



MATHEMATICS

Class 10 - Mathematics

Time Allowed: 3 hours

Maximum Marks: 80

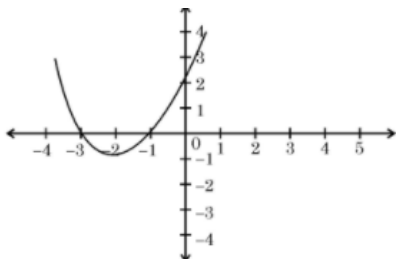
General Instructions:

Read the following instructions carefully and follow them:

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. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take $\pi = 22/7$ wherever required if not stated.
11. Use of calculators is not allowed.

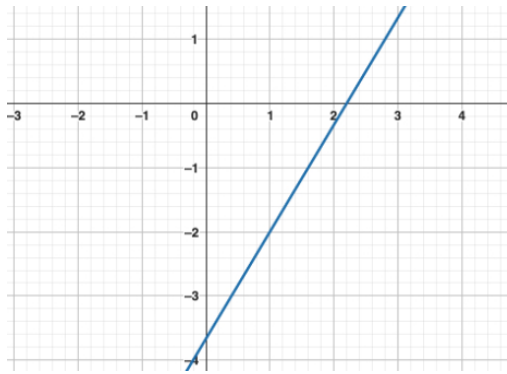
Section A

1. If a is rational and \sqrt{b} is irrational, then $a + \sqrt{b}$ is: [1]
 - a) an irrational number
 - b) an integer
 - c) a natural number
 - d) a rational number
2. In the figure, the graph of the polynomial $p(x)$ is given. The number of zeroes of the polynomial is: [1]

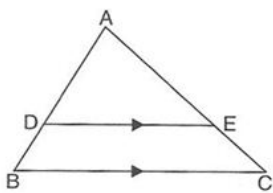


- a) 2
- b) 1
- c) 0
- d) 3

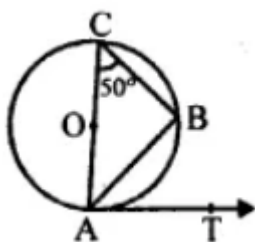
3. The pair of linear equations $5x - 3y = 11$ and $-10x + 6y = -22$ are [1]

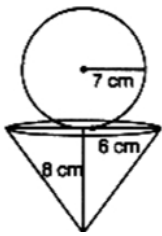


- a) coincident
b) incident
c) consistent
d) inconsistent
4. If the equation $9x^2 + 6kx + 4 = 0$ has equal roots then the value of k is _____. [1]
a) -2 or 0
b) 0 only
c) 2 or 0
d) 2 or -2
5. If $x + 1$, $3x$ and $4x + 2$ are three consecutive terms of an A.P., then the value of x is: [1]
a) 5
b) 2
c) 4
d) 3
6. The ordinate of the point on the y -axis, which is equidistant from $(-4, 1)$ and $(2, 3)$ is: [1]
a) 1
b) 2
c) -1
d) -2
7. The point which lies on the perpendicular bisector of the line segment joining the points $A(-2, -5)$ and $B(2, 5)$ is [1]
a) $(2, 0)$
b) $(-2, 0)$
c) $(0, 2)$
d) $(0, 0)$
8. In the given figure, $DE \parallel BC$. $AB = 15$ cm, $BD = 6$ cm, $AC = 25$ cm, then AE is equal to [1]



- a) 15 cm.
b) 18 cm.
c) 20 cm.
d) 10 cm.
9. In the given figure, O is the centre of a circle, AOC is its diameter such that $\angle ACB = 50^\circ$. If AT is the tangent to the circle at the point A , then $\angle BAT = ?$ [1]





Reason (R): Volume of sphere and surface area of cone is given by $\frac{4}{3}\pi r^3$ and $\frac{1}{3}\pi r^2 h$ respectively.

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

20. **Assertion (A):** Common difference of an AP in which $a_{21} - a_7 = 84$ is 14 [1]

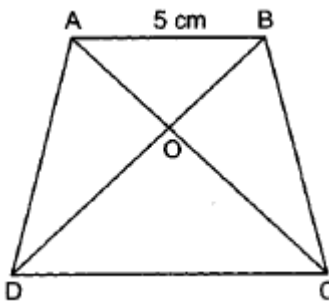
Reason (R): nth term of AP is given by $a_n = a + (n - 1)d$

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

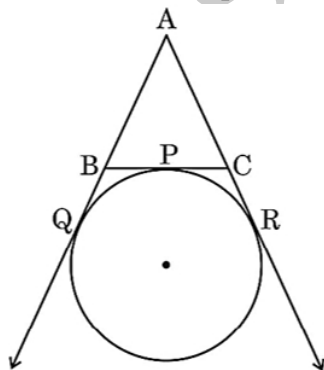
Section B

21. Find the LCM and HCF of the pairs of integers 510 and 92 and verify that $\text{LCM} \times \text{HCF} = \text{product of the two numbers}$. [2]

22. In Fig. $\frac{AO}{OC} = \frac{BO}{OD} = \frac{1}{2}$ and $AB = 5$ cm. Find the value of DC. [2]



23. A circle is touching the side BC of $\triangle ABC$ at P and touching AB and AC produced at Q and R respectively. Prove that $AQ = \frac{1}{2}(\text{perimeter of } \triangle ABC)$. [2]



24. prove that $(\sqrt{3} + 1)(3 - \cot 30^\circ) = \tan^3 60^\circ - 2\sin 60^\circ$ [2]

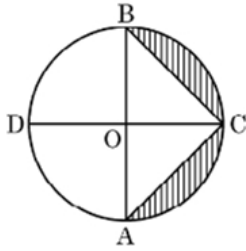
OR

Prove that: $\frac{\tan \theta - \cot \theta}{\sin \theta \cos \theta} = \sec^2 \theta - \text{cosec}^2 \theta$

25. A horse is tethered to one corner of a field which is in the shape of an equilateral triangle of side 12 m. If the length of the rope is 7 m, find the area of the field which the horse cannot graze. Take $\sqrt{3} = 1.732$. Write the answer correct to 2 places of decimal. [2]

OR

In the given figure, AB and CD are the diameters of a circle with centre O, perpendicular to each other. If OA = 7 cm, find the area of the shaded region.



Section C

26. Renu is giving away some packs of fruits to the charity. She has 45 oranges and 20 pears. She needs to calculate the maximum number of packs she can make out of the number of fruits available such that the fruits are equally distributed among the packs. [3]
27. Find the zeroes of the polynomial $y^2 + \frac{3}{2}\sqrt{5}y - 5$ by factorisation method and verify the relationship between the zeroes and coefficient of the polynomials. [3]
28. Solve for x and y: $6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1)$. [3]

OR

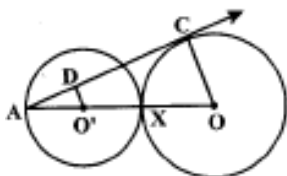
Graphically, solve the following pair of equations:

$$2x + y = 6$$

$$2x - y + 2 = 0$$

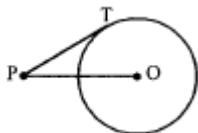
Find the ratio of the areas of the two triangles formed by the lines representing these equations with the x-axis and the lines with the y-axis.

29. Equal circles with centres O and O' touch each other at X. OO' produced to meet a circle with centre O', at A. AC is a tangent to the circle whose centre is O. O'D is perpendicular to AC. Find the value of $\frac{DO'}{CO}$. [3]



OR

In the adjoining figure, point P is 26 cm away from the centre O of the circle and the length PT of the tangent drawn from P to the circle is 24 cm. What is the radius of the circle.



30. Prove that: $\frac{\cos^3 \theta + \sin^3 \theta}{\cos \theta + \sin \theta} + \frac{\cos^3 \theta - \sin^3 \theta}{\cos \theta - \sin \theta} = 2$. [3]
31. The weights in kilograms of 60 workers in a factory are given in the following frequency table. Find the mean weight of a worker. [3]

Weight (in kg) x	60	61	62	63	64	65
No. of workers f	5	8	14	16	10	7

Section D

32. Sum of the areas of two squares is 452 m^2 . If the difference of their perimeters is 8 m, find the sides of the two squares. [5]

OR

A train travels at a certain average speed for a distance 63 km and then travels a distance of 72 km at an average speed of 6 km/hr more than the original speed. If it takes 3 hours to complete total journey, what is its original average speed?

33. In trapezium ABCD, $AB \parallel DC$ and $DC = 2AB$. EF drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{EC} = \frac{3}{4}$. Diagonal DB intersects EF at G. Prove that $7FE = 10AB$. [5]
34. An iron pillar consists of a cylindrical portion 2.8 m high and 20 cm in diameter and a cone 42 cm high is surmounting it. Find the weight of the pillar, given that 1 cm^3 of iron weighs 7.5 g. [5]

OR

A wooden article was made by scooping out a hemisphere from each end of a solid cylinder as shown in the 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.



35. The mode of the following frequency distribution is 55. Find the missing frequencies **a** and **b**. [5]

Class Interval	0 - 15	15 - 30	30 - 45	45 - 60	60 - 75	75 - 90	Total
Frequency	6	7	a	15	10	b	51

Section E

36. **Read the following text carefully and answer the questions that follow:** [4]

Jaspal Singh is an auto driver. His autorickshaw was too old and he had to spend a lot of money on repair and maintenance every now and then. One day he got to know about the EV scheme of the Government of India where he can not only get a good exchange bonus but also avail heavy discounts on the purchase of an electric vehicle. So, he took a loan of ₹ 1,18,000 from a reputed bank and purchased a new autorickshaw.



Jaspal Singh repays his total loan of ₹ 118000 by paying every month starting with the first instalment of ₹ 1000.

- If he increases the instalment by ₹ 100 every month, then what amount will be paid by him in the 30th instalment? (1)
- If he increases the instalment by ₹ 100 every month, then what amount of loan does he still have to pay after 30th instalment? (1)
- If he increases the instalment by ₹ 100 every month, then what amount will be paid by him in the 100th instalment? (2)

OR

If he increases the instalment by ₹ 200 every month, then what amount would he pay in 40th instalment? (2)

37. **Read the following text carefully and answer the questions that follow:** [4]

The Chief Minister of Delhi launched the, 'Switch Delhi', an electric vehicle mass awareness campaign in the

National Capital. The government has also issued tenders for setting up 100 charging stations across the city. Each station will have five charging points. For demo charging station is set up along a straight line and has charging points at $A\left(\frac{-7}{3}, 0\right)$, $B\left(0, \frac{7}{4}\right)$, $C(3, 4)$, $D(7, 7)$ and $E(x, y)$. Also, the distance between C and E is 10 units.



- i. What is the distance DE? (1)
- ii. What is the value of $x + y$? (1)
- iii. Points C, D, E are collinear or not? (2)

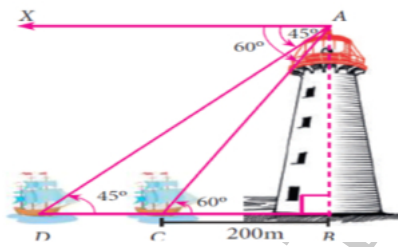
OR

What is the ratio in which B divides AC? (2)

38. **Read the following text carefully and answer the questions that follow:**

[4]

A man is watching a boat speeding away from the top of a tower. The boat makes an angle of depression of 60° with the man's eye when at a distance of 200 m from the tower. After 10 seconds, the angle of depression becomes 45° .



- i. What is the approximate speed of the boat (in km/hr), assuming that it is sailing in still water? (1)
- ii. How far is the boat when the angle is 45° ? (1)
- iii. What is the height of tower? (2)

OR

As the boat moves away from the tower, angle of depression will decrease/increase? (2)