Mathematics 10

Sample Question Paper

Session 2024–25

Basic (Code 241)

Time Allowed: 3 hours | Maximum Marks: 80

General Instructions:

1. This Question Paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1–18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Questions no. 21–25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26–31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32–35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36–38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Questions of section B, 2 Questions of section C and 2 Questions of section D has been provided. And internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = \frac{22}{7}$ wherever required if not stated.
11. Use of calculators is not allowed.

Section A

Section A consists of 20 questions of ***1 mark each.***

1. LCM of $2^3 \times 3^2$ and $2^2 \times 3^3$ is

   (*a*) 2^3 (*b*) 3^3

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

2. For quadratic polynomial $p(x) = ax^2 + bx + c$, if the discriminant is equal to 0, its graph will touch the x - axis at

   (*a*) one point. (*b*) two points.

   (*c*) three points. (*d*) four points.

3. The points at which the graph lines of the equations $ax + by = 0$ and $ax - by = 0$ intersect is

   (*a*) $(a, 0)$ (*b*) $(b, 0)$

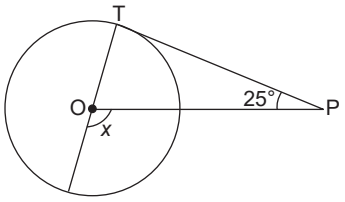
   (*c*) $(0, 0)$ (*d*) (a, b)

4. The distance between the points $(a+b, b+c)$ and $(a-b, c-b)$ is

(*a*) $2\sqrt{3}\ b$ units (*b*) $2\sqrt{2}\ b$ units

(*c*) $3\sqrt{2}\ b$ units (*d*) b units

5. If PT is a tangent of the circle with centre O and $\angle TPO = 25°$, then the measure of x is



(*a*) 110° (*b*) 115°

(*c*) 120° (*d*) 125°

6. If $\Delta PQR \sim \Delta XYZ$, $\angle Q = 50°$ and $\angle R = 70°$, then $\angle X + \angle Y$ is equal to

(*a*) 70° (*b*) 110°

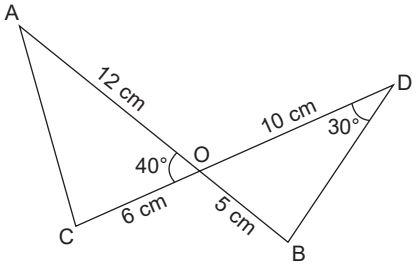
(*c*) 120° (*d*) 50°

7. If $\cot A = \frac{12}{5}$, then the value of $(\sin A + \cos A) \times \operatorname{cosec} A$ is.

(*a*) $\frac{13}{5}$ (*b*) $\frac{14}{5}$

(*c*) $\frac{17}{5}$ (*d*) 1

8. In the given figure, two line segments AB and CD intersect each other at the point O such that OA = 12 cm, OD = 10 cm, OB = 5 cm, OC = 6 cm, $\angle AOC = 40°$ and $\angle BDO = 30°$. Then $\angle OCA$ is equal to



(*a*) 120° (*b*) 100°

(*c*) 90° (*d*) 110°

9. The exponent of 3 in the prime factorisation of 243 is

(*a*) 3 (*b*) 5

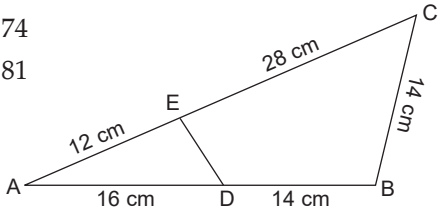
(*c*) 4 (*d*) 6

10. The 12th term of an AP whose first two terms are –3 and 4 is

(*a*) 67 (*b*) 74

(*c*) 60 (*d*) 81

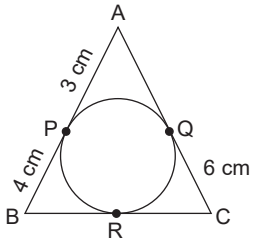
11. In the given figure, if $\Delta AED \sim \Delta ABC$, then DE is equal to



(*a*) 5.5 cm (*b*) 6.5 cm

(*c*) 7.5 cm (*d*) 5.6 cm

12. In the given figure ΔABC is circumscribing a circle. Then the length of BC is



(*a*) 7 cm (*b*) 8 cm

(*c*) 9 cm (d) 10 cm

13. The value of $5\tan^2\theta - 5\sec^2\theta$ is

(*a*) -5 (*b*) 0

(*c*) 1 (*d*) 5

14. If the ratio of the surface areas of two spheres is 4 : 9 then the ratio of their volumes is

(*a*) 2 : 3 (*b*) 4 : 9

(*c*) 8 : 27 (*d*) 16 : 81

15. If a die is thrown once, the probability of getting a perfect square is

(*a*) $\frac{1}{3}$ (*b*) $\frac{1}{4}$

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

16. If the equation $x^2 - 4x + k = 0$ has coincident roots, then

(*a*) $k = -4$ (*b*) $k = 4$

(*c*) $k = 0$ (*d*) $k = -2$

17. For the following frequency distribution

Class	30–35	35–40	40–45	45–50	50–55	55–60	60–65
Frequency	14	16	18	23	18	8	3

the difference of the upper limit of the median class and the lower limit of the modal class is

(*a*) 5 (*b*) 10

(*c*) 15 (*d*) 20

18. If $x = -2$ and $x = \frac{3}{4}$ are solutions of the equation $px^2 + qx - 6 = 0$, then the values of p and q are respectively

(*a*) 1, 6 (*b*) 5, 4

(*c*) 4, 5 (*d*) 6, 1

DIRECTION: In the question numbers 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R).**

Choose the correct option.

(*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 and 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.

19. **Assertion (A) :** The 7th term from the end of the AP 17, 14, 11, ..., -40 is -25.

Reason (R) : For an AP: $a, a + d, a + 2d, \ldots, l$, the nth term from the end is $l - (n - 1)d$.

20. **Assertion (A) :** The product of $(5 + \sqrt{2})$ and $(5 - \sqrt{2})$ is a rational number.

Reason (R) : The product of two rational numbers is always a rational number.

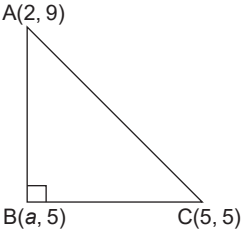
Section B

Section B consists of 5 questions of ***2 marks each****.*

21. If the point P(k–1, 2) is equidistant from the points A(3, k) and B(k, 5) find the values of k.

or

The points A(2, 9), B(a, 5) and C(5, 5) are the vertices of a triangle ABC right-angled at B. Find the value of a.



22. If PA and PB are tangents from an outside point P such that PA = 10 cm and $\angle APB = 60°$, find the length of the chord AB.

23. Determine the second and kth term of an AP whose 9th term is –2.6 and 23rd term is –5.4.

or

The sum of first 3 terms of an AP is half the sum of its next 3 terms. If its first term is 6, find the common difference.

24. If A and B are acute angles such that $\tan(A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, find A and B.

25. Calculate the median for the following data:

Mid-value	15	25	35	45	55	65
Frequency	4	28	15	20	17	16

Section C

Section C consists of 6 questions of ***3 marks each****.*

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

27. C is the mid-point of the line segment A(0, 4) and B(6, 0). C also divides the line segment joining the origin 0 and point P in the ratio 1 : 3. Find the coordinates of C and P and the length BP.

or

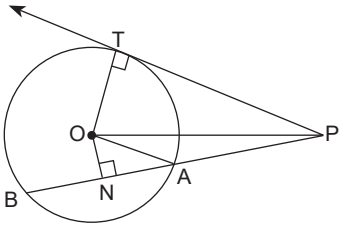
Determine the ratio in which the straight line $2x + y - 4 = 0$ divides the line segment joining points (2, –2) and (3, 7).

28. Prove that: $\frac{(\sin\theta + \cos\theta)^2 - 1}{\tan\theta - \sin\theta\cos\theta} = 2\cot^2\theta$

29. The following table gives the literacy rate (in percentage) in 40 cities. Find the mean literacy rate, choosing a suitable method:

Literacy rate %	45–55	55–65	65–75	75–85	85–95
Number of cities	4	11	12	9	4

30. From an external point P, a tangent PT and a line segment PAB is drawn to a circle with centre O, ON is perpendicular to the chord AB, Prove that



(*a*) $PA \cdot PB = PN^2 - AN^2$

(*b*) $PN^2 - AN^2 = OP^2 - OT^2$

or

Prove that the tangent drawn at the mid-point of an arc of a circle is parallel to the chord joining the end points of the arc.

31. The two-digit number is such that the product of the digits is 20. If 9 is subtracted from the number, the digits interchange their places. Find the number.

Section D

Section D consists of 4 questions of ***5 marks each****.*

32. A bus moving at its usual speed covers distance between towns A and B which are 550 km apart in 1 hour less than it takes to cover the same distance, when it is raining and the bus has to reduce the speed by 5 km/h. Calculate the time taken by the bus to cover the distance between A and B when it is raining.

or

A shopkeeper buys a number of books for ₹ 80. If he had bought 4 more books for the same amount, each book would have cost ₹ 1 less. Find the number of books he bought and also the initial price of the book.

33. Prove that any line drawn parallel to the parallel sides of a trapezium divides the non-parallel sides proportionately.

34. A chord AB of a circle of radius 15 cm makes an angle of 60° at the centre of the circle. Find the area of major and minor segments. [Take $\pi = 3.14$, $\sqrt{3} = 1.73$]

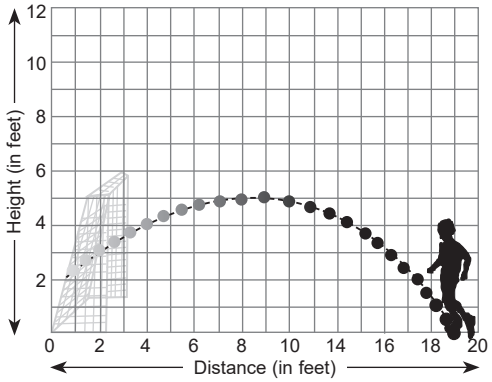
35. A man standing on the deck of a ship, which is 10 m above the water level, observes the angle of elevation of the top of a hill as 60° and the angle of depression of the base of the hill as 30°. Calculate the distance of the hill from the ship and the height of the hill. [$\sqrt{3} = 1.73$]

or

As observed from the top of a lighthouse 100 m above sea level the angle of depression of a ship, sailing directly towards it changes from 30° to 60°. Determine the distance travelled by the ship during the period of observation.

Section E

36. A football tournament was going on between a Delhi school and a Haryana school. The score was levelled and only 5 minutes were left. A boy from Haryana school scored a goal in the last minute and won the tournament. The path of the football was traced on a graph paper as shown. Here the variables x and y represents the horizontal distance (ft) and vertical height (ft) respectively. A quadratic function can be expressed as an expression in the form $ax^2 + bx + c$ where $a \neq 0$.



Based on above information, answer the following questions.

(*a*) What is the shape of the path followed by the football?

(*b*) What kind of polynomial is $f(x) = 0x^2 + 5x + 3$?

(*c*) (*i*) From the graph, write the number of zeroes of the curve of the polynomial.

or

(*ii*) At what height, did the ball reach the goal post?

37. A group of students conducted a survey in a particular locality regarding colour of the hair. The results of the survey are as follows:

65% of people surveyed has black hair

25% of people surveyed has brown hair

Remaining has white hair.

What is the probability that a person selected at random has

(*a*) white hair?

(*b*) brown or black hair?

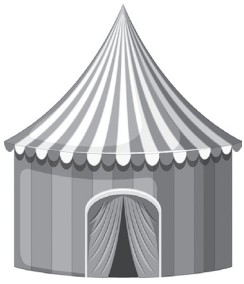
(*c*) (*i*) white or black hair?

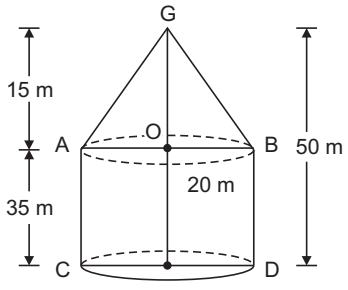
or

(*ii*) neither brown nor white hair?

38. The owner of the circus rented the ground in a certain city. A big tent was put up there. A circus tent of total height 50 metres is to be made in the form of a right circular cylinder surmounted by a right circular cone.

If the height and radius of the conical portion of the tent are 15 metres and 20 metres respectively, answer the following questions.





(*a*) What is the slant height of the conical part of the tent?

(*b*) What is the curved surface area of the conical part of the tent?

(*c*) (*i*) What is the curved surface area of the cylindrical part of the tent?

or

(*ii*) Find the cost of the cloth required, at the rate of ₹ 14 per square metre to make the tent. (Note that the base of the tent will not be covered with canvas.)