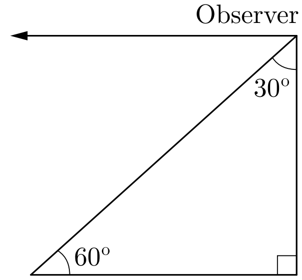
3. The sum of exponents of prime factors in the prime-factorisation of 1764 is

(a) 3 (b) 4 (c) 5 (d) 6

4. Select the quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

(a) $bx^2 + ax + c$ (b) $ax^2 + cx + b$ (c) $cx^2 + bx + a$ (d) $bx^2 + cx + a$

5. In the given figure, the positions of the observer and the object are mentioned, the angle of depression is



(a) 30° (b) 90° (c) 60° (d) 45°

6. For the following distribution.

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

the sum of lower limits of the median class and modal class is

(a) 15 (b) 25 (c) 30 (d) 35

7. If a and b are the zeroes of polynomial $x^2 + ax + b$, the values of a and b are

(a) 1 and 2 (b) 1 and –2 (c) –2 and 1 (d) 2 and 1

8. What do you say about the lines represented by $2x + y = 3$ and $4x + 2y = 6$?

(a) lines are parallel
(b) lines are coincident
(c) lines are intersecting
(d) can't say anything

9. Select the value of k for which the pair of Linear equations $kx + y = d^2$ and $x + ky = 1$ have infinitely many solutions.

(a) 1 (b) 2 (c) 3 (d) 4

10. The quadratic equation $x^2 - 4x + 3\sqrt{2} = 0$ has

(a) two distinct real roots
(b) two equal real roots
(c) no real roots
(d) more than 2 real roots

11. In an AP, if $d = -4$, $n = 7$ and $a_n = 4$, then a is equal to

(a) 6 (b) 7 (c) 20 (d) 28

12. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, then the corresponding side of second triangle is ....

(a) 4.2 cm (b) 5.4 cm (c) 20 cm (d) 6 cm

13. The distance of a point $P(x, y)$ from the origin is

(a) $\sqrt{x^2 - xy + y^2}$ (b) $\sqrt{x^2 + xy + y^2}$ (c) $\sqrt{x^2 + y^2}$ (d) $\sqrt{x^2 + 3xy + y^2}$

14. In a triangle ABC, $\cos\left(\frac{B+C}{2}\right)$ will be

(a) $\sin\frac{A}{4}$ (b) $\cos A$ (c) $\sin\frac{A}{2}$ (d) $\cos\frac{A}{2}$

15. $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = ?$

(a) $\sin A$ (b) $\tan A$ (c) $\cos A$ (d) $\cot A$

16. Volume of a spherical shell is given by

(a) $4\pi(R^2 - r^2)$ (b) $\pi(R^3 - r^3)$ (c) $4\pi(R^3 - r^3)$ (d) $\frac{4}{3}\pi(R^3 - r^3)$

17. The sum of first 16 terms of the AP 10, 6, 2, ... is

(a) -320 (b) 320 (c) -352 (d) -400

18. A bag contains 6 red and 5 blue balls. What is the probability that the ball drawn is not red?

(a) $\frac{5}{11}$ (b) $\frac{6}{11}$ (c) $\frac{2}{11}$ (d) $\frac{7}{11}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The roots of the quadratic equation $x^2 + 2x + 2 = 0$ are imaginary.
Reason : If discriminant $D = b^2 - 4ac < 0$ then the roots of quadratic equation $ax^2 + bx + c = 0$ are imaginary.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** In a circle of radius 6 cm, the angle of a sector $60°$. Then the area of the sector is $18\frac{6}{7}\text{ cm}^2$.
Reason : Area of the circle with radius r is πr^2.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Check whether 4^n can end with the digit 0 for any natural number n.

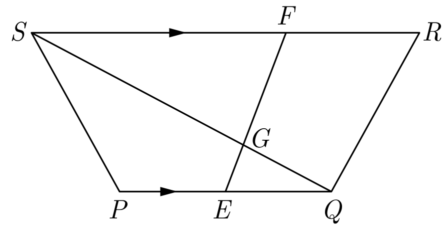
22. If α and β are zeroes of $x^2 - (k-6)x + 2(2k-1)$, find the value of k if $\alpha + \beta = \frac{1}{2}\alpha\beta$.

OR

Find the quadratic polynomial, the sum and product of whose zeroes are -3 and 2 respectively. Hence find the zeroes.

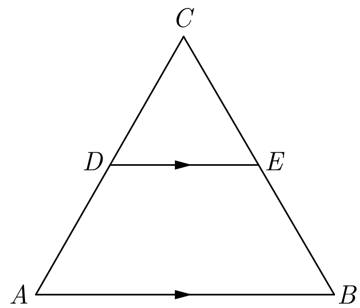
23. If the distance between the points $A(4, p)$ and $B(1, 0)$ is 5 units then what are the values of p?

24. In the figure, $PQRS$ is a trapezium in which $PQ || RS$. On PQ and RS, there are points E and F respectively such that EF intersects SQ at G. Prove that $EQ \times GS = GQ \times FS$.



OR

In the given figure, $\angle A = \angle B$ and $AD = BE$. Show that $DE || AB$.



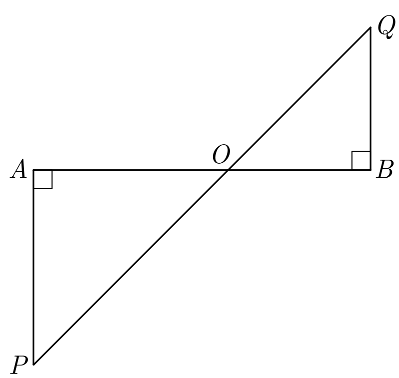
25. Harpreet tosses two different coins simultaneously. What is the probability that she gets :
(i) at least one head ?
(ii) one head and one tail ?

Section - C

Section C consists of 6 questions of 3 marks each.

26. Three bells toll at intervals of 9, 12, 15 minutes respectively. If they start tolling together, after what time will they next toll together?

27. In the given figure, if $\angle A = 90^0, \angle B = 90^0$, $OB = 4.5\text{cm}$ $OA = 6$ cm and $AP = 4$ cm then find QB.



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SOLUTIONS

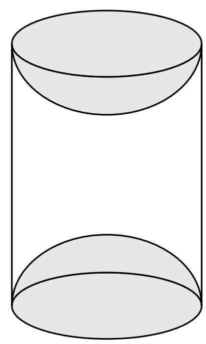
28. If $\sin A = \frac{\sqrt{3}}{2}$, find the value of $2\cot^2 A - 1$.

29. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that $AQ = \frac{1}{2}(BC + CA + AB)$

30. If the total surface area of a solid hemisphere is 462 cm^2, find its volume. Use $\pi = \frac{22}{7}$

OR

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



31. Find the median of the following data :

Height (in cm)	Less than 120	Less than 140	Less than 160	Less than 180	Less than 200
Number of students	12	26	34	40	50

OR

Find the mean of the following distribution :

Height (in cm)	Less than 75	Less than 100	Less than 125	Less than 150	Less than 175	Less than 200
No. of students	5	11	14	18	21	28
Height (in cm)	Less than 225	Less than 250	Less than 275	Less than 300		
No. of students	33	37	45	50		

Section - D

Section D consists of 4 questions of 5 marks each.

32. If the roots of the quadratic equation $(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$ are equal. Then show that $a=b=c$.

OR

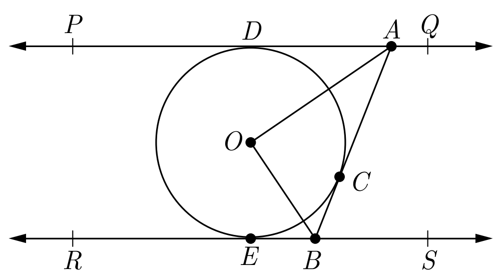
A fast train takes 3 hours less than a slow train for a journey of 60 km. If the speed of the slow train is 10 km/h less than that of the fast train, find the speed of each train.

33. Find the ratio in which the point $P(\frac{3}{4}, \frac{5}{12})$ divides the line segment joining the point A $(\frac{1}{2}, \frac{3}{2})$ and $(2, -5)$.

34. From a point T outside a circle of centre O, tangents TP and TQ are drawn to the circle. Prove that OT is the right bisector of line segment PQ.

OR

In Figure, PQ and RS are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting PQ at A and RS at B. Prove that $\angle AOB = 90^\circ$.



35. Water is flowing at the rate of 15 km/hr through a cylindrical pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time the level of water in pond rise by 21 cm ?

Section - E

Case study based questions are compulsory.

36. TOWER OF PISA : To prove that objects of different weights fall at the same rate, Galileo dropped two objects with different weights from the Leaning Tower of Pisa in Italy. The objects hit the ground at the same time. When an object is dropped from a tall building, it falls about 16 feet in the first second, 48 feet in the second, and 80 feet in the third second, regardless of its weight.

(i) How many feet would an object fall in the sixth second?
(ii) How many feet would an object fall in the six second?
(iii) How many feet would an object fall in the eight second?

37. Speed Limit Enforcement : Rajendra works in traffic police and manage traffic on highway. His van is having radar detection equipment. He takes up a hidden position 50 meter from the highway. Using a sighting device he finds the angle between his position and a road sign in the distance is 60°.

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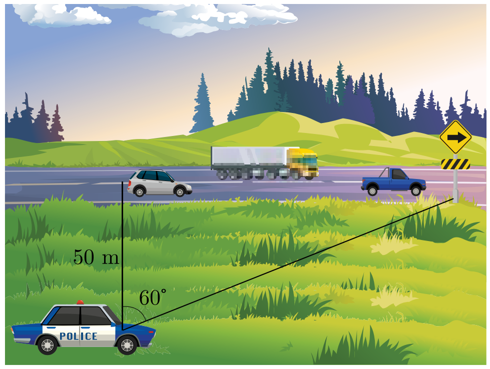


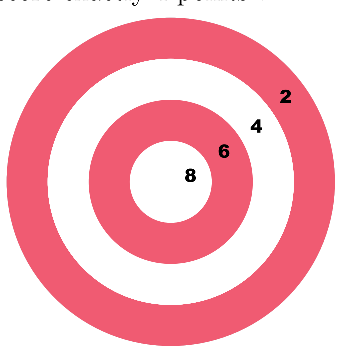
He then uses a stop watch to determine how long it takes a vehicle to pass her location and reach the road sign. In quick succession—an 18-wheeler, a truck, and a car pass her position, with the time each takes to travel this distance noted. Find the speed of each vehicle in miles per hour if

(i) the 18-wheeler takes 8 sec,
(ii) the truck takes 6 sec,
(iii) the car takes 4 sec.

38. Abhinav Bindra is retired sport shooter and currently India's only individual Olympic gold medalist. His gold in the 10-meter air rifle event at the 2008 Summer Olympics was also India's first Olympic gold medal since 1980. He is the first Indian to have held concurrently the world and Olympic titles for the men's 10-meter air rifle event, having earned those honors at the 2008 Summer Olympics and the 2006 ISSF World Shooting Championships. Bindra has also won nine medals at the Commonwealth Games and three gold medals at the Asian Games.

A circular dartboard has a total radius of 8 inch, with circular bands that are 2 inch wide, as shown in figure. Abhinav is still skilled enough to hit this board 100% of the time so he always score at least two points each time he throw a dart. Assume the probabilities are related to area, on the next dart that he throw.

(i) What is the probability that he score at least 4 ?
(ii) What is the probability that he score at least 6 ?
(iii) What is the probability that he hit bull's eye ?
(iv) What is the probability that he score exactly 4 points ?



Sample Paper 18

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If the difference of mode and median of a data is 24, then the difference of median and mean is

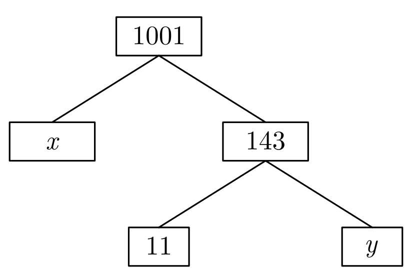
(a) 12 (b) 24 (c) 08 (d) 36

2. If α and β are zeroes and the quadratic polynomial $f(x) = x^2 - x - 4$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta} - \alpha\beta$ is

(a) $\frac{15}{4}$ (b) $\frac{-15}{4}$

(c) 4 (d) 15

3. The values of x and y in the given figure are



(a) 7, 13 (b) 13, 7 (c) 9, 12 (d) 12, 9

4. The father's age is six times his son's age. Four years hence, the age of the father will be four times his son's age. The present ages (in year) of the son and the father are, respectively.

(a) 4 and 24 (b) 5 and 30

(c) 6 and 36 (d) 3 and 24

5. If the sum of the zeroes of the quadratic polynomial $kx^2 + 2x + 3k$ is equal to their product, then k equals

(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

6. In an AP, if $a = 3.5$, $d = 0$ and $n = 101$, then a_n will be

(a) 0 (b) 3.5

(c) 103.5 (d) 104.5

7. The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ has

(a) a unique solution (b) exactly two solutions

(c) infinitely many solutions (d) no solution

8. It is given that, $\Delta ABC \sim \Delta EDF$ such that $AB = 5$ cm, $AC = 7$ cm, $DF = 15$ cm and $DE = 12$ cm then the sum of the remaining sides of the triangles is

(a) 23.05 cm (b) 16.8 cm

(c) 6.25 cm (d) 24 cm

9. QP is a tangent to a circle with centre O at a point P on the circle. If ΔOPQ is isosceles, then $\angle OQR$ equals.

(a) 30° (b) 45°

(c) 60° (d) 90°

10. If $\sin\alpha = \frac{1}{2}$ and $\cos\beta = \frac{1}{2}$, then the value of $(\alpha + \beta)$ is

(a) 0° (b) 30°

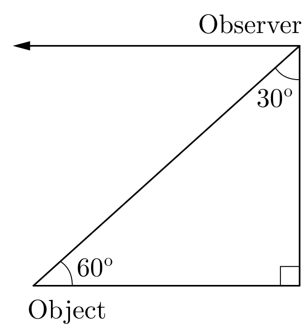
(c) 60° (d) 90°

11. The famous mathematician associated with finding the sum of the first 100 natural numbers is

(a) Pythagoras (b) Newton

(c) Gauss (d) Euclid

12. In the given figure, the positions of the observer and the object are mentioned, the angle of depression is



(a) 30° (b) 90°

(c) 60° (d) 45°

13. Volume of a spherical shell is given by

(a) $4\pi(R^2 - r^2)$

(b) $\pi(R^3 - r^3)$

(c) $4\pi(R^3 - r^3)$

(d) $\frac{4}{3}\pi(R^3 - r^3)$

14. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is

(a) 7

(b) 14

(c) 21

(d) 28

15. The area of the circle that can be inscribed in a square of side 6 cm is

(a) $36\pi\text{ cm}^2$

(b) $18\pi\text{ cm}^2$

(c) $12\pi\text{ cm}^2$

(d) $9\pi\text{ cm}^2$

16. The distance between the points $(a\cos\theta + b\sin\theta,\ 0)$, and $(0,\ a\sin\theta - b\cos\theta)$ is

(a) $a^2 + b^2$

(b) $a^2 - b^2$

(c) $\sqrt{a^2 + b^2}$

(d) $\sqrt{a^2 - b^2}$

17. If the centre of a circle is (3, 5) and end points of a diameter are (4, 7) and (2, y), then the value of y is

(a) 3

(b) -3

(c) 7

(d) 4

18. The point P on x-axis equidistant from the points $A(-1, 0)$ and $B(5, 0)$ is

(a) (2, 0)

(b) (0, 2)

(c) (3, 0)

(d) $(-3, 5)$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** If one zero of poly-nominal $p(x) = (k^2 + 4)x^2 + 13x + 4k$ is reciprocal of other, then $k = 2$.
Reason : If $(x - \alpha)$ is a factor of $p(x)$, then $p(\alpha) = 0$ i.e. α is a zero of $p(x)$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The values of x are $-\frac{a}{2}, a$ for a quadratic equation $2x^2 + ax - a^2 = 0$.

Reason : For quadratic equation $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

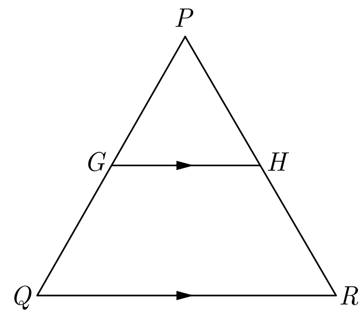
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

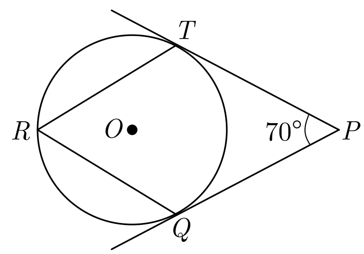
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

21. In the given figure, G is the mid-point of the side PQ of ΔPQR and $GH || QR$. Prove that H is the mid-point of the side PR or the triangle PQR.



22. In figure, O is the centre of a circle. PT are tangents to the circle from an external point P. If $\angle TPQ = 70^\circ$, find $\angle TRQ$.



23. Evaluate : $\dfrac{\cos 45^o}{\sec 30^o} + \dfrac{1}{\sec 60^o}$

24. Find the arithmetic mean of the following frequency distribution :

x_i	3	4	5	7	10
f_i	3	4	8	5	10

OR

Given below is the distribution of weekly pocket money received by students of a class. Calculate the pocket money that is received by most of the students.

Pocket Money (in Rs.)	0-20	20-40	40-60	60-80	80-100	100-120	120-140
Number of students.	2	2	3	12	18	5	2

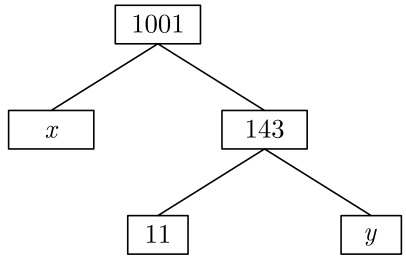
25. a and b are two positive integers such that the least prime factor of a is 3 and the least prime factor of b is 5. Then calculate the least prime factor of $(a+b)$.

OR

What are the values of x and y in the given figure ?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS



Section - C

Section C consists of 6 questions of 3 marks each.

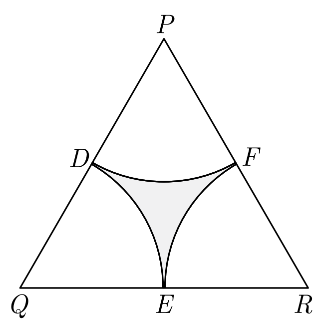
26. If in an AP, the sum of first m terms is n and the sum of its first n terms is m, then prove that the sum of its first $(m+n)$ terms is $-(m+n)$.

27. Prove that $\dfrac{\sin A - \cos A - 1}{\sin A + \cos A - 1} = \dfrac{1}{\sec A - \tan A}$

28. Find the area of minor segment of a circle of radius 14 cm, when its centre angle is 60°. Also find the area of corresponding major segment. Use $\pi = \frac{22}{7}$.

OR

In the given figure, ΔPQR is an equilateral triangle of side 8 cm and D, E, F are centres of circular arcs, each of radius 4 cm. Find the area of shaded region. (Use $\pi = 3.14$) and $\sqrt{3} = 1.732$



29. The table below shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure on food.

Daily expenditure (in ₹)	100-150	150-200	200-250	250-300	300-350
Number of households	4	5	12	2	2

30. If the distance of $P(x, y)$ from $A(6, 2)$ and $B(-2, 6)$ are equal, prove that $y = 2x$.

OR

If (a, b) is the mid-point of the segment joining the points $A(10, -6)$ and $B(k, 4)$ and $a - 2b = 18$, find the value of k and the distance AB.

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

31. Find HCF and LCM of 16 and 36 by prime factorization and check your answer.

Section - D

Section D consists of 4 questions of 5 marks each.

32. For Uttarakhand flood victims two sections A and B of class contributed Rs. 1,500. If the contribution of X-A was Rs. 100 less than that of X-B, find graphically the amounts contributed by both the sections.

OR

Draw the graph of the following equations:

$$2x - y = 1, \; x + 2y = 13$$

Find the solution of the equations from the graph and shade the triangular region formed by the lines and the y -axis.

33. Prove that the parallelogram circumscribing a circle is a rhombus.

34. From the top of a 7 m high building the angle of elevation of the top of a tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.

OR

A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 5 m. From a point on the ground the angles of elevation of top and bottom of the flagstaff are 60° and 30° respectively. Find the height of the tower and the distance of the point from the tower. (take $\sqrt{3} = 1.732$)

35. Water is flowing at the rate of 15 km/hr through a cylindrical pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time the level of water in pond rise by 21 cm ?

Section - E

Case study based questions are compulsory.

36. Nidhi and Ria are very close friends. Nidhi's parents own a Maruti Alto. Ria's parents own a Toyota Liva. Both the families decide to go for a picnic to Somnath temple in Gujrat by their own cars.

Nidhi's car travels x km/h while Ria's car travels 5 km/h more than Nidhi's car. Nidhi's car took 4 hrs more than Ria's car in covering 400 km.

(i) What will be the distance covered by Ria's car in two hour?

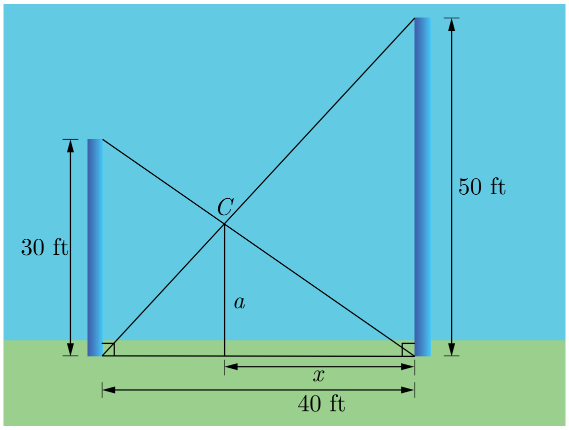
(ii) Write the quadratic equation that describe the speed of Nidhi's car?

(iii) What is the speed of Nidhi's car?

OR

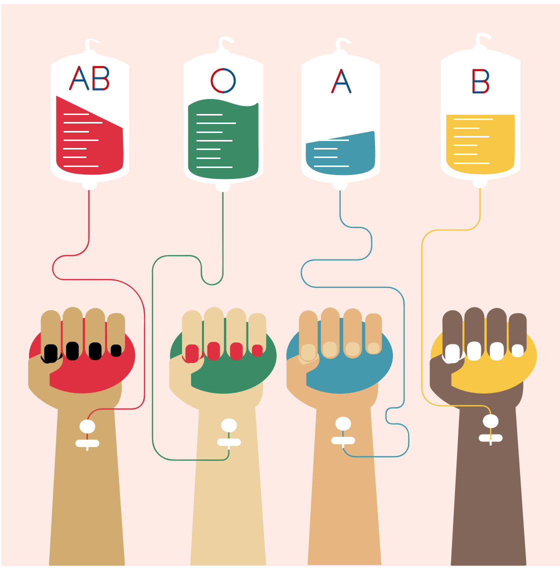
(iv) How much time did Ria take to travel 400 km?

37. Two poles, 30 feet and 50 feet tall, are 40 feet apart and perpendicular to the ground. The poles are supported by wires attached from the top of each pole to the bottom of the other, as in the figure. A coupling is placed at C where the two wires cross.



(i) What is the horizontal distance from C to the taller pole?
(ii) How high above the ground is the coupling ?
(iii) How far down the wire from the smaller pole is the coupling ?

38. Blood Group : Blood type or blood group is a medical term. It describes the type of blood a person has. It is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cells (RBCs). Blood types predict whether a serious reaction will occur in a blood transfusion.



In a sample of 50 people, 21 had type O blood, 22 had type A blood, 5 had type B blood, and 2 had type AB blood. Set up a frequency distribution and find the following probabilities.
(i) What is the probability that a person has type O blood ?
(ii) What is the probability that a person has type A or type B blood ?
(iii) What is the probability that a person has neither type A nor type O blood ?

OR

(iv) What is the probability that a person does not have type AB blood ?

□□□□□□□□

Sample Paper 19

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. The quadratic equation $x^2 - 4x - 3\sqrt{2} = 0$ has

(a) two distinct real roots (b) two equal real roots

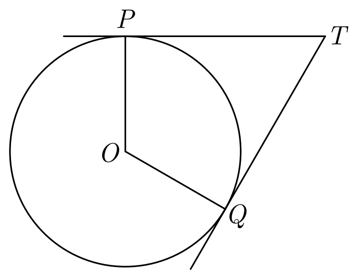
(c) no real roots (d) more than 2 real roots

2. If the square of difference of the zeroes of the quadratic polynomial $x^2 + px + 45$ is equal to 144, then the value of p is

(a) ± 9 (b) ± 12

(c) ± 15 (d) ± 18

3. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110^\circ$, then $\angle PTQ$ is



(a) 60° (b) 70°

(c) 80° (d) 90°

4. The pair of equations $x = a$ and $y = b$ graphically represents lines which are

(a) parallel
(b) intersecting at (b, a)
(c) coincident
(d) intersecting at (a, b)

5. A set of numbers consists of three 4's, five 5's, six 6's, eight 8's and seven 10's. The mode of this set of numbers is

(a) 6
(b) 7
(c) 8
(d) 10

6. If $x^2 + y^2 = 25$, $xy = 12$, then x is

(a) $(3,\ 4)$
(b) $(3, -3)$
(c) $(3, 4, -3, -4)$
(d) $(3, -3)$

7. $\Delta\, ABC$ is an equilateral triangle with each side of length $2p$. If $AD \perp BC$ then the value of AD is

(a) $\sqrt{3}$
(b) $\sqrt{3}\, p$
(c) $2p$
(d) $4p$

8. $\Delta\, ABC$ and $\Delta\, BDE$ are two equilateral triangle such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is ....

(a) 1 : 4
(b) 4 : 1
(c) 1 : 3
(d) 3 : 1

9. From an external point P, tangents PA and PB are drawn to a circle with centre O. If CD is the tangent to the circle at a point E and $PA = 14$ cm. The perimeter of $\Delta\, PCD$ is

(a) 14 cm
(b) 21 cm
(c) 28 cm
(d) 35 cm

10. $(\cos^4 A - \sin^4 A)$ is equal to

(a) $1 - 2\cos^2 A$
(b) $2\sin^2 A - 1$
(c) $\sin^2 A - \cos^2 A$
(d) $2\cos^2 A - 1$

11. An observer, 1.5 m tall is 20.5 away from a tower 22 m high, then the angle of elevation of the top of the tower from the eye of observer is

(a) 30°
(b) 45°
(c) 60°
(d) 90°

12. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45°. The height of a tree is

(a) 10 m
(b) 14 m
(c) 8 m
(d) 15 m

13. From a solid circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base is removed, then the volume of remaining solid is

(a) $280\,\pi\text{cm}^3$ (b) $330\,\pi\text{cm}^3$

(c) $240\,\pi\text{cm}^3$ (d) $440\,\pi\,\text{cm}^3$

14. If median is 137 and mean is 137.05, then the value of mode is

(a) 156.90 (b) 136.90

(c) 186.90 (d) 206.90

15. If a number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then, the probability that $x^2 < 2$ is

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$

(c) $\frac{1}{5}$ (d) $\frac{3}{5}$

16. If the circumference of a circle increases from 4π to 8π, then its area is

(a) halved (b) doubled

(c) tripled (d) quadrupled

17. Which of the following relationship is the correct?

(a) $P(E) + P(\overline{E}) = 1$ (b) $P(\overline{E}) - P(E) = 1$

(c) $P(E) = 1 + P(\overline{E})$ (d) None of these

18. A chord of a circle of radius 10 cm, subtends a right angle at its centre. The length of the chord (in cm) is

(a) $\frac{5}{\sqrt{2}}$ (b) $5\sqrt{2}$

(c) $10\sqrt{2}$ (d) $10\sqrt{3}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP.
Reason : Common difference $d = a_n - a_{n-1}$ is constant or independent of n.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The value of $\sin\theta = \frac{4}{3}$ is not possible.
Reason : Hypotenuse is the largest side in any right angled triangle.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. How many two digits numbers are divisible by 3?

22. From an external point P, tangents PA and PB are drawn to a circle with centre O. If $\angle PAB = 50^{o}$, then find $\angle AOB$.

23. Find the ratio in which the point $(-3, k)$ divides the line segment joining the points $(-5, -4)$ and $(-2, 3)$.Also find the value of k.

24. Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

OR

Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

25. Find the 7^{th} term from the end of AP $7, 10, 13, ... 184$.

OR

The fourth term of an AP is 11. The sum of the fifth and seventh terms of the AP is 34. Find the common difference.

Section - C

Section C consists of 6 questions of 3 marks each.

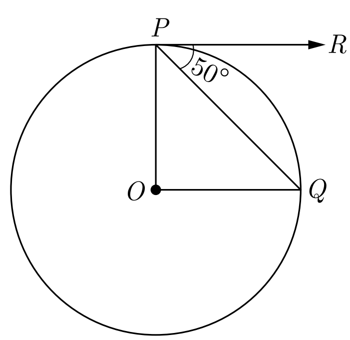
26. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator- Find the fraction.

27. Solve for x : $\frac{1}{x+4} - \frac{1}{x+7} = \frac{11}{30}$ $x \neq -4, \ -7$.

28. Prove that the rectangle circumscribing a circle is a square.

OR

If O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find $\angle POQ$.



29. An electric pole is 10 m high. A steel wire tied to top of the pole is affixed at a point on the ground to keep the pole up right. If the wire makes an angle of 45° with the horizontal through the foot of the pole, find the length of the wire. [Use $\sqrt{2} = 1.414$]

30. From a solid right circular cylinder of height 14 cm and base radius 6 cm, a right circular cone of same height and same base removed. Find the volume of the remaining solid.

OR

A metallic cylinder has radius 3 cm and height 5 cm. To reduce its weights, a conical hole is drilled in the cylinder. The conical hole has a radius of $\frac{3}{2}$ cm and its depth $\frac{8}{9}$ cm. Calculate the ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape.

31. Two dice are tossed simultaneously. Find the probability of getting
(i) an even number on both dice.
(ii) the sum of two numbers more than 9.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find the zeroes of the quadratic polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.

OR

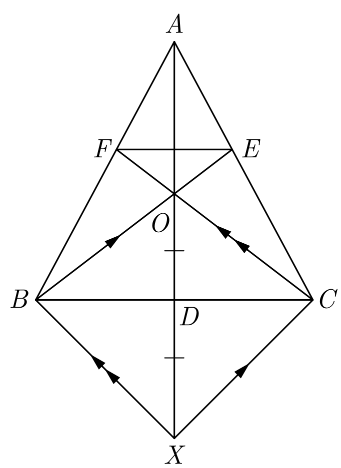
If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, find the values of

(i) $\alpha^2 + \beta^2$ (ii) $\frac{1}{\alpha} + \frac{1}{\beta}$

(iii) $(\alpha - \beta)^2$ (iv) $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$

(v) $\alpha^2 + \beta^2$

33. In ΔABC, AD is a median and O is any point on AD. BO and CO on producing meet AC and AB at E and F respectively. Now AD is produced to X such that $OD = DX$ as shown in figure.
Prove that :
(1) $EF || BC$
(2) $AO : AX = AF : AB$

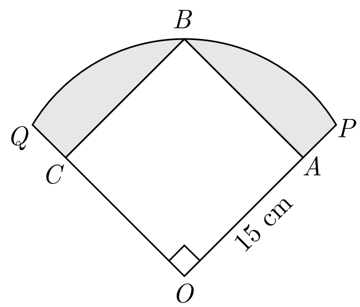


34. If $\sin A = \frac{3}{4}$ calculate $\sec A$.

OR

Evaluate : $4(\sin^4 30^\circ + \cos^4 60^\circ) - 3(\cos^2 45 - \sin^2 90^\circ)$

35. In Figure, a square $OABC$ is inscribed in a quadrant $OPBQ$. If $OA = 15\text{ cm}$, find the area of the shaded region. (Use $\pi = 3.14$).



Section - E

Case study based questions are compulsory.

36. Heart Rate : The heart rate is one of the 'vital signs,' or the important indicators of health in the human body. It measures the number of times per minute that the heart contracts or beats. The speed of the heartbeat varies as a result of physical activity, threats to safety, and emotional responses. The resting heart rate refers to the heart rate when a person is relaxed. While a normal heart rate does not guarantee that a person is free of health problems, it is a useful benchmark for identifying a range of health issues. After the age of 10 years, the heart rate of a person should be between 60 and 100 beats per minute while they are resting.

Thirty women were examined by doctors of AIIMS and the number of heart beats per minute were recorded and summarised as follows.

Number of heart beats per minute	Number of women (f_i)
65-68	2
68-71	4
71-74	3
74-77	8
77-80	7
80-83	4
83-86	2

Continue on next page.....

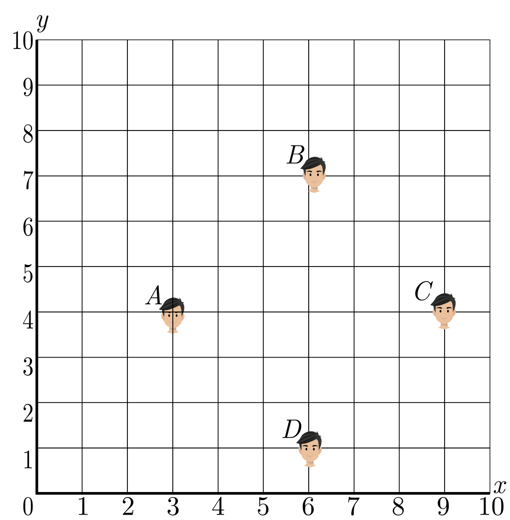
Based on the above information, answer the following questions.
(i) What is the mean heart beats per minute for these women ?
(ii) What is the upper limit of median value of heart beats per minute for these women ?
(iii) What is the lower limit of mode value of heart beats per minute for these women ?

OR

How many women are having heart beat in range 68-77?

37. Morning assembly is an integral part of the school's schedule. Almost all the schools conduct morning assemblies which include prayers, information of latest happenings, inspiring thoughts, speech, national anthem, etc. A good school is always particular about their morning assembly schedule. Morning assembly is important for a child's development. It is essential to understand that morning assembly is not just about standing in long queues and singing prayers or national anthem, but it's something beyond just prayers. All the activities carried out in morning assembly by the school staff and students have a great influence in every point of life. The positive effects of attending school assemblies can be felt throughout life.

Have you noticed that in school assembly you always stand in row and column and this make a coordinate system. Suppose a school have 100 students and they all assemble in prayer in 10 rows as given below.



Here A, B, C and D are four friend Amar, Bharat, Colin and Dravid.
(i) What is the distance between A and B ?
(ii) What is the distance between C and D ?
(iii) What is the distance between A and C ?

OR

What is the distance between D and B ?

Click the Following Button to See the Free MS/Solutions

SOLUTIONS

38. Volume of a Bird Cage. A company makes rectangular shaped bird cages with height b inches and square bottoms. The volume of these cages is given by the function $V = b^3 - 6b^2 + 9b$.

(i) Find an expression for the length of each side of the square bottom.

(ii) Use the function to find the volume of a cage with a height of 18 inches.

(iii) Use the remainder theorem to find the volume of a cage with a height of 15 inches.

□□□□□□□□

Sample Paper 20

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If one of the zeroes of a quadratic polynomial of the form $x^2 + ax + b$ is the negative of the other, then it

(a) has no linear term and the constant term is negative.

(b) has no linear term and the constant term is positive.

(c) can have a linear term but the constant term is negative.

(d) can have a linear term but the constant term is positive.

2. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, then how many tickets has she bought?

(a) 40 (b) 240

(c) 480 (d) 750

3. If a pair of linear equations is consistent, then the lines will be

(a) parallel (b) always coincident

(c) intersecting or coincident (d) always intersecting

4. The sum and product of the zeroes of a quadratic polynomial are 3 and -10 respectively. The quadratic polynomial is

(a) $x^2 - 3x + 10$ (b) $x^2 + 3x - 10$

(c) $x^2 - 3x - 10$ (d) $x^2 + 3x + 10$

5. Value(s) of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is/are

(a) 0 (b) 4

(c) 8 (d) 0, 8

6. The total number of factors of prime number is

(a) 1 (b) 0

(c) 2 (d) 3

7. The 11th term of an AP $-5, \frac{-5}{2}, 0, \frac{5}{2}, ...,$ is

(a) -20 (b) 20

(c) -30 (d) 30

8. If the first term of an AP is -5 and the common difference is 2, then the sum of the first 6 terms is

(a) 0 (b) 5

(c) 6 (d) 15

9. From an external point Q, the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. The radius of circle (in cm) is

(a) 10 (b) 5

(c) 12 (d) 7

10. The value of the polynomial $x^8 - x^5 + x^2 - x + 1$ is

(a) positive for all the real numbers

(b) negative for all the real numbers

(c) 0

(d) depends on value of x

11. If $4\tan\theta = 3$, then $\left(\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}\right)$ is equal to

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$

(c) $\frac{1}{2}$ (d) $\frac{3}{4}$

12. The sum of the areas of two circle, which touch each other externally, is $153\,\pi$. If the sum of their radii is 15, then the ratio of the larger to the smaller radius is

(a) $4:1$ (b) $2:1$

(c) $3:1$ (d) None of these

13. If the mean of the numbers $27 + x$, $31 + x$, $89 + x$ $107 + x, 156 + x$ is 82, then the mean of $130 + x$, $126 + x$, $68 + x$, $50 + x$, and $1 + x$ is

(a) 75 (b) 157

(c) 82 (d) 80

14. If the point $P(k, 0)$ divides the line segment joining the points $A(2, -2)$ and $B(-7, 4)$ in the ratio 1 : 2, then the value of k is

(a) 1 (b) 2

(c) -2 (d) -1

15. Aruna has only ₹ 1 and ₹ 2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is ₹ 75, then the number of ₹ 1 and ₹ 2 coins are, respectively

(a) 35 and 15
(b) 35 and 20
(c) 15 and 35
(d) 25 and 25

16. Ratio of volumes of two cylinders with equal height is

(a) $H:h$
(b) $R:r$
(c) $R^2:r^2$
(d) None of these

17. The point which divides the line segment joining the points $(8,-9)$ and $(2,3)$ in the ratio 1 : 2 internally lies in the

(a) I quadrant
(b) II quadrant
(c) III quadrant
(d) IV quadrant

18. The co-ordinates of the point which is reflection of point $(-3,5)$ in x-axis are

(a) (3, 5)
(b) $(3,-5)$
(c) $(-3,-5)$
(d) $(-3,5)$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** In the $\triangle ABC$, $AB=24$ cm, $BC=10$ cm and $AC=26$ cm, then $\triangle ABC$ is a right angle triangle.
Reason : If in two triangles, their corresponding angles are equal, then the triangles are similar.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** In a circle of radius 6 cm, the angle of a sector 60°. Then the area of the sector is $18\frac{6}{7}$ cm^2.
Reason : Area of the circle with radius r is πr^2.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. In the figure of ΔABC, the points D and E are on the sides CA, CB respectively such that $DE || AB$, $AD=2x, DC=x+3, BE=2x-1$ and $CE=x$. Then, find x.

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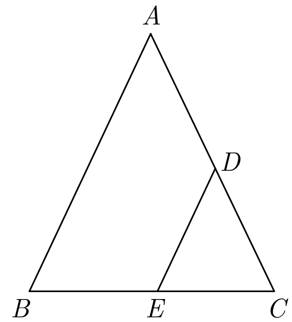
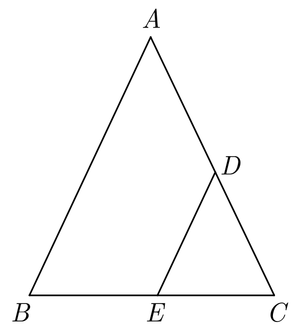
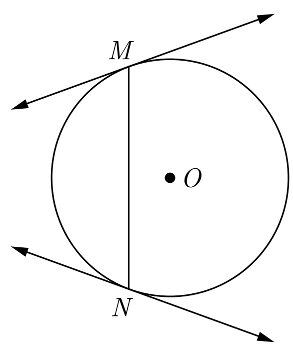


OR

In the figure of ΔABC, $DE || AB$. If $AD = 2x$, $DC = x + 3$, $BE = 2x - 1$ and $CE = x$, then find the value of x.



22. Prove that tangents drawn at the ends of a chord of a circle make equal angles with the chord.



23. Show that : $\dfrac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta)\tan(30^\circ - \theta)} = 1$

24. Find the mean of the following distribution :

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	5	4	1	6	4

OR

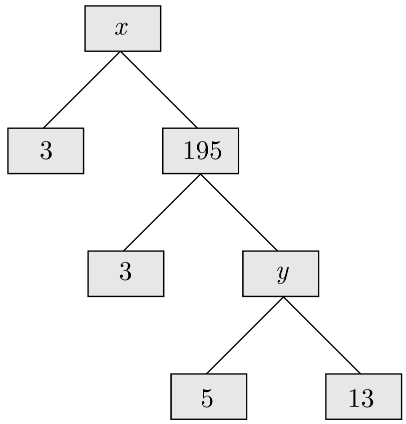
Find the sum of the lower limit of the median class and the upper limit of the modal class :

Classes	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	1	3	5	9	7	3

25. Find the smallest natural number by which 1200 should be multiplied so that the square root of the product is a rational number.

OR

Complete the following factor tree and find the composite number x.



Section - C

Section C consists of 6 questions of 3 marks each.

26. The 17^{th} term of an AP is 5 more than twice its 8^{th} term. If 11^{th} term of AP is 43, then find its n^{th} term.

27. Prove that : $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = 0$

28. In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find the area of sector formed by the arc.

OR

A road which is 7 m wide surrounds a circular park whose circumference is 88 m. Find the area of the road.

29. The weekly expenditure of 500 families is tabulated below :

Weekly Expenditure(Rs.)	Number of families
0-1000	150
1000-2000	200
2000-3000	75
3000-4000	60
4000-5000	15

Find the median expenditure.

30. The co-ordinates of the vertices of ΔABC are $A(7,2)$, $B(9,10)$ and $C(1,4)$. If E and F are the mid-points of AB and AC respectively, prove that $EF = \frac{1}{2}BC$.

OR

Find the ratio in which the line $2x + 3y - 5 = 0$ divides the line segment joining the points $(8, -9)$ and $(2,1)$. Also find the co-ordinates of the point of division.

31. The length, breadth and height of a room are 8 m 50 cm, 6 m 25 cm and 4 m 75 cm respectively. Find the length of the longest rod that can measure the dimensions of the room exactly.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Solve graphically the pair of linear equations :
$3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$
Find the co-ordinates of the vertices of the triangular region formed by these lines and $x-$axis. Also, calculate the area of this triangle.

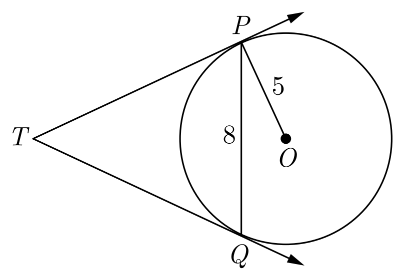
OR

Solve the following pair of equations graphically:

$$2x + 3y = 12,\ x - y - 1 = 0.$$

Shade the region between the two lines represented by the above equations and the X-axis.

33. In Figure, PQ is a chord of length 8 cm of a circle of radius 5 cm and centre O. The tangents at P and Q intersect at point T. Find the length of TP.



34. Two poles of equal heights are standing opposite to each other on either side of the road which is 80 m wide. From a point P between them on the road, the angle of elevation of the top of a pole is 60° and the angle of depression from the top of the other pole of point P is 30°. Find the heights of the poles and the distance of the point P from the poles.

OR

Two post are k metre apart and the height of one is double that of the other. If from the mid-point of the line segment joining their feet, an observer finds the angles of elevation of their tops to be complementary, then find the height of the shorted post.

35. A toy is in the form of a cylinder of diameter $2\sqrt{2}$ m and height 3.5 m surmounted by a cone whose vertical angle is 90°. Find total surface area of the toy.

Section - E

Case study based questions are compulsory.

36. Optimal Pricing Strategy : The director of the National School of Drama must decide what to charge for a ticket to the comedy drama. If the price is set too low, the theatre will lose money; and if the price is too high, people won't come. From past experience she estimates that the profit P from sales (in hundreds) can be approximated by $P(x) = -x^2 + 22x - 40$ where x is the cost of a ticket and $0 \leq x \leq 25$ hundred rupees.

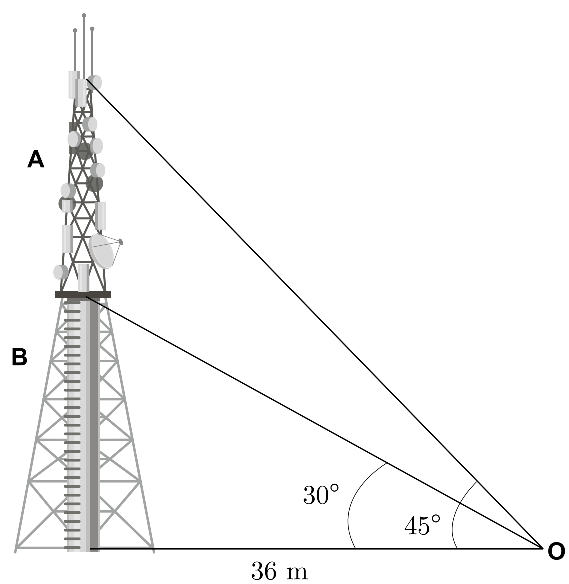
Continue on next page.....

(i) What is the lowest and highest cost of a ticket that would allow the theatre to break even?
(ii) If theatre charge Rs 4 hundred for each ticket, what is the profit/loss ?

OR

If theatre charge Rs 25 hundred for each ticket, what is the profit/loss ?
(iii) What is the maximum profit which can be earned by theatre ?

37. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure, including microwave dishes. They are among the tallest human-made structures. There are 2 main types: guyed and self-supporting structures.
On a similar concept, a radio station tower was built in two sections A and B. Tower is supported by wires from a point O. Distance between the base of the tower and point O is 36 m. From point O, the angle of elevation of the top of section B is 30° and the angle of elevation of the top of section A is 45°.



(i) What is the height of the section B ?
(ii) What is the height of the section A ?
(iii) What is the length of the wire structure from the point O to the top of section A ?

OR

What is the length of the wire structure from the point O to the top of section B ?

38. Hospital Stays : Hospital records indicated that maternity patients stayed in the hospital for the number of days shown in the distribution.

Number of days stayed	Frequency
3	13
4	22
5	45
6	14
7	6
	100

Find these probabilities.
(i) A patient stayed exactly 5 days.
(ii) A patient stayed less than 6 days.
(iii) A patient stayed at most 4 days.

OR

(iv) A patient stayed at least 5 days.

□□□□□□□

Sample Paper 21

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If $\sin\theta - \cos\theta = 0$, then the value of $(\sin^4\theta + \cos^4\theta)$ is

(a) 1

(b) $\frac{3}{4}$

(c) $\frac{1}{2}$

(d) $\frac{1}{4}$

2. Lowest value of $x^2 + 4x + 2$ is

(a) 0

(b) -2

(c) 2

(d) 4

3. The equation $2x^2 + 2(p+1)x + p = 0$, where p is real, always has roots that are

(a) Equal

(b) Equal in magnitude but opposite in sign

(c) Irrational

(d) Real

4. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is

(a) 6 cm

(b) 12 cm

(c) 18 cm

(d) 9 cm

5. The sum of first 16 terms of the AP 10, 6, 2, ... is

(a) -320

(b) 320

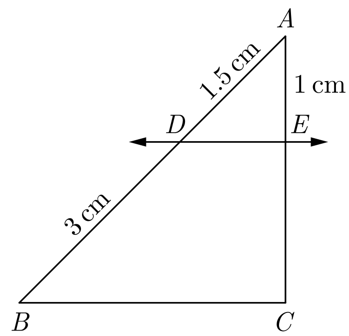
(c) -352

(d) -400

6. Which of the following statement is false?

(a) All isosceles triangles are similar.
(b) All quadrilateral are similar.
(c) All circles are similar.
(d) None of the above

7. In the given figure, $DE \parallel BC$. The value of EC is



(a) 1.5 cm
(b) 3 cm
(c) 2 cm
(d) 1 cm

8. A race track is in the form of a ring whose inner and outer circumference are 437 m and 503 m respectively. The area of the track is

(a) 66 sq. cm.
(b) 4935 sq. cm.
(c) 9870 sq. cm
(d) None of these

9. If a regular hexagon is inscribed in a circle of radius r, then its perimeter is

(a) $3r$
(b) $6r$
(c) $9r$
(d) $12r$

10. If a letter is chosen at random from the letter of English alphabet, then the probability that it is a letter of the word DELHI is

(a) $\frac{1}{5}$
(b) $\frac{1}{26}$
(c) $\frac{5}{26}$
(d) $\frac{21}{26}$

11. If $x = p\sec\theta$ and $y = q\tan\theta$, then

(a) $x^2 - y^2 = p^2 q^2$
(b) $x^2 q^2 - y^2 p^2 = pq$
(c) $x^2 q^2 - y^2 p^2 = \frac{1}{p^2 q^2}$
(d) $x^2 q^2 - y^2 p^2 = p^2 q^2$

12. The pair of equations $y = 0$ and $y = -7$ has

(a) one solution
(b) two solutions
(c) infinitely many solutions
(d) no solution

13. The length of a string between a kite and a point on the ground is 85 m. If the string makes an angle θ with level ground such that $\tan\theta = \frac{15}{8}$, then the height of kite is

(a) 75 m
(b) 78.05 m
(c) 226 m
(d) None of these

14. If the angle of depression of an object from a 75 m high tower is 30°, then the distance of the object from the tower is

(a) $25\sqrt{3}$ m
(b) $50\sqrt{3}$ m
(c) $75\sqrt{3}$ m
(d) 150 m

15. Ratio of volumes of two cones with same radii is

(a) $h_1 : h_2$
(b) $s_1 : s_2$
(c) $r_1 : r_2$
(d) None of these

16. The median of a set of 9 distinct observations is 20.5. If each of the largest 4 observation of the set is increased by 2, then the median of the new set

(a) Is increased by 2
(b) Is decreased by 2
(c) Is two times the original median
(d) Remains the same as that of the original set

17. Mode of the following grouped frequency distribution is

Class	**Frequency**
3-6	2
6-9	5
9-12	10
12-15	23
15-18	21
18-21	12
21-24	03

(a) 13.6
(b) 15.6
(c) 14.6
(d) 16.6

18. A fair die is thrown once. The probability of getting a composite number less than 5 is

(a) $\frac{1}{3}$
(b) $\frac{1}{6}$
(c) $\frac{2}{3}$
(d) 0

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm\frac{8}{3}$.

Reason : The equation $ax^2 + bx + c = 0$ has equal roots if $D = b^2 - 4ac = 0$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.
Reason : $(\text{hypotenuse})^2 = (\text{base})^2 + (\text{height})^2$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. If the sum of first m terms of an AP is the same as the sum of its first n terms, show that the sum of its first $(m+n)$ terms is zero.

22. A circle is inscribed in a ΔABC touching AB, BC and AC at P, Q and R respectively. If $AB = 10\text{ cm}$ $AR = 7\text{ cm}$ and $CR = 5\text{ cm}$, then find the length of BC

23. Find a relation between x and y such that the point $P(x,y)$ is equidistant from the points $A(-5,3)$ and $B(7,2)$.

24. Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.

OR

Show that $5\sqrt{6}$ is an irrational number.

25. Is 184 a term of the sequence $3, 7, 11, ...$?

OR

The ninth term of an AP is -32 and the sum of its eleventh and thirteenth term is -94. Find the common difference of the AP

Section - C

Section C consists of 6 questions of 3 marks each.

26. Solve graphically :

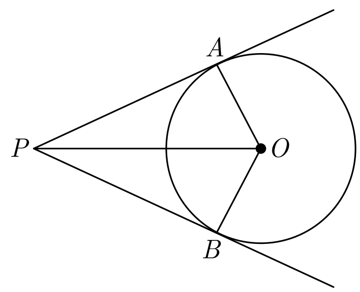
$2x - 3y + 13 = 0;\ 3x - 2y + 12 = 0$

27. Solve the following equation: $\frac{1}{x} - \frac{1}{x-2} = 3,\ x \neq 0,\ 2$

28. If tangents PA and PB drawn from an external point P to a circle with centre O are inclined to each other at an angle of 80°, then find $\angle POA$.

OR

In the given figure, OP is equal to the diameter of a circle with centre O and PA and PB are tangents. Prove that ABP is an equilateral triangle.



29. The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of a tower from the foot of the building is 60°. If the tower is 50 m high, then find the height of the building.

30. From a solid cylinder whose height is 15 cm and the diameter is 16 cm, a conical cavity of the same height and same diameter is hollowed out, Find the total surface area of remaining solid. (Given your answer in terms of π).

OR

A solid right-circular cone of height 60 cm and radius 30 cm is dropped in a right-circular cylinder full of water of height 180 cm and radius 60 cm. Find the volume of water left in the cylinder in cubic metre. Use $\pi = \frac{22}{7}$.

31. An integer is chosen between 70 and 100. Find the probability that it is
(i) a prime number (ii) divisible by 7

Section - D

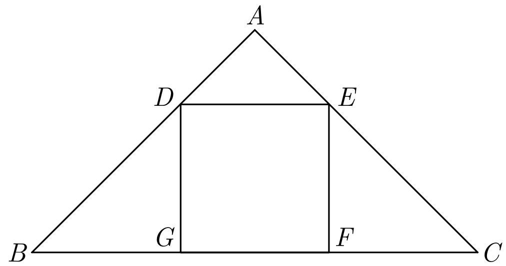
Section D consists of 4 questions of 5 marks each.

32. Polynomial $x^4 + 7x^3 + 7x^2 + px + q$ is exactly divisible by $x^2 + 7x + 12$, then find the value of p and q.

OR

If α and β are the zeroes of polynomial $p(x) = 3x^2 + 2x + 1$, find the polynomial whose zeroes are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$.

33. In the given figure, $DEFG$ is a square and $\angle BAC = 90^\circ$. Show that $FG^2 = BG \times FC$.



34. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

OR

Evaluate :
$\tan^2 30^\circ \sin 30^\circ + \cos 60^\circ \sin^2 90^\circ \tan^2 60^\circ - 2\tan 45^\circ \cos^2 0^\circ \sin 90^\circ$

35. Four equal circles are described at the four corners of a square so that each touches two of the others. The shaded area enclosed between the circle is $\frac{24}{7}$ cm^2. Find the radius of each circle.

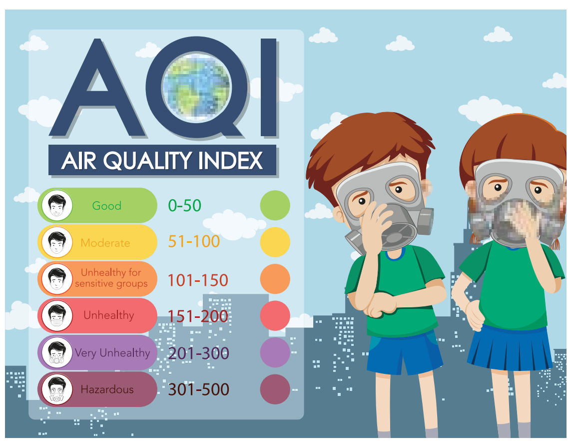
Section - E

Case study based questions are compulsory.

36. Air Quality Iindex : AQI is an index for reporting air quality on a daily basis. The purpose of the AQI is to help people know how the local air quality impacts their health. The Environmental Protection Agency (EPA) calculates the AQI for five major air pollutants :

1. Ground-level ozone
2. Particle pollution/particulate matter (PM2.5/pm 10)
3. Carbon Monoxide
4. Sulfur dioxide
5. Nitrogen dioxide

The higher the AQI value, the greater the level of air pollution and the greater the health concerns.



Following frequency distribution shows the Air Quality Index of different localities of Delhi on 27th December 2020 reported by Times of India Newspaper on 28th December 2020.

AIQ	Number of weeks f
270-280	4
280-290	10
290-300	14
300-310	20
310-320	24
320-330	8
Total	80

Continue on next page.....

Based on the above information, answer the following questions.

(i) Estimate the mean AQI.

(ii) In which class does the median of distribution lie ?

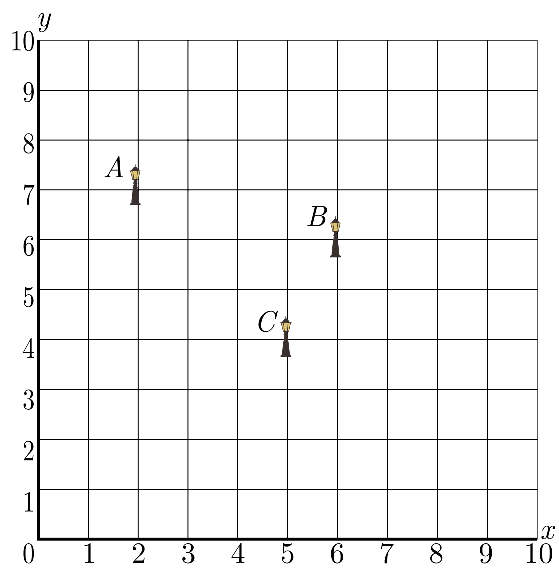
(iii) In which class does the mode of distribution lie ?

OR

What is the median AQI?

37. Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles A, B and C in a society's common park. Despite these three poles, some parts of the park are still in dark. So, RWA decides to have one more electric pole D in the park.

The park can be modelled as a coordinate systems given below.



On the basis of the above information, answer any four of the following questions:

(i) What is the position of the pole C?

(ii) What is the distance of the pole B from the corner O of the park ?

(iii) Find the position of the fourth pole D so that four points A, B C and D form a parallelogram .

OR

What is the distance between poles A and C ?

38. Box : For the box to satisfy certain requirements, its length must be three unit greater than the width, and its height must be two unit less than the width.

(i) If width is taken as x, find the polynomial that represent volume of box.
(ii) Find the polynomial that represent the area of paper sheet used to make box.
(iii) If it must have a volume of 18 unit, what must be its length and height ?

OR

If box is made of a paper sheet which cost is Rs 100 per square unit, what is the cost of paper?

□□□□□□□

Sample Paper 22

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. The HCF and the LCM of 12, 21, 15 respectively are

(a) 3, 140 (b) 12, 420

(c) 3, 420 (d) 420, 3

2. If the mean of a, b, c is M and $ab + bc + ca = 0$, the mean of a^2, b^2 and c^2 is KM^2, then K is equal to

(a) 3 (b) 9

(c) 6 (d) 4

3. The 2 digit number which becomes $\frac{5}{6}$th of itself when its digits are reversed. The difference in the digits of the number being 1, then the two digits number is

(a) 45 (b) 54

(c) 36 (d) None of these

4. Each root of $x^2 - bx + c = 0$ is decreased by 2. The resulting equation is $x^2 - 2x + 1 = 0$, then

(a) $b = 6, c = 9$ (b) $b = 3, c = 5$

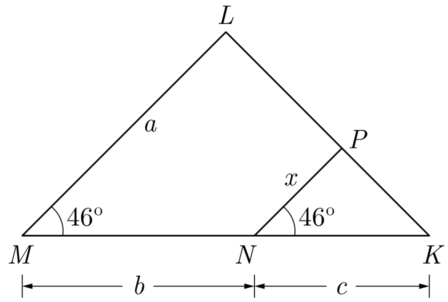
(c) $b = 2, c = -1$ (d) $b = -4, c = 3$

5. If the nth term of an AP is given by $a_n = 5n - 3$, then the sum of first 10 terms if

(a) 225 (b) 245

(c) 255 (d) 270

6. In the given figure, x is



(a) $\frac{ab}{a+b}$ (b) $\frac{ac}{b+c}$

(c) $\frac{bc}{b+c}$ (d) $\frac{ac}{a+c}$

7. If the perimeter of one face of a cube is 20 cm, then its surface area is

(a) 120 cm^2 (b) 150 cm^2

(c) 125 cm^2 (d) 400 cm^2

8. From an external point Q, the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. The radius of circle (in cm) is

(a) 10 (b) 5

(c) 12 (d) 7

9. The length of a string between a kite and a point on the ground is 85 m. If the string makes an angle θ with level ground such that $\tan\theta = \frac{15}{8}$, then the height of kite is

(a) 75 m (b) 78.05 m

(c) 226 m (d) None of these

10. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45°. Find the height of a tree.

(a) 15 m (b) 10 m

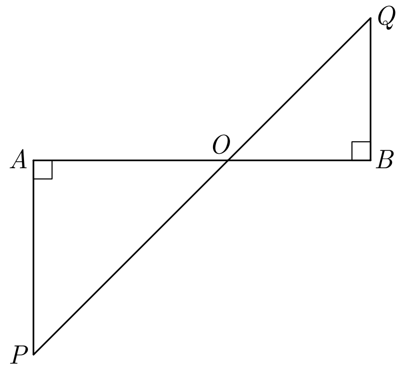
(c) 7.5 m (d) 12 m

11. If the sum of the circumferences of two circles with radii R_1 and R_2 is equal to the circumference of a circle of radius R, then

(a) $R_1 + R_2 = R$ (b) $R_1 + R_2 > R$

(c) $R_1 + R_2 > R$ (d) $R_1 + R_2 < R$

12. In the given figure, if $\angle A = 90^0, \angle B = 90^0$, $OB = 4.5\text{cm}$ $OA = 6$ cm and $AP = 4$ cm then find QB.



(a) 3 cm (b) 6 cm
(c) 4.5 cm (d) 3.5 cm

13. Twelve solid spheres of the same size are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. The diameter of each sphere is
(a) 4 cm (b) 3 cm
(c) 2 cm (d) 6 cm

14. Consider the following frequency distribution

Class	0-5	6-11	12-17	18-23	24-29
Frequency	13	10	15	8	11

The upper limit of the median class is
(a) 17 (b) 17.5
(c) 18 (d) 18.5

15. The probability that a number selected at random from the numbers 1, 2, 3, ..., 15 is a multiple of 4 is
(a) $\frac{4}{15}$ (b) $\frac{2}{15}$
(c) $\frac{1}{15}$ (d) $\frac{1}{5}$

16. One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is
(a) $\frac{1}{5}$ (b) $\frac{3}{5}$
(c) $\frac{4}{5}$ (d) $\frac{1}{3}$

17. The zeroes of the quadratic polynomial $x^2 + kx + k$ where $k \neq 0$,
(a) cannot both be positive
(b) cannot both be negative
(c) are always unequal
(d) are always equal

18. If the point P (6, 2) divides the line segment joining $A(6,5)$ and $B(4,y)$ in the ratio $3:1$ then the value of y is

(a) 4 (b) 3

(c) 2 (d) 1

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $x^3 + x$ has only one real zero.
Reason : A polynomial of nth degree must have n real zeroes.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The value of $\sec^2 10^\circ - \cot^2 80^\circ$ is 1.
Reason : The value of $\sin 30^\circ = \frac{1}{2}$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

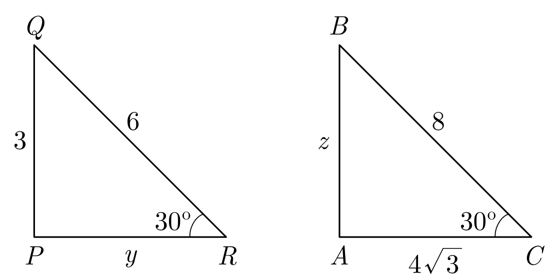
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

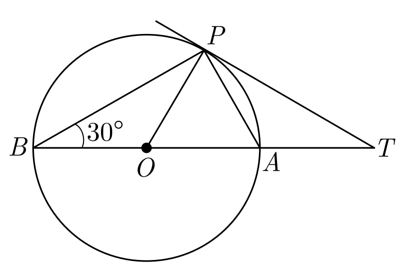
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the given figure, $\Delta ABC \sim \Delta PQR$. Find the value of $y + z$.



22. In the given figure, BOA is a diameter of a circle and the tangent at a point P meets BA when produced at T. If $\angle PBO = 30^0$, what is the measure of $\angle PTA$?



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23. If $\tan 2A = \cot(A - 18^\circ)$, where $2A$ is an acute angle, find the value of A.

24. A bag contains 5 red, 8 green and 7 white balls. One ball is drawn at random from the bag, find the probability of getting :
(i) not a white ball,
(ii) neither a green nor a red ball.

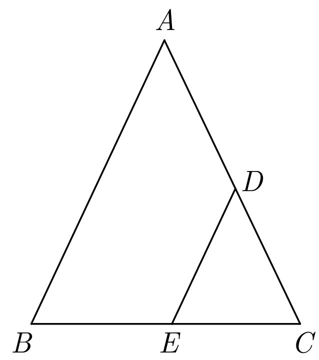
OR

Two coins are tossed together. Find the probability of getting both heads or both tails.

25. In $\Delta ABC, AD \perp BC$, such that $AD^2 = BD \times CD$. Prove that ΔABC is right angled at A.

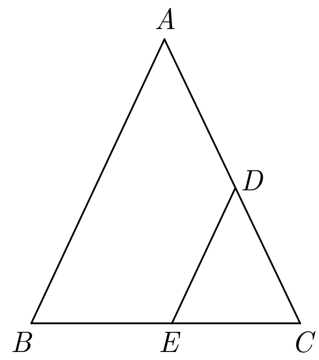
OR

In the figure of ΔABC, the points D and E are on the sides CA, CB respectively such that $DE || AB$, $AD = 2x, DC = x + 3, BE = 2x - 1$ and $CE = x$. Then, find x.



OR

In the figure of ΔABC, $DE || AB$. If $AD = 2x$, $DC = x + 3, BE = 2x - 1$ and $CE = x$, then find the value of x.



Section - C

Section C consists of 6 questions of 3 marks each.

26. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

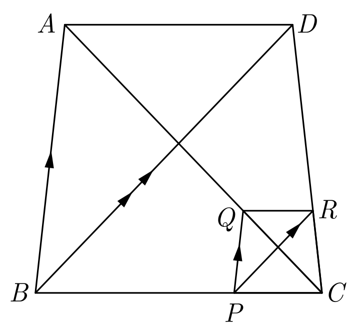
27. Solve the following pair of linear equations :

$$8x + 5y = 9$$
$$3x + 2y = 4$$

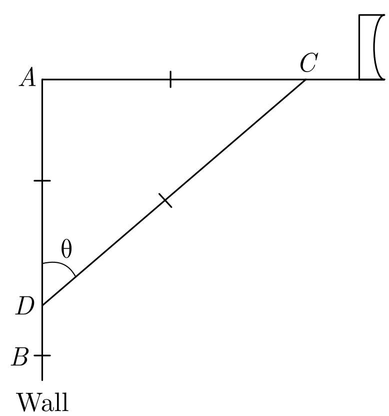
28. Two right triangles ABC and DBC are drawn on the same hypotenuse BC and on the same side of BC. If AC and BD intersect at P, prove that $AP \times PC = BP \times DP$.

OR

In the given figure, two triangles ABC and DBC lie on the same side of BC such that $PQ \,||\, BA$ and $PR \,||\, BD$. Prove that $QR \,||\, AD$.



29. The rod of TV disc antenna is fixed at right angles to wall AB and a rod CD is supporting the disc as shown in Figure. If $AC = 1.5$ m long and $CD = 3$ m, find (i) $\tan\theta$ (ii) $\sec\theta + \operatorname{cosec}\theta$.



30. A vessel is in the form of a hemispherical bowl surmounted by a hollow cylinder of same diameter. The diameter of the hemispherical bowl is 14 cm and the total height of the vessel is 13 cm. Find the total surface area of the vessel. Use $\pi = \frac{22}{7}$

OR

A sphere of diameter 12 cm, is dropped in a right circular cylindrical vessel, partly filled with water. If the sphere is completely submerged in water, the water level into the cylindrical vessel rises by $3\frac{5}{9}$ cm. Find the diameter of the cylindrical vessel.

31. The $\frac{3}{4}$th part of a conical vessel of internal radius 5 cm and height 24 cm is full of water. The water emptied into a cylindrical vessel with internal radius 10 cm. Find the height of water in cylindrical vessel.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Solve for x : $\left(\frac{2x}{x-5}\right)^2+\left(\frac{2x}{x-5}\right)-24=0, x\neq 5$

OR

Solve for x : $\frac{x+3}{x-2}-\frac{1-x}{x}=\frac{17}{4};\ \ x\neq 0,\ 2$

33. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O, is 60°, then find the length of OP.

34. The median of the following data is 525. Find the values of x and y, if total frequency is 100 :

Class	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency	2	5	x	12	17	20	x	9	7	4

OR

On annual day of a school, 400 students participated in the function. Frequency distribution showing their ages is as shown in the following table :

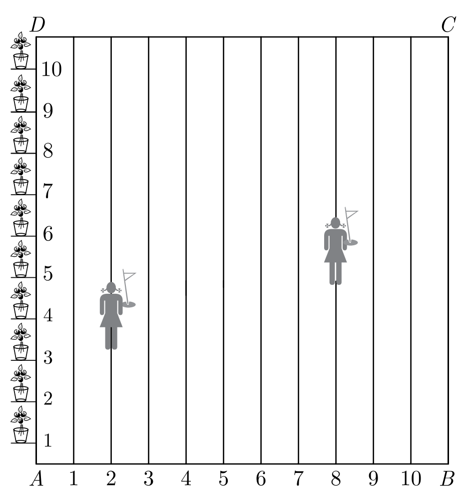
Ages (in years)	05-07	07-09	09-11	11-13	13-15	15-17	17-19
Number of students	70	120	32	100	45	28	5

Find mean and median of the above data.

35. To conduct Sports Day activities, in your rectangular school ground $ABCD$, lines have been drawn with chalk powder at a distance of 1 m each. 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in Figure. Niharika runs ¼th the distance AD on the 2nd line and posts a green flag. Preet runs $\frac{1}{5}$th distance AD on the eighth line and posts a red flag.

(i) What is the distance between the two flags?

(ii) If Rashmi has to post a blue flag exactly half way between the line segment joining the two flags, where should she post the blue flag?



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Section - E

Case study based questions are compulsory.

36. Box : For the box to satisfy certain requirements, its length must be three unit greater than the width, and its height must be two unit less than the width.

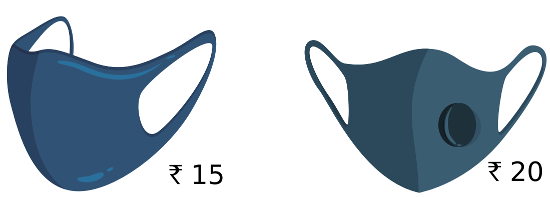
(i) If width is taken as x, find the polynomial that represent volume of box.
(ii) Find the polynomial that represent the area of paper sheet used to make box.
(iii) If it must have a volume of 18 unit, what must be its length and height ?

OR

(iv) If box is made of a paper sheet which cost is Rs 100 per square unit, what is the cost of paper?

37. MASK : Masks are an additional step to help prevent people from getting and spreading COVID-19. They provide a barrier that keeps respiratory droplets from spreading. Wear a mask and take every day preventive actions in public settings.

Due to ongoing Corona virus outbreak, Wellness Medical store has started selling masks of decent quality. The store is selling two types of masks currently type A and type B.



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The cost of type A mask is Rs. 15 and of type B mask is Rs. 20. In the month of April, 2020, the store sold 100 masks for total sales of Rs. 1650.

(i) How many masks of each type were sold in the month of April? If the store had sold 50 masks of each type, what would be its sales in the month of April?

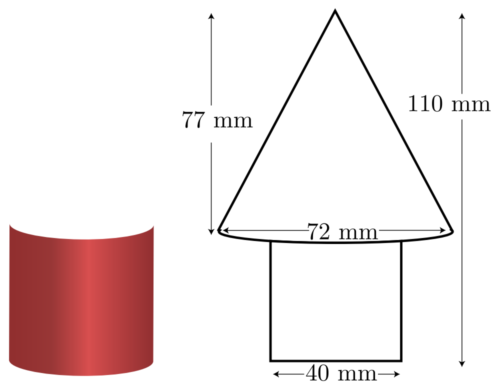
(ii) Due to great demand and short supply, the store has increased the price of each type by Rs. 5 from May 1, 2020. In the month of May, 2020, the store sold 310 masks for total sales of Rs. 6875. How many masks of each type were sold in the month of May?

(iii) What percent of masks of each type sale was increased in the month of May, compared with the sale of month April?

OR

(v) What extra profit did store earn by increasing price in May month.

38. In a toys manufacturing company, wooden parts are assembled and painted to prepare a toy. For the wood processing activity center, the wood is taken out of storage to be sawed, after which it undergoes rough polishing, then is cut, drilled and has holes punched in it. It is then fine polished using sandpaper. For the retail packaging and delivery activity center, the polished wood sub-parts are assembled together, then decorated using paint.



One specific toy is in the shape of a cone mounted on a cylinder. The total height of the toy is 110 mm and the height of its conical part is 77 mm. The diameters of the base of the conical part is 72 mm and that of the cylindrical part is 40 mm.

(i) If its cylindrical part is to be painted red, what is the surface area need to be painted ?

(ii) If its conical part is to be painted blue, what is the surface area need to be painted ?

(iii) How much of the wood have been used in making the toy ?

OR

(iv) If the cost of painting the toy is 2 paise for $8\pi \text{ mm}^2$, then what is the cost of painting of a box of 100 toys?

□□□□□□□

Sample Paper 23

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

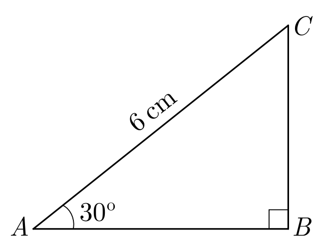
General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. In the adjoining figure, the length of BC is



(a) $2\sqrt{3}$ cm (b) $3\sqrt{3}$ cm

(c) $4\sqrt{3}$ cm (d) 3 cm

2. If the sum of the zeroes of the polynomial $f(x) = 2x^3 - 3kx^2 + 4x - 5$ is 6, then the value of k is

(a) 2 (b) -2

(c) 4 (d) -4

3. For what value of k, do the equations $3x - y + 8 = 0$ and $6x - ky = -16$ represent coincident lines ?

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$

(c) 2 (d) -2

4. If the height and length of the shadow of a man are equal, then the angle of elevation of the sun is,

(a) 45° (b) 60°

(c) 90° (d) 120°

5. The condition for one root of the quadratic equation $ax^2+bx+c=0$ to be twice the other, is

(a) $b^2=4ac$ (b) $2b^2=9ac$

(c) $c^2=4a+b^2$ (d) $c^2=9a-b^2$

6. The quadratic equation $x^2+4x-3\sqrt{2}=0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

7. If in a lottery, there are 5 prizes and 20 blanks, then the probability of getting a prize is

(a) $\frac{2}{5}$ (b) $\frac{4}{5}$

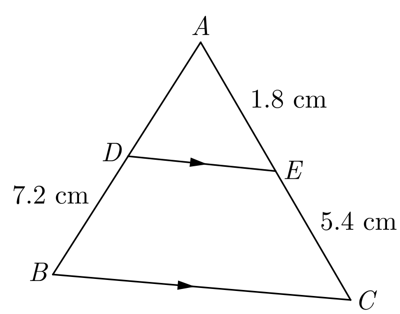
(c) $\frac{1}{5}$ (d) 1

8. In an AP, if $a=1$, $a_n=20$ and $S_n=399$, then n is equal to

(a) 19 (b) 21

(c) 38 (d) 42

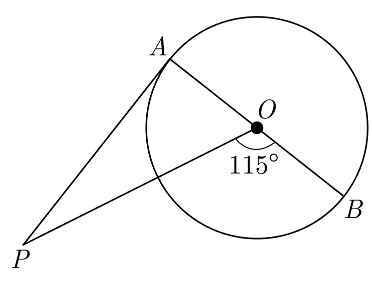
9. In Figure, $DE\,||\,BC$. Find the length of side AD, given that $AE=1.8$ cm, $BD=7.2$ cm and $CE=5.4$ cm.



(a) 2.4 cm (b) 2.2 cm

(c) 3.2 cm (d) 3.4 cm

10. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB=115^\circ$, then perimeter of $\angle APO$ is



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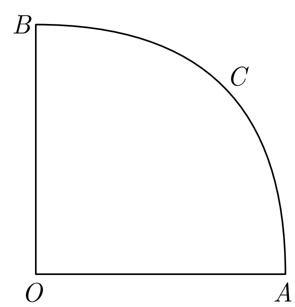
(a) 25° (b) 20°
(c) 30° (d) 65°

11. QP is a tangent to a circle with centre O at a point P on the circle. If $\Delta\, OPQ$ is isosceles, then $\angle OQR$ equals.
(a) 30° (b) 45°
(c) 60° (d) 90°

12. If $b\tan\theta = a$, the value of $\dfrac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}$ is
(a) $\dfrac{a-b}{a^2+b^2}$ (b) $\dfrac{a+b}{a^2+b^2}$
(c) $\dfrac{a^2+b^2}{a^2-b^2}$ (d) $\dfrac{a^2-b^2}{a^2+b^2}$

13. The top of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, then the length of the wire is
(a) 12 m (b) 10 m
(c) 8 m (d) 6 m

14. In the given figure, $OACB$ is a quadrant of a circle of radius 7 cm. The perimeter of the quadrant is



(a) 11 cm (b) 18 cm
(c) 25 cm (d) 36 cm

15. If the coordinates of the point of intersection of less than ogive and more than ogive is (13.5,20), then the value of median is
(a) 13.5 (b) 20
(c) 33.5 (d) 7.5

16. Two circles of radii 20 cm and 37 cm intersect in A and B. If O_1 and O_2 are their centres and $AB = 24$ cm, then the distance O_1O_2 is equal to
(a) 44 cm (b) 51 cm
(c) 40.5 cm (d) 45 cm

17. While computing the mean of grouped data, we assume that the frequencies are
(a) evenly distributed over all the classes
(b) centred at the class marks of the classes
(c) centred at the upper limits of the classes
(d) centred at the lower limits of the classes

18. The probability that a two digit number selected at random will be a multiple of 3 and not a multiple of 5 is
(a) $\frac{2}{15}$
(b) $\frac{4}{15}$
(c) $\frac{1}{15}$
(d) $\frac{4}{90}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** ABC and DEF are two similar triangles such that $BC = 4\text{ cm}$, $EF = 5\text{ cm}$ and area of $\Delta ABC = 64\text{ cm}^2$, then area of $\Delta DEF = 100\text{ cm}^2$.
Reason : The areas of two similar triangles are in the ratio of the squares of the corresponding altitudes.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** Total surface area of the cylinder having radius of the base 14 cm and height 30 cm is 3872 cm^2.
Reason : If r be the radius and h be the height of the cylinder, then total surface area $= (2\pi rh + 2\pi r^2)$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

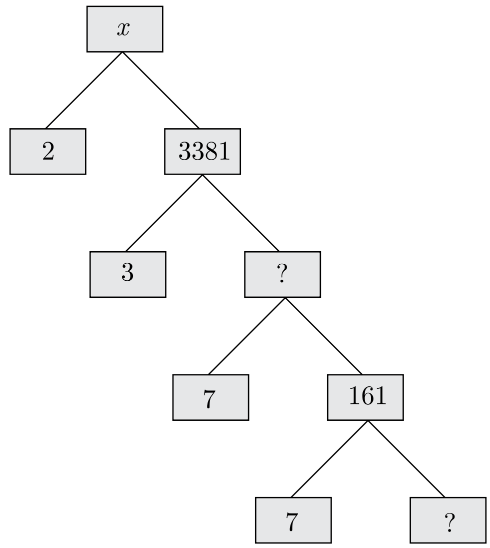
21. How many terms of AP 3, 5, 7, 9, ... must be taken to get the sum 120?

22. Prove that in two concentric circles, the chord of the larger circle, which touches the smaller circle is bisected at the point of contact.

23. The x-coordinate of a point P is twice its y-coordinate. If P is equidistant from $Q(2, -5)$ and $R(-3, 6)$, find the co-ordinates of P.

Continue on next page.....

24. Complete the following factor tree and find the composite number x.



OR

Show that 571 is a prime number.

25. Find, 100 is a term of the AP $25, 28, 31, ...$ or not.

OR

The seventeenth term of an AP exceeds its 10^{th} term by 7. Find the common difference.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Solve graphically : $2x + 3y = 2,\ x - 2y = 8$

27. Solve for x : $\frac{1}{x} + \frac{2}{2x-3} = \frac{1}{x-2}, x \neq 0,\ \frac{2}{3},\ 2.$

28. An isosceles triangle ABC, with $AB = AC$, circumscribes a circle, touching BC at P, AC at Q and AB at R. Prove that the contact point P bisects BC.

OR

From a point P, which is at a distant of 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR are drawn to the circle, then the area of the quadrilateral $PQOR$ (in cm^2).

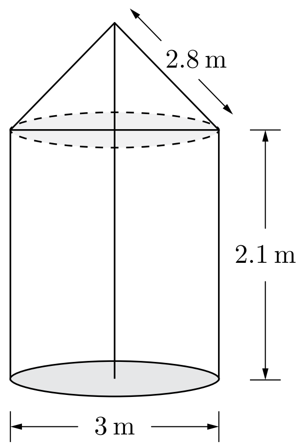
29. The top of two poles of height 16 m and 10 m are connected by a length l meter. If wire makes an angle of 30° with the horizontal, then find l.

30. A solid is in the shape of a cone mounted on a hemisphere of same base radius. If the curved surface areas of the hemispherical part and the conical part are equal, then find the ratio of the radius and the height of the conical part.

Continue on next page.....

OR

A tent is in the shape of cylinder surmounted by a conical top of same diameter. If the height and diameter of cylindrical part are 2.1 m and 3 m respectively and the slant height of conical part is 2.8 m, find the cost of canvas needed to make the tent if the canvas is available at the rate of Rs.500 per square meter. Use $\pi = \frac{22}{7}$.



31. Find the probability that 5 Sundays occur in the month of November of a randomly selected year.

Section - D

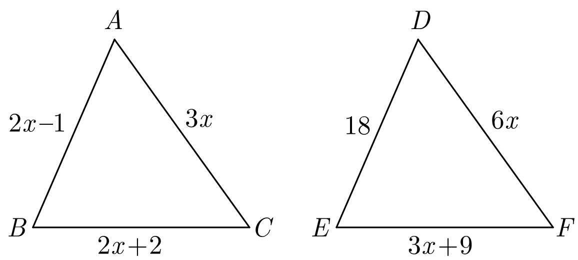
Section D consists of 4 questions of 5 marks each.

32. If α and β are the zeroes of the polynomial $p(x) = 2x^2 + 5x + k$ satisfying the relation, $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of k.

OR

If β and $\frac{1}{\beta}$ are zeroes of the polynomial $(a^2 + a)x^2 + 61x + 6a$. Find the value of β and α.

33. In Figure, if $\Delta ABC \sim \Delta DEF$ and their sides of lengths (in cm) are marked along them, then find the lengths of sides of each triangle.



34. If $\sec\theta = x + \frac{1}{4x}, x \neq 0$ find $(\sec\theta + \tan\theta)$.

OR

Evaluate :

$$\sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin 90^\circ - 2\cos^2 90^\circ + \frac{1}{24}$$

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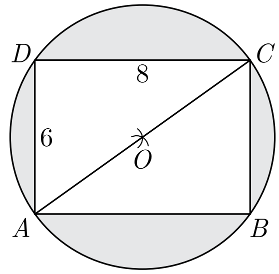
SOLUTIONS

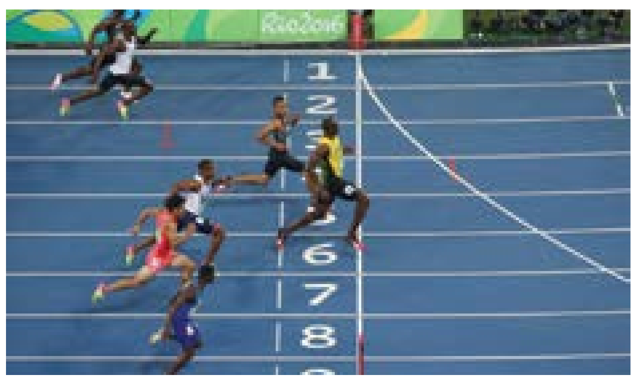
35. Find the area of the shaded region in Figure, if $ABCD$ is a rectangle with sides 8 cm and 6 cm and O is the centre of circle. (Take $\pi = 3.14$)



Section - E

Case study based questions are compulsory.

36. 100 Metres Race : The 100 metres is a sprint race in track and field competitions. The shortest common outdoor running distance, it is one of the most popular and prestigious events in the sport of athletics. It has been contested at the summer Olympics since 1896 for men and since 1928 for women. The World Championships 100 metres has been contested since 1983. The reigning 100 m Olympic or world champion is often named "the fastest man or woman in the world".



A stopwatch was used to find the time that it took a group of students to run 100 m.

Time (in sec)	0-20	20-40	40-60	60-80	80-100
No. of students	8	10	13	6	3

Based on the above information, answer the following questions.

(i) Estimate the mean time taken by a student to finish the race.

(ii) What will be the upper limit of the modal class ?

(iii) What is the sum of lower limits of median class and modal class ?

OR

How many students finished the race within 1 minute?

Continue on next page.....

37. Satellite Images : Satellite images are images of Earth collected by imaging satellites operated by governments and businesses around the world. Satellite imaging companies sell images by licensing them to governments and businesses such as Apple Maps and Google Maps. It should not be confused for astronomy images collected by space telescope.

Barun lives in Jaipur in Vaishali. Satellite image of his colony is shown in given figure. In this view, his house is pointed out by a flag, which is situated at the point of intersection of x and y- axes. If he goes 2 cm east and 3 cm north from the house, then he reaches to a grocery store, If he goes 4 cm west and 6 cm south from the house, then he reaches to his office. If he goes 6 cm east and 8 cm south from the house, then he reaches to a food court. If he goes 6 cm west and 8 cm north from the house, he reaches to a his kid's school.
Based on the above information, answer the following questions.

(i) Find the distance between grocery store and food court.

(ii) Find the distance of the school from the house.

(iii) If the grocery store and office lie on a line, what is the ratio of distance of house from grocery store to that from office ?

OR

Find the ratio of distances of house from school to food court.

38. Swimming Pool : The volume of water in a rectangular, in-ground, swimming pool is given by $V(x) = x^3 + 11x^2 + 24x$ where $V(x)$ is the volume in cubic feet when the water is x ft high.

(i) Find the dimension of base of pool.

(ii) Use the remainder theorem to find the volume when $x = 3$ ft.

(iii) If the volume is 100 ft^3 of water, what is the height x?

OR

(iv) If the maximum capacity of the pool is 520 ft^3 what is the maximum depth?

□□□□□□□

Sample Paper 24

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. AB and CD are two common tangents to circles which touch each other at a point C. If D lies on AB such that $CD = 4$ cm then AB is

(a) 12 cm (b) 8 cm

(c) 4 cm (d) 6 cm

2. If one of the zeroes of the quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is

(a) $\frac{4}{3}$ (b) $\frac{-4}{3}$

(c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

3. If the lines given by $3x + 2ky = 2$ and $2x + 5y + 1 = 0$ are parallel, then the value of k is

(a) $-\frac{5}{4}$ (b) $\frac{2}{5}$

(c) $\frac{15}{4}$ (d) $\frac{3}{2}$

4. The following data gives the distribution of total household expenditure (in $<$) of manual workers in a city.

Expenditure (in $<$)	Frequency
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	28
3000-3500	30

Expenditure (in <)	**Frequency**
3500-4000	22
4000-4500	16
4500-5000	07

Then, find the average expenditure which is done by the maximum number of manual workers.

(a) 1747.26 (b) 1847.26

(c) 1947.26 (d) 2047.26

5. The quadratic equation $2x^2 - 3\sqrt{2}\,x + \frac{9}{4} = 0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

6. The quadratic equation $3x^2 + 4\sqrt{3}\,x + 4$ has

(a) two distinct real roots (b) two equal real roots

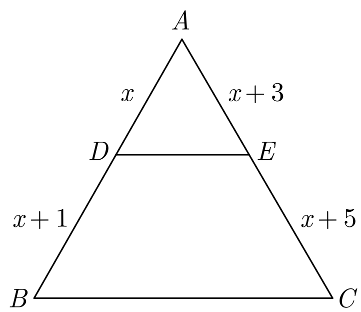
(c) no real roots (d) more than 2 real roots

7. A letter is chosen at random from the letters of the word ASSASSINATION, then the probability that the letter chosen is a vowel is in the form of $\frac{6}{2x+1}$, then x is equal to

(a) 5 (b) 6

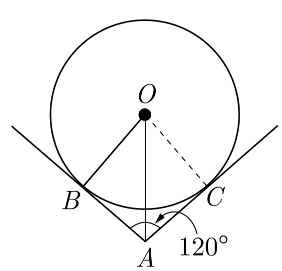
(c) 7 (d) 8

8. In $\Delta\,ABC, DE \,||\, BC$, find the value of x.



(a) 3 (b) 2 (c) 4 (d) 1

9. In the given figure, two tangents AB and AC are drawn to a circle with centre O such that $\angle BAC = 120^\circ$, then OA is equal to that



(a) $2AB$ (b) $3AB$ (c) $4AB$ (d) $5AB$

10. Given that $\sin\alpha = \frac{\sqrt{3}}{2}$ and $\cos\beta = 0$, then the value of $\beta - \alpha$ is

(a) 0°
(b) 90°
(c) 60°
(d) 30°

11. If $\sec 5A = \operatorname{cosec}(A + 30^\circ)$, where $5A$ is an acute angle, then the value of A is

(a) 15°
(b) 5°
(c) 20°
(d) 10°

12. Two poles of height 6 m and 11 m stand vertically upright on a plane ground. If the distance between their foot is 12 m, then distance between their tops is

(a) 12 m
(b) 14 m
(c) 13 m
(d) 11 m

13. A 6 m high tree cast a 4 m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?

(a) 75 m
(b) 100 m
(c) 150 m
(d) 50 m

14. The ratio of the length of a rod and its shadow is $1:\sqrt{3}$ then the angle of elevation of the sun is

(a) 90°
(b) 45°
(c) 30°
(d) 75°

15. If two solid hemispheres of same base radius r are joined together along their bases, then curved surface area of this new solid is

(a) $4\pi r^2$
(b) $6\pi r^2$
(c) $3\pi r^2$
(d) $8\pi r^2$

16. If the mean of the observation $x, x+3, x+5, x+7$ and $x+10$ is 9, the mean of the last three observation is

(a) $10\frac{1}{3}$
(b) $10\frac{2}{3}$
(c) $11\frac{1}{3}$
(d) $11\frac{2}{3}$

17. If the radius of a circle is diminished by 10%, then its area is diminished by

(a) 10%
(b) 19%
(c) 36%
(d) 20%

18. Two dice are thrown together. The probability that sum of the two numbers will be a multiple of 4, is:

(a) $\frac{1}{2}$
(b) $\frac{1}{3}$
(c) $\frac{1}{8}$
(d) $\frac{1}{4}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** If n^{th} term of an AP is $7-4n$, then its common differences is -4.
Reason : Common difference of an AP is given by $d = a_{n+1} - a_n$.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.
Reason : A parallelogram circumscribing a circle is a rhombus.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

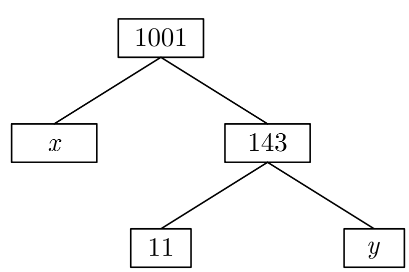
Section B consists of 5 questions of 2 marks each.

21. Which term of the AP 3, 15, 27, 39, ... will be 120 more than its 21st term?

22. Prove that the lengths of two tangents drawn from an external point to a circle are equal.

23. If the point $P(x, y)$ is equidistant from the points $Q(a+b, b-a)$ and $R(a-b, a+b)$, then prove that $bx = ay$.

24. What are the values of x and y in the given figure ?



25. In a certain AP 32^{th} term is twice the 12^{th} term. Prove that 70^{th} term is twice the 31^{st} term.

OR

Find the middle term of the AP 213, 205, 197, ... 37.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Represent the following pair of linear equations graphically and hence comment on the condition of consistency of this pair.

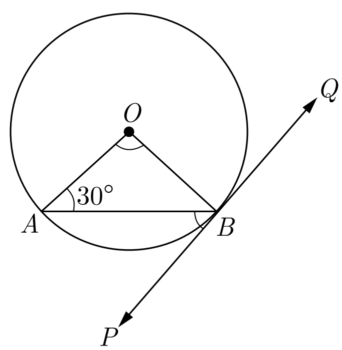
$x-5y=6$ and $2x-10y=12$.

27. Solve for x : $\frac{x+1}{x-1}+\frac{x-2}{x+2}=4-\frac{2x+3}{x-2}; x \neq 1,-2,2$

28. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

OR

In the figure, PQ is a tangent to a circle with centre O. If $\angle OAB=30^{\circ}$, find $\angle ABP$ and $\angle AOB$.



29. The angles of depression of the top and bottom of a 50 m high building from the top of a tower are 45° and 60° respectively. Find the height of the tower and the horizontal distance between the tower and the building. (Use $\sqrt{3}=1.73$)

30. A solid is in the shape of a hemisphere surmounted by a cone. If the radius of hemisphere and base radius of cone is 7 cm and height of cone is 3.5 cm, find the volume of the solid. $\left(\text{Take } \pi=\frac{22}{7}\right)$

OR

The rain water from 22m $\times$ 20 m roof drains into cylindrical vessel of diameter 2 m and height 3.5 m. If the rain water collected from the roof fills $\frac{4th}{5}$ of cylindrical vessel then find the rainfall in cm.

31. In a family of three children, find the probability of having at least two boys.

Section - D

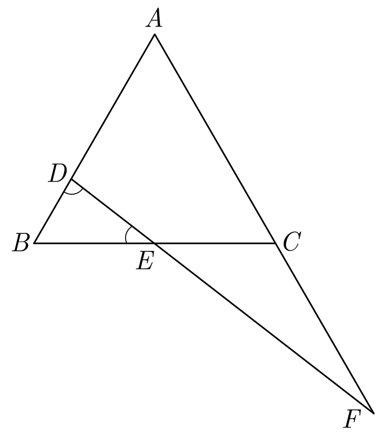
Section D consists of 4 questions of 5 marks each.

32. If α and β are the zeroes of polynomial $p(x)=3x^2+2x+1$, find the polynomial whose zeroes are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$.

OR

If α and β are zeroes of the polynomial $p(x)=6x^2-5x+k$ such that $\alpha-\beta=\frac{1}{6}$, Find the value of k.

33. In the figure, $\angle BED = \angle BDE$ and E is the mid-point of BC. Prove that $\frac{AF}{CF} = \frac{AD}{BE}$.

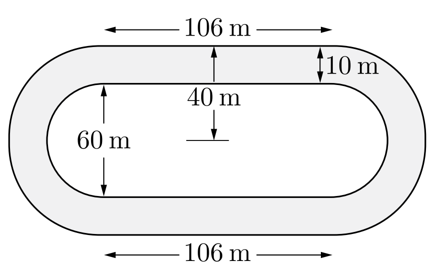


34. Prove that: $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + \sec\theta\operatorname{cosec}\theta$

OR

If $15\tan^2\theta + 4\sec^2\theta = 23$, then find the value of $(\sec\theta + \operatorname{cosec}\theta)^2 - \sin^2\theta$.

35. Fig. depicts a racing track whose left and right ends are semi-circular. The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide everywhere, find the area of the track.



Section - E

Case study based questions are compulsory.

36. Sulfur dioxide (SO_2) is a colorless gas at ambient temperature and pressure. It is soluble in water and forms sulfurous acid which is slowly oxidized to sulfuric acid by dissolved oxygen.

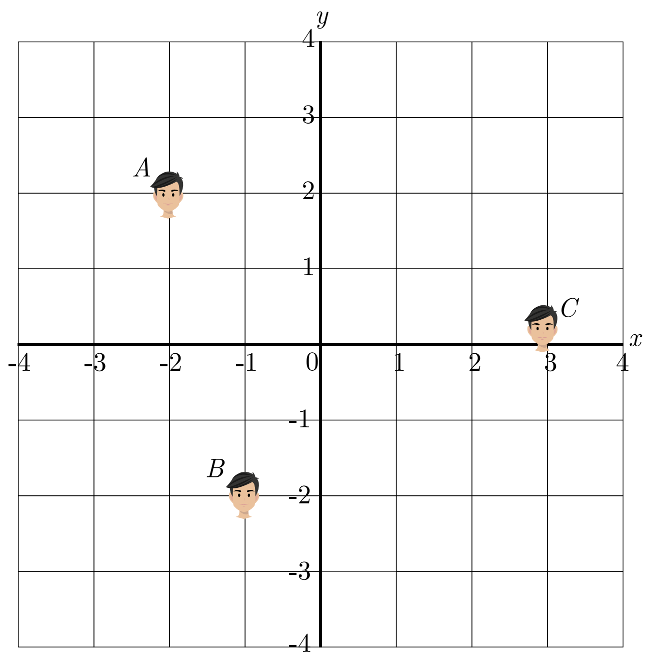
Continue on next page.....

Sulfur dioxide is a major air pollutant and has significant impacts upon human health. In addition, the concentration of sulfur dioxide in the atmosphere can influence the habitat suitability for plant communities, as well as animal life. Sulfur dioxide emissions are a precursor to acid rain and atmospheric particulates.
To find out the concentration of SO_2 in the air (in parts per million, i.e. ppm), the data was collected for 30 localities in a delhi and is presented below:

Concentration of SO_2 (in ppm)	**Frequency**
0.00-0.04	4
0.04-0.08	9
0.08-0.12	9
0.12-0.16	2
0.16-0.20	4
0.20-0.24	2

Based on the above information, answer the following questions.
(i) What is the mean concentration of SO_2 in the air?
(ii) What is the lower limit of median value of concentration of SO_2 in the air?
(iii) Find the median value concentration of SO_2 in the air.
(iv) How many localities are having SO_2 in range 0.04-0.16 ppm ?

37. Ajay, Bhigu and Colin are fast friend since childhood. They always want to sit in a row in the classroom . But teacher doesn't allow them and rotate the seats row-wise everyday. Bhigu is very good in maths and he does distance calculation everyday. He consider the centre of class as origin and marks their position on a paper in a co-ordinate system. One day Bhigu make the following diagram of their seating position.



(i) What is the distance of point A from origin ?
(ii) What is the distance between A and B ?
(iii) What is the distance between B and C ?
(iv) A point D lies on the line segment between points A and B such that $AD:DB = 4:3$. What are the the coordinates of point D ?

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SOLUTIONS

38. Cost of Production : The cost to produce bottled spring water is given by $C(x) = 16x - 63$ where x is the number of thousands of bottles. The total income (revenue) from the sale of these bottles is given by the function $R(x) = -x^2 + 326x - 7463$.

(i) Since Profit = Revenue − Cost, find the profit function.
(ii) How many bottles sold will produce the maximum profit?
(iii) What is the maximum profit?
(iv) Find the profit when 245 thousand bottles are sold. Use remainder theorem

□□□□□□□

Sample Paper 25

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If the angle of depression of an object from a 75 m high tower is 30°, then what is the distance of the object from the tower?

(a) $75\sqrt{2}$ m (b) $75\sqrt{3}$ m

(c) 75 m (d) $75\sqrt{2.5}$ m

2. If one zero of a quadratic polynomial $(kx^2 + 3x + k)$ is 2, then the value of k is

(a) $\frac{5}{6}$ (b) $-\frac{5}{6}$

(c) $\frac{6}{5}$ (d) $-\frac{6}{5}$

3. Two concentric circles are of radii 10 cm and 8 cm, then the length of the chord of the larger circle which touches the smaller circle is

(a) 6 cm (b) 12 cm

(c) 18 cm (d) 9 cm

4. If ½ is a root of the equation $x^2 + kx - \frac{5}{4} = 0$, then the value of k is

(a) 2 (b) -2

(c) $\frac{1}{4}$ (d) $\frac{1}{2}$

5. Consider the data:

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	13	20	14	7	4

The difference of the upper limit of the median class and the lower limit of the modal class is

(a) 0 (b) 19

(c) 20 (d) 38

6. An AP starts with a positive fraction and every alternate term is an integer. If the sum of the first 11 terms is 33, then the fourth term is

(a) 2 (b) 3

(c) 5 (d) 6

7. If the sum of the zeroes of the quadratic polynomial $kx^2 + 2x + 3k$ is equal to their product, then k equals

(a) $\frac{1}{3}$ (b) $-\frac{1}{3}$

(c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

8. $\Delta\, ABC$ and $\Delta\, BDE$ are two equilateral triangle such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is ....

(a) 1 : 4 (b) 4 : 1

(c) 1 : 3 (d) 3 : 1

9. If $\sin\theta = \frac{a}{b}$, then $\cos\theta$ is equal to

(a) $\dfrac{b}{\sqrt{b^2 - a^2}}$ (b) $\dfrac{b}{a}$

(c) $\dfrac{\sqrt{b^2 - a^2}}{b}$ (d) $\dfrac{a}{\sqrt{b^2 - a^2}}$

10. An observer, 1.5 m tall is 20.5 away from a tower 22 m high, then the angle of elevation of the top of the tower from the eye of observer is

(a) 30° (b) 45°

(c) 60° (d) 90°

11. HCF of two numbers is 27 and their LCM is 162. If one of the numbers is 54, then the other number is

(a) 36 (b) 35

(c) 9 (d) 81

12. Volumes of two spheres are in the ratio 64 : 27. The the ratio of their surface areas is

(a) 3 : 4 (b) 4 : 3

(c) 9 : 16 (d) 16 : 9

13. Volume of a spherical shell is given by

(a) $4\pi(R^2 - r^2)$ (b) $\pi(R^3 - r^3)$

(c) $4\pi(R^3 - r^3)$ (d) $\frac{4}{3}\pi(R^3 - r^3)$

14. While computing mean of grouped data, we assume that the frequencies are

(a) evenly distributed over all the classes

(b) centred at the class marks of the classes

(c) centred at the upper limits of the classes

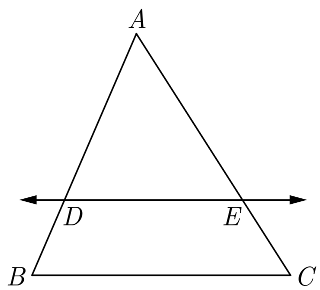
(d) centred at the lower limits of the classes

15. If an event cannot occur, then its probability is

(a) 1 (b) $\frac{3}{4}$

(c) $\frac{1}{2}$ (d) 0

16. In Figure, in ΔABC, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of AE?



(a) 4 cm (b) 6 cm

(c) 8 cm (d) 3 cm

17. The probability of getting a number greater then 3 in throwing a die is

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{3}{4}$ (d) $\frac{2}{3}$

18. The distance of the point $(-12, 5)$ from the origin is

(a) 12 (b) 5

(c) 13 (d) 169

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $x + y - 4 = 0$ and $2x + ky - 3 = 0$ has no solution if $k = 2$.

Reason : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are consistent if $\frac{a_1}{a_2} \neq \frac{k_1}{k_2}$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If the outer and inner diameter of a circular path is 10 m and 6 m then area of the path is $16\pi\, m^2$.

Reason : If R and r be the radius of outer and inner circular path, then area of path is $\pi(R^2 - r^2)$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

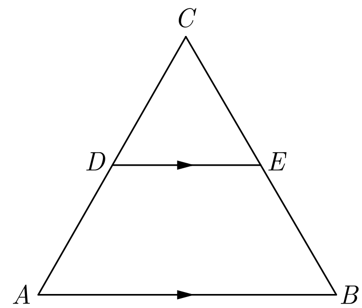
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

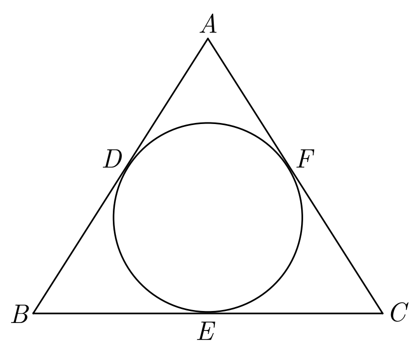
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the given figure, $\angle A = \angle B$ and $AD = BE$. Show that $DE || AB$.



22. In the given figure, if $AB = AC$, prove that $BE = CE$.



23. Find the value of $\cos 2\theta$, if $2\sin 2\theta = \sqrt{3}$.

24. A lot consists of 144 ball pens of which 20 are defective and others are good. Nuri will buy a pen if it is good, but will not buy if it is defective. The shopkeeper draws one pen at random and gives it to her. What is the probability that :
(i) she will buy it ?
(ii) she will not buy it ?

OR

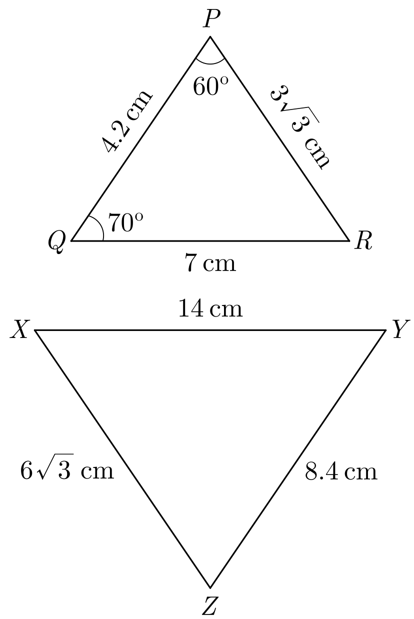
A bag contains 3 red, 4 green and 5 white candles, one candle is drawn at random from the bag, find the probability that candle is not red.

25. $ABCD$ is a trapezium in which $AB || CD$ and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.

Continue on next page.....

OR

In the given figures, find the measure of $\angle X$.



Section - C

Section C consists of 6 questions of 3 marks each.

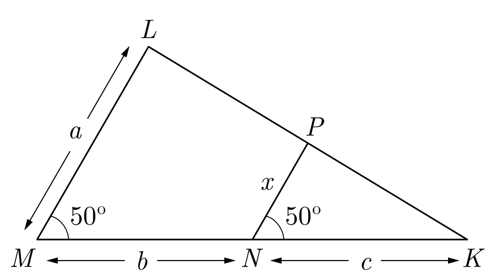
26. If the sum and product of the zeroes of the polynomial $ax^2 - 5x + c$ are equal to 10 each, find the value of 'a' and 'c'.

27. Given the linear equation $2x + 3y - 8 = 0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is :
(a) intersecting lines
(b) parallel lines
(c) coincident lines.

28. If in $\Delta ABC, AD$ is median and $AE \perp BC$, then prove that $AB^2 + AC^2 = 2AD^2 + \frac{1}{2}BC^2$.

OR

In the given figure, find the value of x in terms of a, b and c.



29. If in a triangle ABC right angled at B, $AB = 6$ units and $BC = 8$ units, then find the value of $\sin A \cos C + \cos A \sin C$

30. A metallic solid sphere of radius 10.5 cm melted and recasted into smaller solid cones each of radius 3.5 cm and height 3 cm. How may cones will be made ?

OR

A cylindrical tub, whose diameter is 12 cm and height 15 cm is full of ice-cream. The whole ice-cream is to be divided into 10 children in equal ice-cream cones, with conical base surmounted by hemispherical top. If the height of conical portion is twice the diameter of base, find the diameter of conical part of ice-cream cones.

31. Write the smallest number which is divisible by both 306 and 657.

Section - D

Section D consists of 4 questions of 5 marks each.

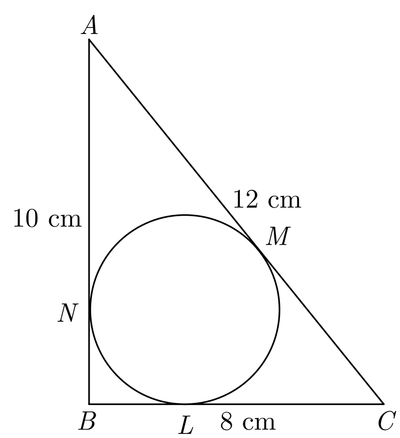
32. Find x in terms of a, b and c :

$$\frac{a}{x-a} + \frac{b}{x-b} = \frac{2c}{x-c}, x \neq a, b, c$$

OR

Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.

33. In figure, a circle is inscribed in a ΔABC having sides $BC = 8\,\text{cm}$, $AB = 10\,\text{cm}$ and $AC = 12\,\text{cm}$. Find the length BL, CM and AN.



34. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

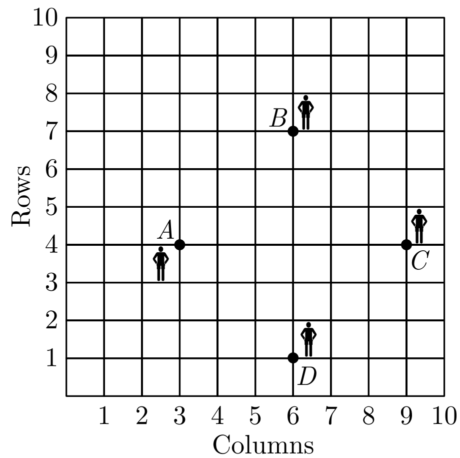
Class	0- 10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

OR

Literacy rates of 40 cities are given in the following table. It is given that mean literacy rate is 63.5, then find the missing frequencies x and y.

Literacy rate (in %)	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90
Number of cities	1	2	3	x	y	6	8	4	2	3	2

35. In a classroom, 4 friends are seated at the points A, B, C, and D as shown in Figure. Champa and Chameli walk into the class and after observing for a few minutes Champa asks Chameli, Don't you think $ABCD$ is a square? Chameli disagrees. Using distance formula, find which of them is correct.



Section - E

Case study based questions are compulsory.

36. Swimming Pool : The volume of water in a rectangular, in-ground, swimming pool is given by $V(x) = x^3 + 11x^2 + 24x$ where $V(x)$ is the volume in cubic feet when the water is x ft high.

(i) Find the dimension of base of pool.

(ii) Use the remainder theorem to find the volume when $x = 3$ ft.

(iii) If the volume is 100 ft^3 of water, what is the height x?

OR

(iv) If the maximum capacity of the pool is 520 ft^3 what is the maximum depth?

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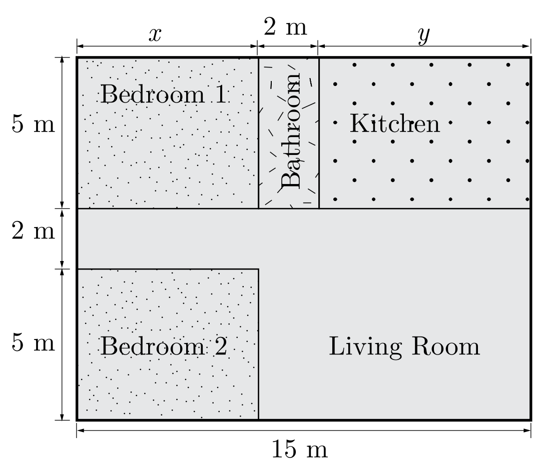
SOLUTIONS

37. Architect : An architect is a skilled professional who plans and designs buildings and generally plays a key role in their construction. Architects are highly trained in the art and science of building design. Since they bear responsibility for the safety of their buildings' occupants, architects must be professionally licensed.

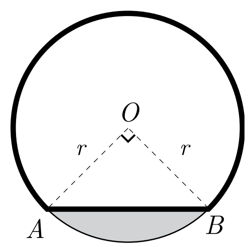
Varsha is a licensed architect and design very innovative house. She has made a house layout for her client which is given below. In the layout, the design and measurements has been made such that area of two bedrooms and kitchen together is 95 sq. m.



(i) Which pair of linear equations does describe this situation ?
(ii) What is the length of the outer boundary of the layout.
(iii) What is the area of bedroom 1 ? What is the area of living room in the layout ?
(iv) What is the cost of laying tiles in Kitchen at the rate of Rs. 50 per sq. m ?

38. Atal Tunnel : Atal Tunnel (also known as Rohtang Tunnel) is a highway tunnel built under the Rohtang Pass in the eastern Pir Panjal range of the Himalayas on the Leh-Manali Highway in Himachal Pradesh. At a length of 9.02 km, it is the longest tunnel above 10,000 feet (3,048 m) in the world and is named after former Prime Minister of India, Atal Bihari Vajpayee. The tunnel reduces the travel time and overall distance between Manali and Keylong on the way to Leh. Moreover, the tunnel bypasses most of the sites that were prone to road blockades, avalanches, and traffic snarls.

Earth is excavated to make a railway tunnel. The tunnel is a cylinder of radius 7 m and length 450 m. A level surface is laid inside the tunnel to carry the railway lines. Figure given below shows the circular cross - section of the tunnel. The level surface is represented by AB, the centre of the circle is O and $\angle AOB = 90^\circ$. The space below AB is filled with rubble (debris from the demolition buildings).



(i) How much volume of earth is removed to make the tunnel ?

(ii) If the cost of excavation of 1 cubic meter is Rs 250, what is the total cost of excavation?

(iii) A coating is to be done on the surface of inner curved part of tunnel. What is the area of tunnel to be being coated ? Costing of coating is Rs 30 per m^2. What is the total cost of coating ?

OR

(iv) How much volume of debris is required to fill the ground surface of tunnel ?

□□□□□□□

Sample Paper 26

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10 (b) -10

(c) -7 (d) -2

2. HCF of 144 and 198 is

(a) 9 (b) 18

(c) 6 (d) 12

3. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then value of $x + y$ is

(a) 10 (b) 11

(c) 12 (d) 13

4. The times, in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated below

Class	Frequency
13.8-14	2
14-14.2	4
14.2-14.4	5
14.4-14.6	71
14.6-14.8	48
14.8-15	20

The number of athletes who completed the race in less than 14.6 second is :

(a) 11 (b) 71

(c) 82 (d) 130

5. The real roots of the equation $x^{2/3}+x^{1/3}-2=0$ are
(a) 1, 8
(b) $-1,-8$
(c) $-1,8$
(d) $1,-8$

6. If the sum of the first $2n$ terms of 2, 5, 8, ... is equal to the sum of the first n terms of 57, 59, 61, ..., then n is equal to
(a) 10
(b) 12
(c) 11
(d) 13

7. The top of two poles of height 20 m and 14 m are connected by a wire. If the wire makes an angle of 30° with the horizontal, then find the length of the wire.
(a) 12 m
(b) 20 m
(c) 8 m
(d) 6 m

8. The perimeters of two similar triangles are 25 cm and 15 cm respectively. If one side of the first triangle is 9 cm, then the corresponding side of second triangle is ....
(a) 5.4 cm
(b) 5.2 cm
(c) 4.9 cm
(d) 5.1 cm

9. Two circles of radii 20 cm and 37 cm intersect in A and B. If O_1 and O_2 are their centres and $AB=24$ cm, then the distance O_1O_2 is equal to
(a) 44 cm
(b) 51 cm
(c) 40.5 cm
(d) 45 cm

10. If $\cos(\alpha+\beta)=0$, then $\sin(\alpha-\beta)$ can be reduced to
(a) $\cos\beta$
(b) $\cos 2\beta$
(c) $\sin\alpha$
(d) $\sin 2\alpha$

11. The zeroes of the polynomial $x^2-3x-m(m+3)$ are
(a) $m, m+3$
(b) $-m, m+3$
(c) $m, -(m+3)$
(d) $-m, -(m+3)$

12. A 6 m high tree cast a 4 m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?
(a) 75 m
(b) 100 m
(c) 150 m
(d) 50 m

13. It is proposed to build a single circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park would be
(a) 10 m
(b) 15 m
(c) 20 m
(d) 24 m

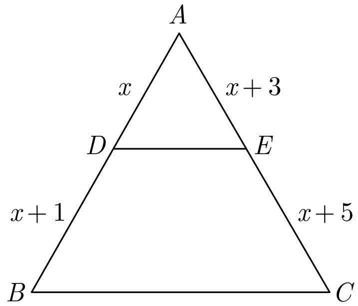
14. If the radius of the sphere is increased by 100%, the volume of the corresponding sphere is increased by
(a) 200%
(b) 500%
(c) 700%
(d) 800%

15. Which of the following cannot be the probability of an event?

(a) $\frac{1}{3}$ (b) 0.1

(c) 3% (d) $\frac{17}{16}$

16. In $\Delta ABC, DE || BC$, find the value of x.



(a) 3 (b) 2

(c) 4 (d) 1

17. Out of one digit prime numbers, one number is selected at random. The probability of selecting an even number is

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{3}{4}$ (d) $\frac{2}{3}$

18. Distance of point $P(3, 4)$ from x-axis is

(a) 3 units (b) 4 units

(c) 5 units (d) 1 units

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** If the height of a cone is 24 cm and diameter of the base is 14 cm, then the slant height of the cone is 15 cm.

Reason : If r be the radius and h be the slant height of the cone, then slant height $= \sqrt{h^2 + r^2}$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If the number of runs scored by 11 players of a cricket team of India are 5, 19, 42, 11, 50, 30, 21, 0, 52, 36, 27 then median is 30.

Reason : Median $= \left(\frac{n+1}{2}\right)^{\text{th}}$ value, if n is odd.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

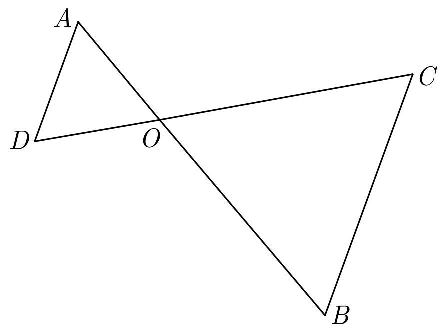
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

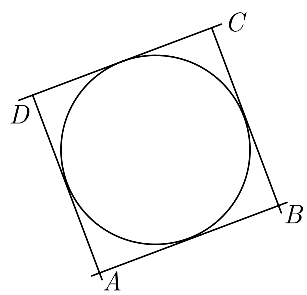
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the given figure, $OA \times OB = OC \times OD$, show that $\angle A = \angle C$ and $\angle B = \angle D$.



22. In figure, a circle touches all the four sides of a quadrilateral $ABCD$. If $AB = 6$ cm, $BC = 9$ cm and $CD = 8$ cm, then find the length of AD.



23. Find the value of $\sin 30^{\circ} \cos 60^{\circ} + \cos 30^{\circ} \sin 60^{\circ}$ is it equal to $\sin 90^{\circ}$ or $\cos 90^{\circ}$?

24. Two different dice are thrown together. Find the probability that the product of the number appeared is less than 18.

OR

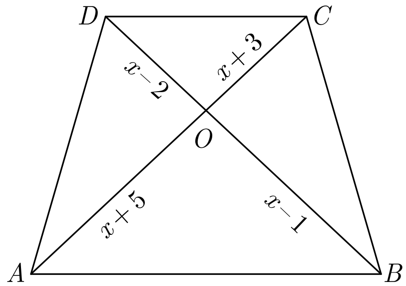
Harpreet tosses two different coins simultaneously. What is the probability that she gets :
(i) at least one head ?
(ii) one head and one tail ?

25. In a rectangle $ABCD, E$ is a point on AB such that $AE = \frac{2}{3}AB$. If $AB = 6$ km and $AD = 3$ km, then find DE.

OR

In the given figure, if $AB || DC$, find the value of x.

Continue on next page.....



Section - C

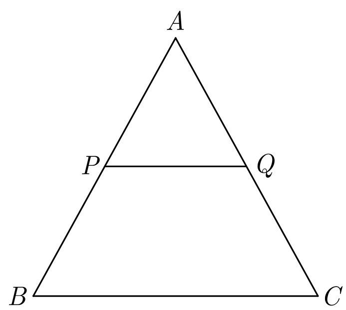
Section C consists of 6 questions of 3 marks each.

26. If one the zero of a polynomial $3x^2 - 8x + 2k + 1$ is seven times the other, find the value of k.

27. Solve for x and y :

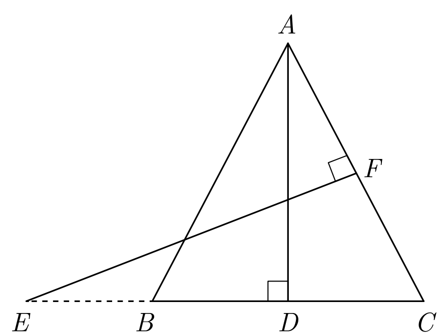
$$\begin{aligned} ax + by &= \frac{a+b}{2} \\ 3x + 5y &= 4 \end{aligned}$$

28. In the given figure, P and Q are the points on the sides AB and AC respectively of ΔABC, such that $AP = 3.5$ cm, $PB = 7$ cm, $AQ = 3$ cm and $QC = 6$ cm. If $PQ = 4.5$ cm, find BC.



OR

In the given figure, $AB = AC$. E is a point on CB produced. If AD is perpendicular to BC and EF perpendicular to AC, prove that ΔABD is similar to ΔCEF.



29. Evaluate : $\dfrac{5\cos^2 60^\circ + 4\cos^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 60^\circ}$

30. A solid sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is completely submerged into water, by how much will the level of water rise in the cylindrical vessel ?

OR

A hemispherical tank, of diameter 3 m, is full of water. It is being emptied by a pipe at the rate of $3\frac{4}{7}$ litre per second. How much time will it take to make the tank half empty ? Use $\pi = \frac{22}{7}$

31. 144 cartons of Coke cans and 90 cartons of Pepsi cans are to be stacked in a canteen. If each stack is of the same height and if it equal contain cartons of the same drink, what would be the greatest number of cartons each stack would have?

Section - D

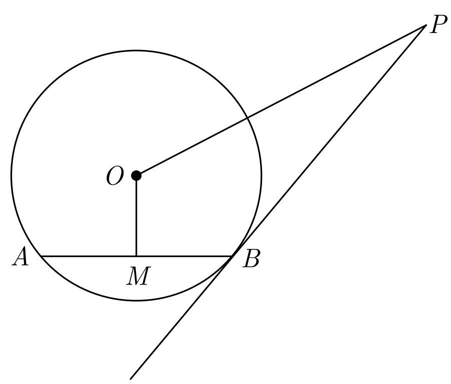
Section D consists of 4 questions of 5 marks each.

32. Solve for x : $\dfrac{x-1}{2x+1} + \dfrac{2x+1}{x-1} = 2$ where $x \neq -\dfrac{1}{2}, 1$

OR

Find the positive values of k for which quadratic equations $x^2 + kx + 64 = 0$ and $x^2 - 8x + k = 0$ both will have the real roots.

33. PB is a tangent to the circle with centre O to $B.AB$ is a chord of length 24 cm at a distance of 5 cm from the centre. It the tangent is length 20 cm, find the length of PO.



34. The arithmetic mean of the following frequency distribution is 53. Find the value of k.

Class	0-20	20-40	40-60	60-80	80-100
Frequency	12	15	32	k	13

Continue on next page.....

OR

The following distribution gives the weights of 60 students of a class. Find the mean and mode weights of the students.

Weight (in kg)	40-44	44-48	48-52	52-56	56-60	60-64	64-68	68-72
Number of students	4	6	10	14	10	8	6	2

35. Point A lies on the line segment XY joining $X(6,-6)$ and $Y(-4,-1)$ in such a way that $\frac{XA}{XY}=\frac{2}{5}$. If point A also lies on the line $3x+k(y+1)=0$, find the value of k.

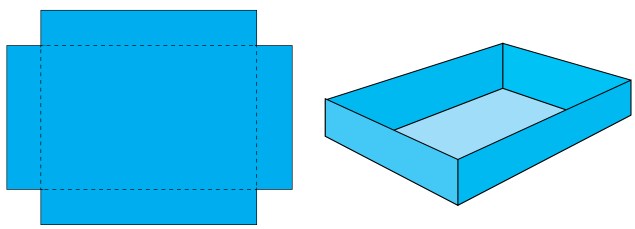
Section - E

Case study based questions are compulsory.

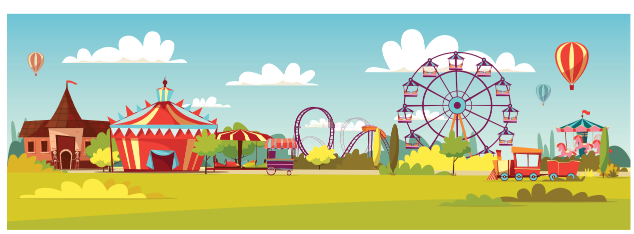
36. Overflow Pan : A metalworker makes an overflow pan by cutting equal squares with sides of length x from the corners of a 30 cm by 20 cm piece of aluminium, as shown in the figure. The sides are then folded up and the corners sealed.

(i) Find a polynomial function $V(x)$ that gives the volume of the pan.

(ii) Find the volume of the pan if the height is 6 cm. Use remainder theorem.



37. Mr. RK Agrawal is owner of a famous amusement park in Delhi. The ticket charge for the park is Rs 150 for children and Rs 400 for adult.



Generally he does not go to park and it is managed by team of staff. One day Mr Agrawal decided to random check the park and went there. When he checked the cash counter, he found that 480 tickets were sold and Rs 134500 was collected.

(i) Let the number of children visited be x and the number of adults visited be y. Which of the following is the correct system of equations that model the problem ?

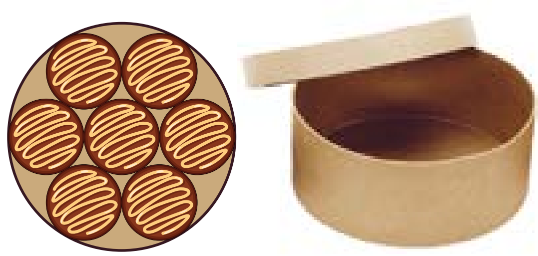
(ii) How many children visited the park ? How many adults visited the park?

(iii) How much amount collected if 300 children and 350 adults visited the park?

(iv) One day total visited children and adults together is 750 and the total amount collected is Rs 212500. What are the number of children and adults visited the park ?

38. A bakery is an establishment that produces and sells flour-based food baked in an oven such as bread, cookies, cakes, pastries, and pies. Some retail bakeries are also categorized as cafés, serving coffee and tea to customers who wish to consume the baked goods on the premises.

Tania runs a bakery shop and her bakery is very famous for tasty biscuits. The amount of mixture required to make one biscuit is 18 cu cm. Before it is cooked, the mixture is rolled into a sphere. After the biscuit is cooked, the biscuit becomes a cylinder of radius 3 cm and height 0.7 cm. The increase in volume is due to air being trapped in the biscuit. Biscuits are packed in a cylindrical card box of height 14 cm. The arrangement of biscuits is shown below.



(i) What is the volume of the biscuits after it is cooked ? What is the volume of air trapped, while cooking the biscuit ?

(ii) How many biscuits will be there in a box ?

(iii) How much space is vacant in box after biscuits are packed ?

OR

(iv) If weight of 7 biscuits is 50 grams, what will be the weight of box of biscuits?

Sample Paper 27

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. A pole casts a shadow of length $2\sqrt{3}$ m on the ground, when the Sun's elevation is 60^o. Find the height of the pole.

(a) 4 m
(b) 6 m
(c) 2 m
(d) 3 m

2. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is

(a) x^2+5x+6
(b) x^2-5x+6
(c) x^2-5x-6
(d) $-x^2+5x+6$

3. A single letter is selected at random from the word PROBABILITY. The probability that the selected letter is a vowel is

(a) $\frac{2}{11}$
(b) $\frac{3}{11}$
(c) $\frac{4}{11}$
(d) 0

4. The value of k for which the system of linear equations $x+2y=3$, $5x+ky+7=0$ is inconsistent is

(a) $-\frac{14}{3}$
(b) $\frac{2}{5}$
(c) 5
(d) 10

5. The quadratic equation $2x^2-\sqrt{5}\,x+1=0$ has

(a) two distinct real roots
(b) two equal real roots
(c) no real roots
(d) more than 2 real roots

6. The first four terms of an AP whose first term is -2 and the common difference is -2 are

(a) $-2, 0, 2, 4$ (b) $-2, 4, -8, 16$

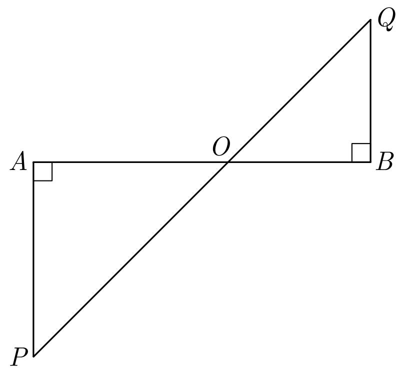
(c) $-2, -4, -6, -8$ (d) $-2, -4, -8, -16$

7. $2\sqrt{3}$ is

(a) an integer (b) a rational number

(c) an irrational number (d) a whole number

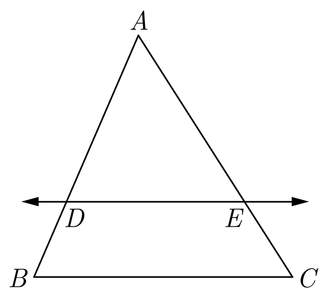
8. In the given figure, if $\angle A = 90^o, \angle B = 90^o$, $OB = 4.5\text{cm}$ $OA = 6$ cm and $AP = 4$ cm then find QB.



(a) 3 cm (b) 6 cm

(c) 4.5 cm (d) 3.5 cm

9. In Figure, in ΔABC, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of AE?



(a) 4 cm (b) 6 cm

(c) 8 cm (d) 3 cm

10. For the following distribution.

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

the sum of lower limits of the median class and modal class is

(a) 15 (b) 25

(c) 30 (d) 35

11. If ΔABC is right angled at C, then the value of $\cos(A+B)$ is

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

12. The radius of a circle whose circumference is equal to the sum of the circumferences of the two circles of diameters 36 cm and 20 cm is

(a) 56 cm (b) 42 cm

(c) 28 cm (d) 16 cm

13. The base radii of a cone and a cylinder are equal. If their curved surface areas are also equal, then the ratio of the slant height of the cone to the height of the cylinder is

(a) 2 : 1 (b) 1 : 2

(c) 1 : 3 (d) 3 : 1

14. The diameter of a sphere is 6 cm. It is melted and drawn into a wire of diameter 2 mm. The length of the wire is

(a) 12 m (b) 18 m

(c) 36 m (d) 66 m

15. The mean weight of 9 students is 25 kg. If one more student is joined in the group the mean is unaltered, then the weight of the 10^{th} student is

(a) 25 kg (b) 24 kg

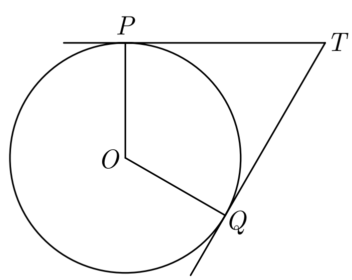
(c) 26 kg (d) 23 kg

16. The probability expressed as a percentage of a particular occurrence can never be

(a) less than 100 (b) less than 0

(c) greater than 1 (d) anything but a whole number

17. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110^\circ$, then $\angle PTQ$ is



(a) 60° (b) 70°

(c) 80° (d) 90°

18. If $A(\frac{m}{3}, 5)$ is the mid-point of the line segment joining the points $Q(-6,7)$ and $R(-2,3)$, then the value of m is

(a) -12 (b) -4

(c) 12 (d) -6

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** If both zeros of the quadratic polynomial $x^2 - 2kx + 2$ are equal in magnitude but opposite in sign then value of k is ½.

Reason : Sum of zeros of a quadratic polynomial $ax^2 + bx + c$ is $\frac{-b}{a}$

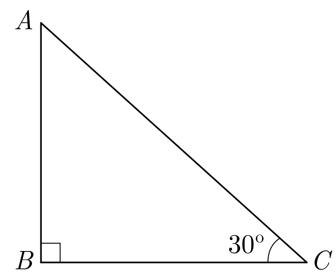
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** In the figure, if $BC = 20\text{ m}$, then height AB is 11.56 m.



Reason : $\tan\theta = \dfrac{AB}{BC} = \dfrac{\text{perpendicular}}{\text{base}}$ where θ is the angle $\angle ACB$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

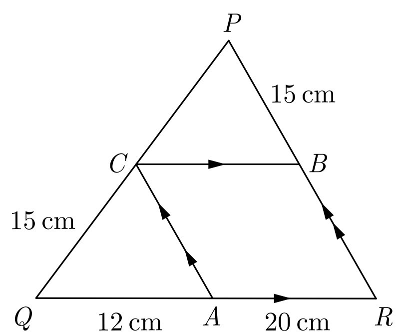
(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

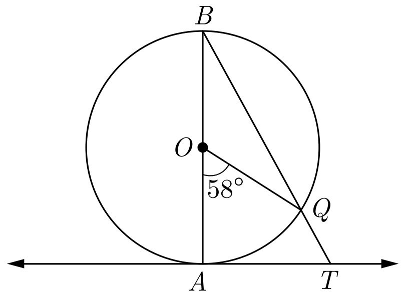
Section - B

Section B consists of 5 questions of 2 marks each.

21. In the given figure, $CB \,||\, QR$ and $CA \,||\, PR$. If $AQ = 12$ cm, $AR = 20$ cm, $PB = CQ = 15$ cm, calculate PC and BR.



22. In given figure, AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 58^\circ$, find $\angle ATQ$.



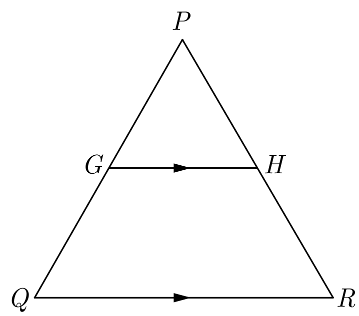
23. Evaluate : $\dfrac{\cos 45^\circ}{\sec 30^\circ} + \dfrac{1}{\sec 60^\circ}$

24. A box contains 12 balls of which some are red in colour. If 6 more red balls are put in the box and a ball is drawn at random the probability of drawing a red ball doubles than what it was before. Find the number of red balls in the bag.

OR

Two different dice are tossed together. Find the probability :
(i) that the number on each die is even.
(ii) that the sum of numbers appearing on the two dice is 5.

25. In the given figure, G is the mid-point of the side PQ of ΔPQR and $GH || QR$. Prove that H is the mid-point of the side PR or the triangle PQR.



OR

In ΔABC, if X and Y are points on AB and AC respectively such that $\frac{AX}{XB} = \frac{3}{4}$, $AY = 5$ and $YC = 9$, then state whether XY and BC parallel or not.

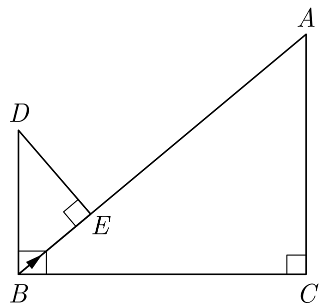
Section - C

Section C consists of 6 questions of 3 marks each.

26. If α and β are the zeroes of the polynomial $f(x) = x^2 - 4x - 5$ then find the value of $\alpha^2 + \beta^2$

27. Solve graphically :
$2x - 3y + 13 = 0$; $3x - 2y + 12 = 0$

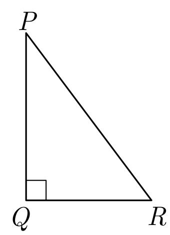
28. In the given figure, $DB \perp BC, DE \perp AB$ and $AC \perp BC$. Prove that $\frac{BE}{DE} = \frac{AC}{BC}$.



OR

A 6 m high tree cast a 4 m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?

29. In the given $\angle PQR$, right-angled at Q, $QR = 9$ cm and $PR - PQ = 1$ cm. Determine the value of $\sin R + \cos R$.



30. A well of diameter 4 m is dug 14 m deep. The earth taken out is spread evenly all around the well to form a 40 m high embankment. Find the width of the embankment.

OR

The $\frac{3}{4}$th part of a conical vessel of internal radius 5 cm and height 24 cm is full of water. The water emptied into a cylindrical vessel with internal radius 10 cm. Find the height of water in cylindrical vessel.

31. Find HCF and LCM of 16 and 36 by prime factorization and check your answer.

Section - D

Section D consists of 4 questions of 5 marks each.

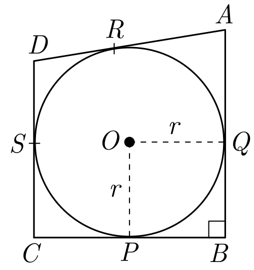
32. Solve, for x : $\sqrt{3}\,x^2 + 10x + 7\sqrt{3} = 0$

OR

If $x = -2$ is a root of the equation $3x^2 + 7x + p = 0$, find the value of k so that the roots of the equation $x^2 + k(4x + k - 1) + p = 0$ are equal.

Continue on next page.....

33. In figure, a circle with centre O is inscribed in a quadrilateral $ABCD$ such that, it touches the sides BC, AB, AD and CD at points P, Q, R and S respectively. If $AB = 29$ cm, $AD = 23$ cm, $\angle B = 90^\circ$ and $DS = 5$ cm, then find the radius of the circle (in cm).



34. The table below show the salaries of 280 persons:

Salary (In thousand ₹)	No. of Persons
5-10	49
10-15	133
15-20	63
20-25	15
25-30	6
30-35	7
35-40	4
40-45	2
45-50	1

Calculate the median salary of the data.

OR

The median of the following data is 525. Find the values of x and y if the total frequency is 100.

Class Interval	Frequency
0-100	2
100-200	5
200-300	x
300-400	12
400-500	17
500-600	20
600-700	y
700-800	9
800-900	7
900-1000	4

35. Find the ratio in which the y-axis divides the line segment joining the points $(-1, -4)$ and $(5, -6)$. Also find the coordinates of the point of intersection.

Section - E

Case study based questions are compulsory.

36. Cost of Production : The cost to produce bottled spring water is given by $C(x) = 16x - 63$ where x is the number of thousands of bottles. The total income (revenue) from the sale of these bottles is given by the function $R(x) = -x^2 + 326x - 7463$.

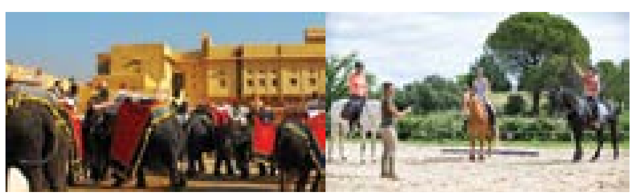
(i) Since $\text{Profit} = \text{Revenue} - \text{Cost}$, find the profit function.

(ii) How many bottles sold will produce the maximum profit?

(iii) What is the maximum profit?

(iv) Find the profit when 245 thousand bottles are sold. Use remainder theorem

37. Jodhpur is the second-largest city in the Indian state of Rajasthan and officially the second metropolitan city of the state. Jodhpur was historically the capital of the Kingdom of Marwar, which is now part of Rajasthan. Jodhpur is a popular tourist destination, featuring many palaces, forts, and temples, set in the stark landscape of the Thar Desert. It is popularly known as the "Blue City" among people of Rajasthan and all over India. The old city circles the Mehrangarh Fort and is bounded by a wall with several gates. The city has expanded greatly outside the wall, though, over the past several decades. Jodhpur is also known for the rare breed of horses known as Marwari or Malani, which are only found here.



Last year we visited Jodhpur in a group of 25 friends. When we went mehrangarh fort we found following fare for ride :

Ride	Normal Hours Fare	Peak Hours Fare
Horse	Rs 50	3 Times
Elephant	Rs 100	2 Times

Some people choose to ride on horse and rest choose to ride on elephant.

(i) First day we rode in normal hours and we paid Rs 1950 for ride. Let x be the number of horses hired and y be the number elephants hired. Which of the following is the correct system of equation that model the problem ?

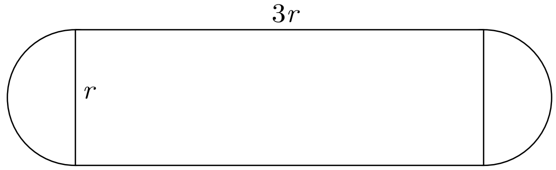
(ii) How many horses were hired ? How many elephant were hired ?

(iii) Next day we rode in peak hours, then how much total fare was paid by our group?

(iv) What was the increase in total fare because of peak hours ride ?

38. Boiler : The boiler is essentially a closed vessel inside which water is stored. Fuel is burnt in a furnace and hot gasses are produced. These hot gasses come in contact with water vessel where the heat of these hot gases transfer to the water and consequently steam is produced in the boiler. Then this steam is piped to the turbine of thermal power plant.

Rajesh has been given the task of designing a boiler for NTPC. Boiler consist of a cylindrical part in middle and two hemispherical part at its both end. The cross section of boiler is given below. Length of cylindrical part is the 3 times of radius of hemispherical part.



(i) Which of the following is correct expression for the surface area of cylindrical part of boiler?
(ii) Which of the following is correct expression for the total surface area of boiler?
(iii) Which of the following is correct expression for the volume of boiler? What is the ratio of volume to the surface area?
(iv) If $r = 3\,\text{m}$, what is the volume of boiler?

□□□□□□□□

Sample Paper 28

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

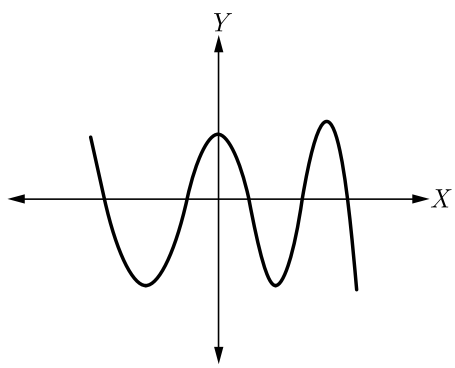
Section A consists of 20 questions of 1 mark each.

1. In a circle of radius 14 cm, an arc subtends an angle of 45° at the centre, then the area of the sector is

(a) $71\,\text{cm}^2$ (b) $76\,\text{cm}^2$

(c) $77\,\text{cm}^2$ (d) $154\,\text{cm}^2$

2. The graph of $y = p(x)$, where $p(x)$ is a polynomial in variable x, is as follows.



The number of zeroes of $p(x)$ is ....

(a) 2 (b) 3

(c) 4 (d) 5

3. The zeroes of the quadratic polynomial $\sqrt{3}\,x^2 - 8x + 4\sqrt{3}$ are

(a) $2\sqrt{3}$ and $\sqrt{3}$ (b) $2\sqrt{3}$ and $\frac{1}{\sqrt{3}}$

(c) $\frac{1}{\sqrt{3}}$ and $\sqrt{3}$ (d) $\frac{2}{\sqrt{3}}$ and $2\sqrt{3}$

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SOLUTIONS

4. Select the quadratic polynomial $p(x)$ with 3 and $-\frac{2}{5}$ as sum and product of its zeroes, respectively.
(a) $x^2 - 3x - \frac{2}{5}$
(b) $x^2 - 3x - 2$
(c) $5x^2 - 15x - 2$
(d) $15x^2 - 5x + \frac{2}{5}$

5. If $ad \neq bc$, then what do you say about the solution of the pair of linear equations $ax + by = p$ and $cx + dy = q$?
(a) no solution
(b) unique solution
(c) infinitely solution
(d) can't say anything

6. What are the values of x and y for the following pair of linear equations ?

$$3x + 2y - 7 = 0$$
$$4x + y - 6 = 0$$

(a) 1 and 2
(b) 2 and 2
(c) 1 and 1
(d) –1 and –1

7. The quadratic equation $2x^2 - 3\sqrt{2}\,x + \frac{9}{4} = 0$ has
(a) two distinct real roots
(b) two equal real roots
(c) no real roots
(d) more than 2 real roots

8. From an external point P, tangents PA and PB are drawn to a circle with centre O. If CD is the tangent to the circle at a point E and $PA = 14$ cm. The perimeter of ΔPCD is
(a) 14 cm
(b) 21 cm
(c) 28 cm
(d) 35 cm

9. What is the common difference of an AP in which $a_{18} - a_{14} = 32$?
(a) 8
(b) -8
(c) -4
(d) 4

10. The n^{th} term of the AP $a, 3a, 5a, \ldots$ is
(a) na
(b) $(2n-1)a$
(c) $(2n+1)a$
(d) $2na$

11. If $\tan A = \cot B$, then the value of $(A + B)$ is
(a) 90°
(b) 120°
(c) 60°
(d) 180°

12. If $\cos A = \frac{2}{5}$, the value of $4 + 4\tan^2 A$ will be
(a) 1
(b) 2
(c) 4
(d) 25

13. If the angle of depression of an object from a 75 m high tower is 30°, then the distance of the object from the tower is
(a) $25\sqrt{3}$ m
(b) $50\sqrt{3}$ m
(c) $75\sqrt{3}$ m
(d) 150 m

14. ΔABC is an equilateral triangle of side $2a$, then length of one of its altitude is ....

(a) $a\sqrt{3}$ (b) $a2\sqrt{3}$

(c) $a3\sqrt{2}$ (d) $a\sqrt{2}$

15. If the radius of the sphere is increased by 100%, the volume of the corresponding sphere is increased by

(a) 200% (b) 500%

(c) 700% (d) 800%

16. In the formula $\overline{x} = a + \frac{\sum f_i d_i}{\sum f_i}$, for finding the mean of grouped data d_i's are deviation from a of

(a) lower limits of the classes (b) upper limits of the classes

(c) mid-points of the classes (d) frequencies of the class marks

17. a and b are two positive integers such that the least prime factor of a is 3 and the least prime factor of b is 5. Then the least prime factor of $(a+b)$ will be

(a) 1 (b) 2

(c) 3 (d) 4

18. A pair of dice is thrown once. What is the probability of getting a doublet?

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$

(c) $\frac{1}{6}$ (d) $\frac{1}{5}$

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** $4x^2 - 12x + 9 = 0$ has repeated roots.
Reason : The quadratic equation $ax^2 + bx + c = 0$ have repeated roots if discriminant $D > 0$.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** The value of y is 6, for which the distance between the points $P(2,-3)$ and $Q(10,y)$ is 10.
Reason : Distance between two given points $A(x_1, y_1)$ *and* $B(x_2, y_2)$ is given,

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Explain why $(7\times13\times11)+11$ and $(7\times6\times5\times4\times3\times2\times1)+3$ are composite numbers.

22. Find the zeroes of the quadratic polynomial $\sqrt{3}\,x^2-8x+4\sqrt{3}$.

OR

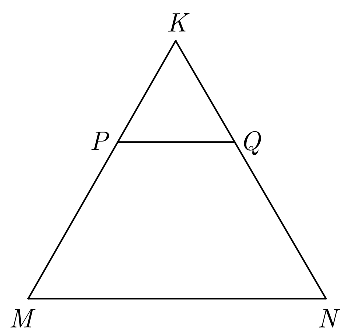
Find a quadratic polynomial, the sum and product of whose zeroes are 6 and 9 respectively. Hence find the zeroes.

23. What is the distance of point $P(3,4)$ from x-axis?

24. If triangle ABC is similar to triangle DEF such that $2AB=DE$ and $BC=8$ cm then find EF.

OR

In the figure, PQ is parallel to MN. If $\frac{KP}{PM}=\frac{4}{13}$ and $KN=20.4$ cm then find KQ.



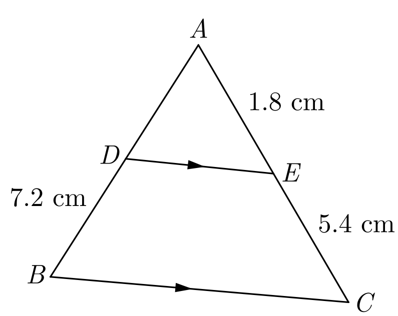
25. There are 30 cards of the same size in a bag in which the numbers 1 to 30 are written. One card is taken out of the bag at random. Find the probability that the number on the selected card is not divisible by 3.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Given that $\sqrt{5}$ is irrational, prove that $2\sqrt{5}-3$ is an irrational number.

27. In Figure, $DE||BC$. Find the length of side AD, given that $AE=1.8\,\text{cm}$, $BD=7.2\,\text{cm}$ and $CE=5.4\,\text{cm}$.



28. Show that : $\dfrac{\cos^2(45^\circ+\theta)+\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\tan(30^\circ-\theta)}=1$

29. If tangents PA and PB drawn from an external point P to a circle with centre O are inclined to each other at an angle of 80°, then find $\angle POA$.

30. A right circular cone of radius 3 cm, has a curved surface area of 47.1 cm^2. Find the volume of the cone. (Use $\pi = 3.14$)

OR

The sum of the radius of base and height of a solid right circular cylinder is 37 cm. If the total surface area of the solid cylinder is 1628 sq. cm, find the volume of the cylinder. $\pi = \frac{22}{7}$.

31. Compute the mode for the following frequency distribution:

Size of items (in cm)	0- 4	4- 8	8- 12	12-16	16-20	20-24	24-28
Frequency	5	7	9	17	12	10	6

OR

The mean of the following frequency distribution is 18. The frequency f in the class interval 19-21 is missing. Determine f.

Class interval	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

Section - D

Section D consists of 4 questions of 5 marks each.

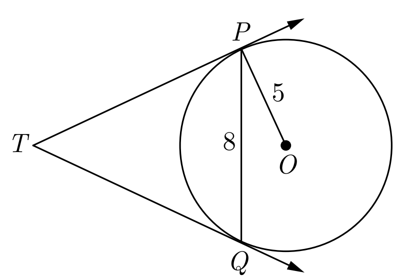
32. Solve for x : $\dfrac{1}{x+1}+\dfrac{2}{x+2}=\dfrac{4}{x+4}$ $x\neq -1,-2,-4$

OR

A two digit number is such that product of its digits is 14. If 45 is added to the number, the digits interchange their places. Find the number.

33. Find the ratio in which the point $(-3,k)$ divides the line segment joining the points $(-5,-4)$ and $(-2,3)$.Also find the value of k.

34. In Figure, PQ is a chord of length 8 cm of a circle of radius 5 cm and centre O. The tangents at P and Q intersect at point T. Find the length of TP.



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OR

A right triangle ABC, right angled at A is circumscribing a circle. If $AB = 6$ cm and $BC = 10\,\text{cm}$, find the radius r of the circle.

35. Sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals.

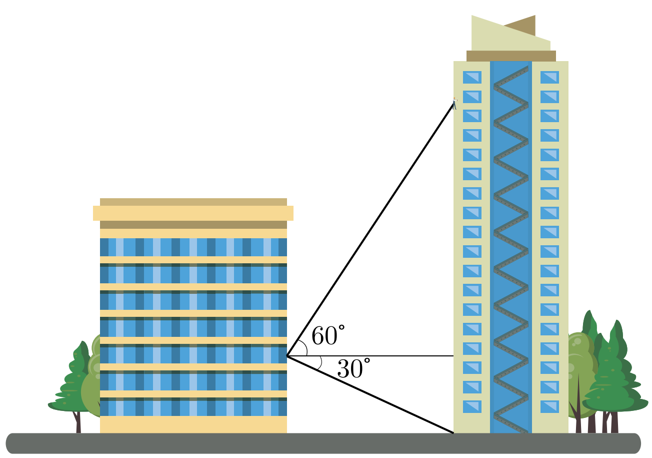
Section - E

Case study based questions are compulsory.

36. Salary : In investigating different job opportunities, you find that firm A will start you at Rs 25,000 per year and guarantee you a raise of Rs 1,200 each year whereas firm B will start you at Rs 28,000 per year but will guarantee you a raise of only Rs 800 each year.

(i) Over a period of 15 years, how much would you receive from firm A?
(ii) Over a period of 15 years, how much would you receive from firm B?
(iii) What would be your annual salary at firm A for the tenth year?
(iv) What would be your annual salary at firm B for the tenth year?

37. From his hotel room window on the fourth floor, Ranjan notices some window washers high above him on the hotel across the street.



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Curious as to their height above ground, he quickly estimates the buildings are 60 m apart, the angle of elevation to the workers is about 60°, and the angle of depression to the base of the hotel is about 30°.

(i) How high above ground is the window of Ranjan's hotel room?

(ii) How high above ground are the workers?

38. Political survey questions are questions asked to gather the opinions and attitudes of potential voters. Political survey questions help you identify supporters and understand what the public needs. Using such questions, a political candidate or an organization can formulate policies to gain support from these people.

A survey of 100 voters was taken to gather information on critical issues and the demographic information collected is shown in the table. One out of the 100 voters is to be drawn at random to be interviewed on the India Today News on prime time.

	Women	Men	Totals
Republican	17	20	37
Democrat	22	17	39
Independent	8	7	15
Green Party	6	3	5
Totals	53	47	100

(i) What is the probability the person is a woman or a Republican ?

(ii) What is the probability the person is a Democrat ?

(iii) What is the probability the person is a Independent men ?

(iv) What is the probability the person is a Independent men or green party men ?

Sample Paper 29

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. Two lines are given to be parallel. The equation of one of the lines is $4x + 3y = 14$, then the equation of the second line will be

(a) $12x + 9x = 42$ (b) $12x + 9y = 5$

(c) $12x + 8y = 15$ (d) $12x + 8y = 42$

2. If the height and length of the shadow of a man are equal, then the angle of elevation of the sun is,

(a) 45° (b) 60°

(c) 90° (d) 120°

3. A die is thrown once. What is the probability of getting a prime number?

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$

(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

4. Thus (a) is correct option. If one root of the equation $(k-1)x^2 - 10x + 3 = 0$ is the reciprocal of the other then the value of k is ....

(a) 2 (b) 3

(c) 4 (d) 5

5. If p and q are the zeroes of polynomial $f(x) = 2x^2 - 7x + 3$, the value of $p^2 + q^2$ will be

(a) $\frac{39}{5}$ (b) $\frac{5}{39}$

(c) $\frac{37}{4}$ (d) $\frac{4}{37}$

6. Select the least number that is divisible by all numbers between 1 and 10 (both inclusive).

(a) 2520 (b) 5040

(c) 1010 (d) 2020

7. If m and n are the zeroes of the polynomial $3x^2+11x-4$, then value of $\frac{m}{n}+\frac{n}{m}$ will be

(a) $\frac{12}{145}$ (b) $-\frac{12}{145}$

(c) $-\frac{145}{12}$ (d) $\frac{145}{12}$

8. The quadratic equation $x^2+x-5=0$ has

(a) two distinct real roots (b) two equal real roots

(c) no real roots (d) more than 2 real roots

9. The 4th term from the end of an AP $-11, -8, -5, \ldots, 49$ is

(a) 37 (b) 40

(c) 43 (d) 58

10. The common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \ldots$ is

(a) 1 (b) $\frac{1}{p}$

(c) -1 (d) $-\frac{1}{p}$

11. If the point $C(k, 4)$ divides the line segment joining two points $A(2, 6)$ and $B(5,1)$ in ratio $2:3$, the value of k is ....

(a) $\frac{5}{16}$ (b) $\frac{16}{5}$

(c) $\frac{9}{5}$ (d) $\frac{5}{9}$

12. If $x=3\sin\theta+4\cos\theta$ and $y=3\cos\theta-4\sin\theta$ then x^2+y^2 is

(a) 25 (b) 45

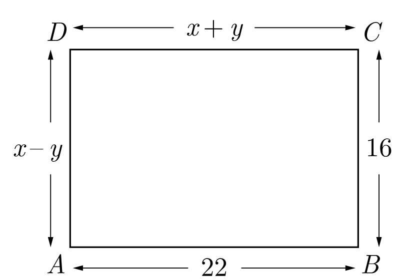
(c) 7 (d) 49

13. ΔABC and ΔBDE are two equilateral triangle such that D is the mid-point of BC. Ratio of the areas of triangles ABC and BDE is ....

(a) 1 : 1 (b) 3 : 1

(c) 2 : 1 (d) 4 : 1

14. In the figure given below, $ABCD$ is a rectangle. The values of x and y will be



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(a) 3 and 19
(b) 19 and 3
(c) 4 and 18
(d) 18 and 4

15. If $k+1=\sec^2\theta(1+\sin\theta)(1-\sin\theta)$, then the value of k. will be
(a) 0
(b) 1
(c) 2
(d) 15

16. If the sum of the areas of two circles with radii R_1 and R_2 is equal to the area of a circle of radius R, then
(a) $R_1+R_2=R$
(b) $R_1^2+R_2^2=R^2$
(c) $R_1+R_2<R$
(d) $R_1^2+R_2^2<R^2$

17. The base radii of a cone and a cylinder are equal. If their curved surface areas are also equal, then the ratio of the slant height of the cone to the height of the cylinder is
(a) 2 : 1
(b) 1 : 2
(c) 1 : 3
(d) 3 : 1

18. While computing mean of grouped data, we assume that the frequencies are
(a) evenly distributed over all the classes
(b) centred at the class marks of the classes
(c) centred at the upper limits of the classes
(d) centred at the lower limits of the classes

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The equation $x^2+3x+1=(x-2)^2$ is a quadratic equation.
Reason : Any equation of the form $ax^2+bx+c=0$ where $a\neq 0$, is called a quadratic equation.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** If in a circle, the radius of the circle is 3 cm and distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm.
Reason : $(\text{hypotenuse})^2=(\text{base})^2+(\text{height})^2$
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.

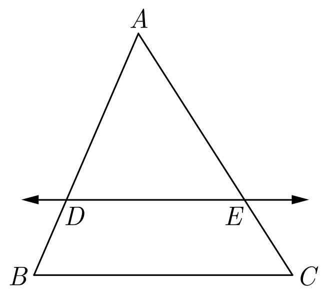
22. Form a quadratic polynomial $p(x)$ with 3 and $-\frac{2}{5}$ as sum and product of its zeroes, respectively.

OR

If α and β are the zeroes of the polynomial $f(x) = 5x^2 - 7x + 1$ then find the value of $\left(\frac{\alpha}{\beta} + \frac{\beta}{\alpha}\right)$

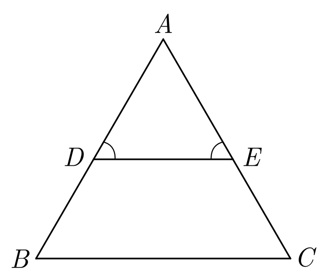
23. If $A(\frac{m}{3}, 5)$ is the mid-point of the line segment joining the points $Q(-6, 7)$ and $R(-2, 3)$, then what is the value of m ?

24. In Figure, in ΔABC, $DE \parallel BC$ such that $AD = 2.4$ cm, $AB = 3.2$ cm and $AC = 8$ cm, then what is the length of AE?



OR

In Figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that ΔBAC is an isosceles triangle.



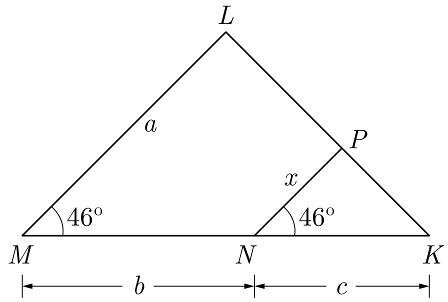
25. A bag contains cards bearing numbers from 11 to 30. A card is taken out from the bag at random. Find the probability that the selected card has multiple of 5 on it.

Section - C

Section C consists of 6 questions of 3 marks each.

26. Given that $\sqrt{2}$ is irrational, prove that $(5 + 3\sqrt{2})$ is an irrational number.

27. What is the value of x in given figure?



28. Evaluate : $\dfrac{\cos 45^{\circ}}{\sec 30^{\circ}} + \dfrac{1}{\sec 60^{\circ}}$

29. An isosceles triangle ABC, with $AB = AC$, circumscribes a circle, touching BC at P, AC at Q and AB at R. Prove that the contact point P bisects BC.

30. A glass is in the shape of a cylinder of radius 7 cm and height 10 cm. Find the volume of juice in litre required to fill 6 such glasses. Use $\pi = \frac{22}{7}$

OR

The volume of a right circular cylinder with its height equal to the radius is $25\frac{1}{7}$ cm^3. Find the height of the cylinder. (Use $\pi = \frac{22}{7}$)

31. Find the mode of the following frequency distribution :

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	3	8	9	10	3	2

OR

The marks obtained by 110 students in an examination are given below

Marks	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Number of Students	14	16	28	23	18	8	3

Find the mean marks of the students.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Write all the values of p for which the quadratic equation $x^2 + px + 16 = 0$ has equal roots. Find the roots of the equation so obtained.

OR

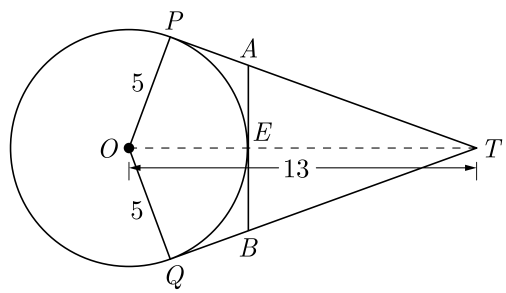
In a flight of 600 km, an aircraft was slowed down due to bad weather. The average speed of the trip was reduced by 200 km/hr and the time of flight increased by 30 minutes. Find the duration of flight.

33. If the point $P(x, y)$ is equidistant from the points $Q(a+b, b-a)$ and $R(a-b, a+b)$, then prove that $bx = ay$.

34. a, b and c are the sides of a right triangle, where c is the hypotenuse. A circle, of radius r, touches the sides of the triangle. Prove that $r = \frac{a+b-c}{2}$.

OR

In figure O is the centre of a circle of radius 5 cm. T is a point such that $OT = 13$ cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.



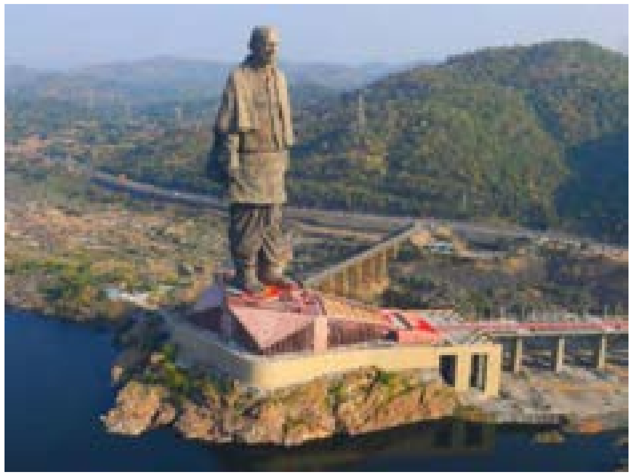
35. Four equal circles are described at the four corners of a square so that each touches two of the others. The shaded area enclosed between the circle is $\frac{24}{7}$ cm^2. Find the radius of each circle.

Section - E

Case study based questions are compulsory.

36. Arc of a Baby Swing : When Mackenzie's baby swing is started, the first swing (one way) is a 30 inch arc. As the swing slows down, each successive arc is 1.5 inch less than the previous one.
(i) Find the length of the tenth swing.
(ii) How far Mackenzie has travelled during the 10 swings ?

37. Statue of Unity : It is a colossal statue of Indian statesman and independence activist Sardar Vallabh bhai Patel, who was the first Deputy Prime Minister and Home minister of independent India.

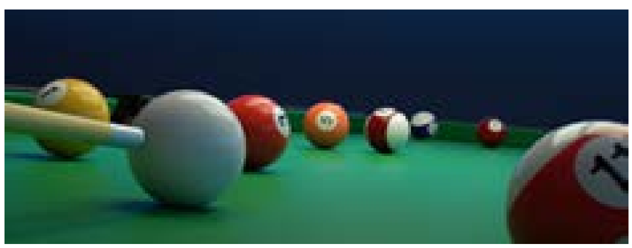


Patel was highly respected for his leadership in uniting the 562 princely states of India to form the single Union of India. It is located in the state of Gujarat and it is the world's tallest statue.

(i) For a person standing 240 m from the center of the base of the statue, the angle of elevation to the top of the statue is 45°. How tall is the statue?

(ii) A cop in helicopter near the top of the statue, notices a car wreck some distance from the statue. If the angle of depression from the cop's eyes to the wreck is 60°, how far away is the accident from the centre of base of the statue?

38. Eight Ball : This is a game played on a pool table with 15 balls numbered 1 through 15 and a cue ball that is solid white. Of the 15 numbered balls, 8 are a solid (nonwhite) color and numbered 1 through 8, and seven are striped balls numbered 9 through 15.



The fifteen numbered pool balls (no cueball) are placed in a large bowl and mixed, then one is drawn out.

(i) What is the probability of drawing the eight ball ?

(ii) What is the probability of drawing a number greater than fifteen ?

(iii) What is the probability of drawing an even number ?

(iv) What is the probability of drawing a multiple of three ?

□□□□□□□

Sample Paper 30

Class- X Exam - 2023-24

Mathematics - Standard

Time Allowed: 3 Hours **Maximum Marks : 80**

General Instructions :

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

Section A consists of 20 questions of 1 mark each.

1. If the first term of an AP is -5 and the common difference is 2, then the sum of the first 6 terms is

(a) 0 (b) 5

(c) 6 (d) 15

2. What are the values of x and y for the following system of linear equations ?

$$2x - y = 2$$
$$x + 3y = 15$$

(a) 4 and 5 (b) 3 and 4

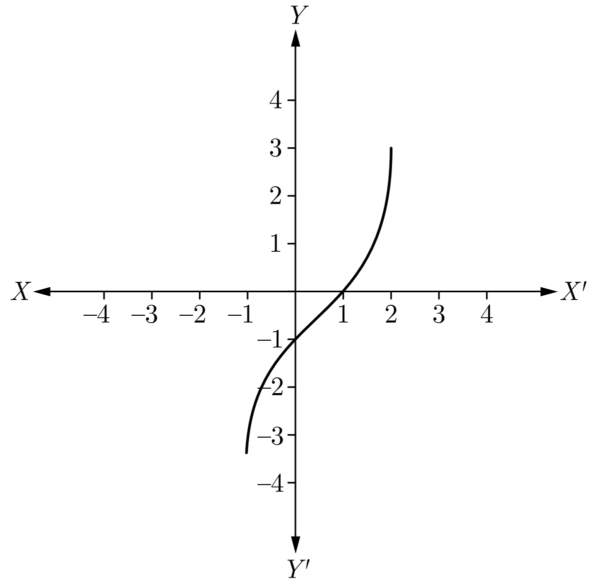
(c) 5 and 4 (d) 4 and 4

3. In the formula $\overline{x} = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$, for finding the mean of grouped frequency distribution, u_i is equal to

(a) $\frac{x_i + a}{h}$ (b) $h(x_i - a)$

(c) $\frac{x_i - a}{h}$ (d) $\frac{a - x_i}{h}$

4. In given figure, the graph of a polynomial $p(x)$ is shown. The number of zeroes of $p(x)$ will be



(a) 1 (b) 2
(c) 3 (d) 4

5. If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, the value of $(\alpha - \beta)^2$ is
(a) 2 (b) 1
(c) -1 (d) -6

6. If α and β are the zeroes of a polynomial $x^2 - 4\sqrt{3}\,x + 3$, then the value of $\alpha + \beta - \alpha\beta$ will be
(a) $\sqrt{3}(2 - \sqrt{3})$ (b) $\sqrt{3}(2 + \sqrt{3})$
(c) $\sqrt{3}(4 + \sqrt{3})$ (d) $\sqrt{3}(4 - \sqrt{3})$

7. If $2x + y = 23$ and $4x - y = 19$, the value of $(5y - 2x)$ and $(\frac{y}{x} - 2)$ will be
(a) $-\frac{5}{7}$ and 31 (b) 31 and $-\frac{5}{7}$
(c) 37 and $\frac{2}{7}$ (d) $\frac{2}{7}$ and 37

8. $1 + \dfrac{\cot^2\alpha}{1 + \operatorname{cosec}\alpha} = ?$
(a) $\cos\alpha$ (b) $\tan\alpha$
(c) $\operatorname{cosec}\alpha$ (d) $\sin\alpha$

9. In ΔABC, $AB = 6\sqrt{3}$ cm, $AC = 12$ cm and $BC = 6$ cm, then $\angle B =$ ....
(a) 30° (b) 60°
(c) 45° (d) 90°

10. The quadratic equation $5x^2 - 3x + 1 = 0$ has
(a) two distinct real roots (b) two equal real roots
(c) no real roots (d) more than 2 real roots

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11. The decimal representation of $\frac{21}{16 \times 15}$ will

(a) terminate after 2 decimal place

(b) terminate after 3 decimal place

(c) terminate after 4 decimal places

(d) terminate after 5 decimal places

12. The co-ordinate of the point dividing the line segment joining the points $A(1,3)$ and $B(4,6)$ in the ratio 2 : 1 is ....

(a) (5, 3)

(b) (3, 5)

(c) (4, 6)

(d) (6, 4)

13. If $\sin\theta + \sin^2\theta = 1$ then $\cos^2\theta + \cos^4\theta = ?$

(a) 1

(b) 2

(c) $2\sqrt{2}$

(d) $2\sqrt{3}$

14. A bag contains cards with numbers written on it from 1–80. A card is pulled out at random. What is the probability that the card shows a perfect square?

(a) $\frac{1}{2}$

(b) $\frac{1}{5}$

(c) $\frac{1}{10}$

(d) $\frac{3}{10}$

15. The ratio of the length of a rod and its shadow is $1:\sqrt{3}$ then the angle of elevation of the sun is

(a) 90°

(b) 45°

(c) 30°

(d) 75°

16. If the circumference of a circle and the perimeter of a square are equal, then

(a) Area of the circle = Area of the square

(b) Area of the circle > Area of the square

(c) Area of the circle < Area of the square

(d) Nothing definite can be said about the relation between the areas of the circle and square

17. The first term of AP is p and the common difference is q, then its 10th term is

(a) $q + 9p$

(b) $p - 9q$

(c) $p + 9q$

(d) $2p + 9q$

18. Ratio of lateral surface areas of two cylinders with equal height is

(a) 1 : 2

(b) $H : h$

(c) $R : r$

(d) None of these

In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correction option.

19. **Assertion :** The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm\frac{8}{3}$.
Reason : The equation $ax^2 + bx + c = 0$ has equal roots if $D = b^2 - 4ac = 0$

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

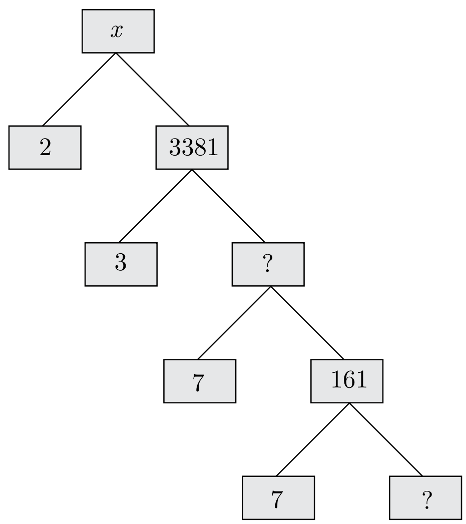
(d) Assertion (A) is false but reason (R) is true.

20. **Assertion :** PA and PB are two tangents to a circle with centre O. Such that $\angle AOB = 110°$, then $\angle APB = 90°$.
Reason : The length of two tangents drawn from an external point are equal.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section - B

Section B consists of 5 questions of 2 marks each.

21. Complete the following factor tree and find the composite number x.



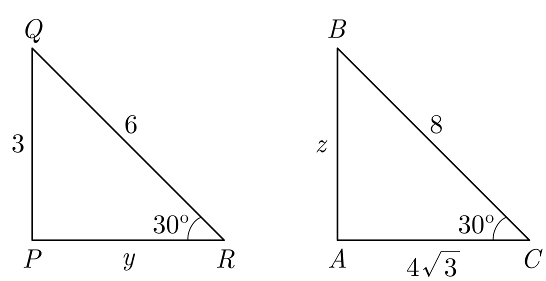
22. If one zero of the polynomial $2x^2 + 3x + \lambda$ is $\frac{1}{2}$, find the value of λ and the other zero.

OR

Find the value of k such that the polynomial $x^2 - (k+6)x + 2(2k+1)$ has sum of its zeros equal to half of their product.

23. If the centre of a circle is (3, 5) and end points of a diameter are (4, 7) and (2, y), what is the value of y ?

24. In the given figure, $\Delta ABC \sim \Delta PQR$. Find the value of $y + z$.



OR

In an equilateral triangle of side 24 cm, find the length of the altitude.

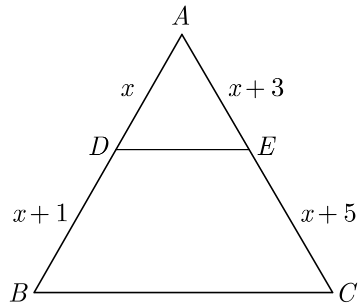
25. A letter of English alphabet is chosen at random, find the probability that the letter so chosen is :
(i) a vowel,
(ii) a consonant.

Section - C

Section C consists of 6 questions of 3 marks each.

26. 144 cartons of Coke cans and 90 cartons of Pepsi cans are to be stacked in a canteen. If each stack is of the same height and if it equal contain cartons of the same drink, what would be the greatest number of cartons each stack would have?

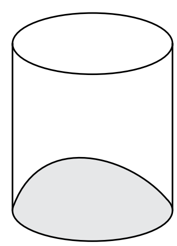
27. In $\Delta ABC, DE || BC$, find the value of x.



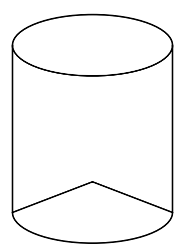
28. If $\tan 2A = \cot(A - 18°)$, where $2A$ is an acute angle, find the value of A.

29. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.

30. Isha is 10 years old girl. On the result day, Isha and her father Suresh were very happy as she got first position in the class. While coming back to their home, Isha asked for a treat from her father as a reward for her success. They went to a juice shop and asked for two glasses of juice.
Aisha, a juice seller, was serving juice to her customers in two types of glasses.
Both the glasses had inner radius 3 cm. The height of both the glasses was 10 cm.
First Type : A glass with hemispherical raised bottom.



Second Type : A glass with conical raised bottom of height 1.5 cm.



Isha insisted to have the juice in first type of glass and her father decided to have the juice in second type of glass. Out of the two, Isha or her father Suresh, who got more quantity of juice to drink and by how much?

OR

A sphere of maximum volume is cut out from a solid hemisphere of radius 6 cm. Find the volume of the cut out sphere.

31. The weekly expenditure of 500 families is tabulated below :

Weekly Expenditure(Rs.)	Number of families
0-1000	150
1000-2000	200
2000-3000	75
3000-4000	60
4000-5000	15

Find the median expenditure.

OR

Following frequency distribution shows the expenditure on milk of 30 households in a locality :

Daily expenditure on milk (Rs.)	0-30	30-60	60-90	90-120	120-150
Number of households	5	6	9	6	4

Find the mode for the above data.

Section - D

Section D consists of 4 questions of 5 marks each.

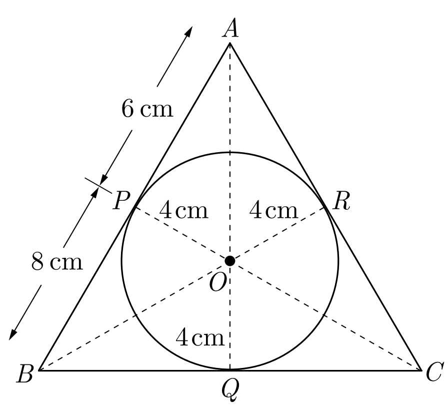
32. Find the value of p for which the quadratic equation $(p+1)x^2 - 6(p+1)x + 3(p+9) = 0$, $p \neq -1$ has equal roots. Hence find the roots of the equation.

OR

If the price of a book is reduced by ₹ 5, a person can by 4 more books for ₹ 600. Find the original price of the book.

33. If $A(5,2)$, $B(2,-2)$ and $C(-2,t)$ are the vertices of a right angled triangle with $\angle B = 90°$, then find the value of t.

34. In Figure the radius of incircle of ΔABC of area 84 cm^2 and the lengths of the segments AP and BP into which side AB is divided by the point of contact are 6 cm and 8 cm Find the lengths of the sides AC and BC.



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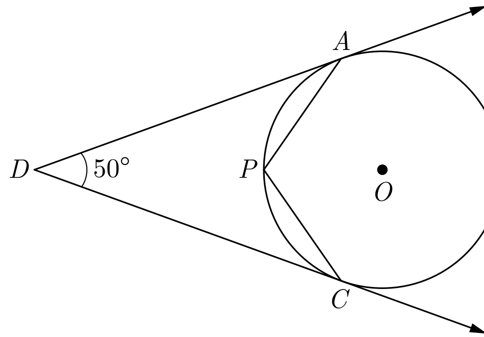
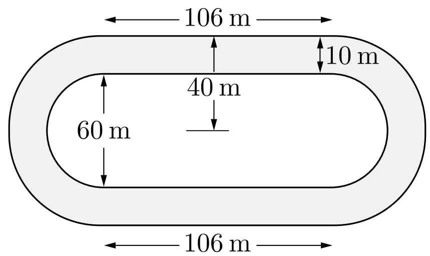
OR

In the given figure, O is the centre of the circle. Determine $\angle APC$, if DA and DC are tangents and $\angle ADC = 50^\circ$.



35. Fig. depicts a racing track whose left and right ends are semi-circular. The distance between the two inner parallel line segments is 60 m and they are each 106 m long. If the track is 10 m wide everywhere, find the area of the track.



Section - E

Case study based questions are compulsory.

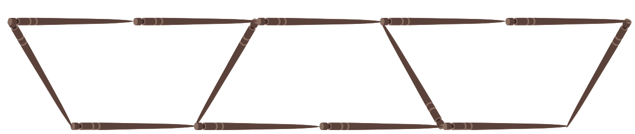
36. It takes 5 toothpicks to build the top trapezoid shown at below. You need 9 toothpicks to build 2 adjoined trapezoids and 13 toothpicks for 3 trapezoids.

(i) If 1000 toothpicks are available, how many trapezoids will be in the last complete row?

(ii) How many complete rows will there be?

(iii) How many toothpicks will you use to construct these rows?

(iv) Use the numbers in this problem to carefully describe the difference between a sequence and a series.



37. From the observation deck of a seaside building 200 m high, Jignesh sees two fishing boats in the distance. The angle of depression to the nearer boat is 60° while for the boat farther away the angle is 45°.

(i) How far out to sea is the nearer boat?

(ii) How far apart are the two boats?

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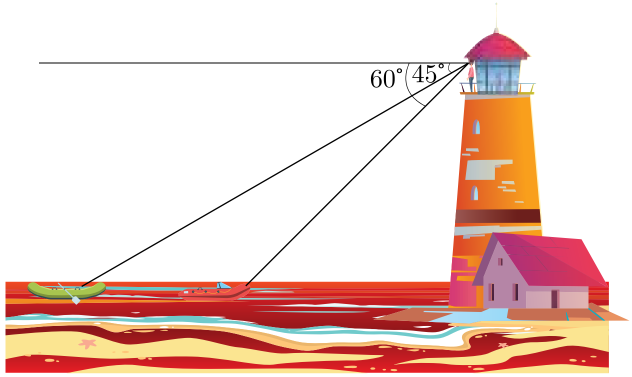

38. Family Structures : For a recent year, 51% of the families in the United States had no children under the age of 18; 20% had one child; 19% had two children; 7% had three children; and 3% had four or more children.

If a family is selected at random, find the following probability.
(i) Find the probability that the family has two or three children.
(ii) Find the probability that the family has more than one child.
(iii) Find the probability that the family has less than three children.
(iv) Based on the answers to parts (i), (ii) and (iii) which is most likely to occur? Explain why.

□□□□□□□