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. The HCF of 135 and 225 is: **[1]**
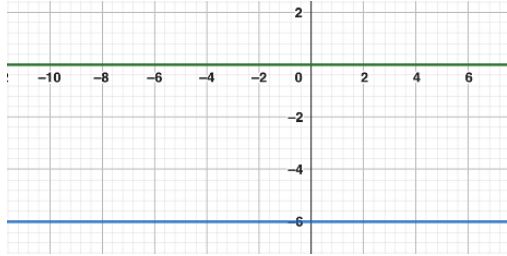
    a) 5   b) 15

    c) 45   d) 75

2. In the given figure, graph of a polynomial f(x) is shown. The number of zeroes of polynomial f(x) is: **[1]**
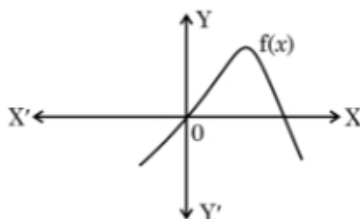
    a) 1   b) 3

    c) 2   d) 0

3. The pair of linear equations y = 0 and y = - 6 has: **[1]**

    a) no solution   b) only solution (0, 0)

    c) infinitely many solutions   d) a unique solution

4. If **p** is a root of the quadratic equation $x^2 - (p + q) x + k = 0$, then the value of **k** is **[1]**

    a) p + q   b) p

    c) pq   d) q

5. The 14th term from the end of the A.P. -11, -8, -5, ..., 49 is: **[1]**

    a) 28   b) 7

    c) 13   d) 10
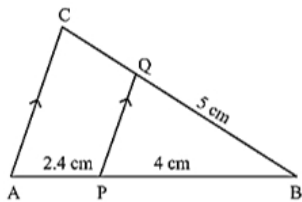
6. Distance of point P(3, 4) from x-axis is **[1]**

    a) 5 units   b) 1 unit

    c) 4 units   d) 3 units
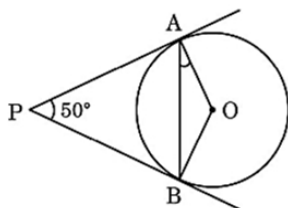
7. The distance of point P(4, -5) from origin is **[1]**

    a) $\sqrt{40}$ units   b) 1 unit

    c) 3 units   d) $\sqrt{41}$ units

8. In the given figure, PQ || AC. If BP = 4 cm, AP = 2.4 cm and BQ = 5 cm, then length of BC is: **[1]**

    a) 3 cm   b) $\frac{25}{3}$ cm

    c) 0.3 cm   d) 8 cm

9. In the figure, PA and PB are two tangents to the circle with centre O such that $\angle APB = 50^o$. Then, the measure of $\angle OAB$ is: **[1]**

    a) 100° b) 75°

    c) 25° d) 50°

10. The length of the tangent from an external point P to a circle of radius 5 cm is 10 cm. The distance of the point **[1]**

from the centre of the circle is

    a) 12 cm

    b) $\sqrt{125}$

    c) $\sqrt{104}$ cm

    d) 8 cm

11. $\frac{1+\tan^2 A}{1+\cot^2 A}$ is equal to **[1]**

    a) -1

    b) $\cot^2 A$

    c) $\tan^2 A$

    d) $\sec^2 A$

12. The value of $2\sin^2 30^o + 3\tan^2 60^o - \cos^2 45^o$ is: **[1]**

    a) 9

    b) $\frac{19}{2}$

    c) $3\sqrt{3}$

    d) $\frac{9}{4}$

13. A tree casts a shadow 7 m long on the ground, when the angle of elevation of the Sun is 45°. The height of the tree is: **[1]**

    a) 3.5 m

    b) $7\sqrt{3}$ m

    c) 7 m

    d) $\frac{7}{3}\sqrt{3}$ m

14. If the area of a sector of a circle is $\frac{7}{20}$ of the area of the circle, then the angle at the centre is equal to **[1]**

    a) 110°

    b) 100°

    c) 130°

    d) 126°

15. A piece of wire 20cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. The radius of the circle is **[1]**

    a) $\frac{20}{6+\pi}$ cm

    b) $\frac{30}{6+\pi}$ cm

    c) $\frac{60}{\pi}$ cm

    d) $\frac{15}{6+\pi}$ cm

16. Two dice are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is: **[1]**

    a) $\frac{1}{9}$

    b) $\frac{2}{9}$

    c) $\frac{1}{6}$

    d) $\frac{1}{12}$

17. A card is drawn at random from a well-shuffled deck of 52 playing cards. The probability of getting an ace of spade is: **[1]**

    a) $\frac{1}{13}$

    b) $\frac{3}{52}$

    c) $\frac{1}{52}$

    d) $\frac{1}{26}$

18. The median and mode respectively of a frequency distribution are 26 and 29. Then its mean is **[1]**

    a) 28.4

    b) 27.5

    c) 25.8

    d) 24.5

19. **Assertion (A):** In a solid hemisphere of radius 10 cm, a right cone of same radius is removed out. The volume of the remaining solid is 523.33 cm^3 [Take $\pi = 3.14$ and $\sqrt{2} = 1.4$] **[1]**

**Reason (R):** Expression used here to calculate volume of remaining solid = Volume of hemisphere - Volume of cone

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):** Let the positive numbers a, b, c be in A.P., then $\frac{1}{bc}, \frac{1}{ac}, \frac{1}{ab}$ are also in A.P. **[1]**

Reason (R): If each term of an A.P. is divided by a b c, then the resulting sequence is also in A.P.

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 greatest number which divides 85 and 72 leaving remainder 1 and 2 respectively. **[2]**

22. In the given figure, G is the mid-point of the side PQ of $\triangle$PQR and GH ∥QR. Prove that H is the mid-point of the side PR of the triangle PQR. **[2]**
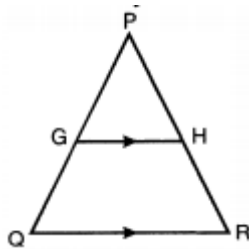
23. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O, is 60° then find the length of OP. **[2]**
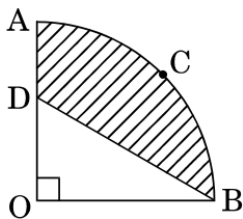
24. Prove the trigonometric identity: **[2]**

$\tan^2 A - \tan^2 B = \frac{\cos^2 B - \cos^2 A}{\cos^2 B \cos^2 A} = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$

OR

Prove that $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$.

25. In Figure, OACB is a quadrant of a circle with centre O and radius 7 cm. If OD = 3 cm, then find the area of the shaded region. **[2]**

OR

Find the area of the sector of a circle of radius 7 cm and of central angle 90°. Also, find the area of corresponding major sector.

Section C

26. There are 156, 208 and 260 students in groups A, B and C respectively. Buses are to be hired to take them for a field trip. Find the minimum number of buses to be hired, if the same number studets should be accommodated in each bus. **[3]**

27. If α and β are zeroes of the quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeroes are 2α and 2β. **[3]**

28. A sum of Rs 700 is to be used in give seven cash prizes to students of a school for their overall academic performance. If each prize is Rs 20 less than its preceding prize, find the value of each of the prizes. **[3]**

Find the term of the arithmetic progression 9, 12, 15, 18,... which is 39 more than its 36th term.

29. In the given figure, a circle is inscribed in a triangle PQR. If PQ = 10 cm, QR = 8 cm and PR = 12 cm, find the lengths of QM, RN and PL. **[3]**
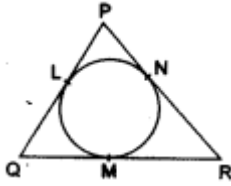
OR

Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.

30. If $\tan \theta + \sin \theta = m$ and $\tan \theta - \sin \theta = n$, show that $m^2 - n^2 = 4\sqrt{mn}$. **[3]**

31. Find the mean of the following frequency distribution: **[3]**

Class:	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35
Frequency:	4	10	5	6	5

Section D

32. The sum of reciprocals of Roohi's age (in years) 3 years ago and 5 years hence from now is $\frac{1}{3}$ Find her present age. **[5]**

OR

The hypotenuse (in cm) of a right angled triangle is 6 cm more than twice the length of the shortest side. If the length of third side is 6 cm less than thrice the length of shortest side, then find the dimensions of the triangle.

33. A statue 1.46m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is $60°$ and from the same point, the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal. [Use $\sqrt{3} = 1.73$.] **[5]**

34. A toy is in the form of a cone mounted on a hemisphere. The diameter of the base of the cone is 7 cm and its height is 15.5 cm. Find the volume of the toy. (Use $\pi = 3.14$). **[5]**

OR

A solid is in the shape of a cone standing on a hemisphere with both their diameters being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid. [Use $\pi = 3.14$]

35. Find the mean of the following distribution: **[5]**

| Class	10 - 25	25 - 40	40 - 55	55 - 70	70 - 85	85 - 100
Frequency	2	3	7	6	6	6

Section E

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

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.

Vishu 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.
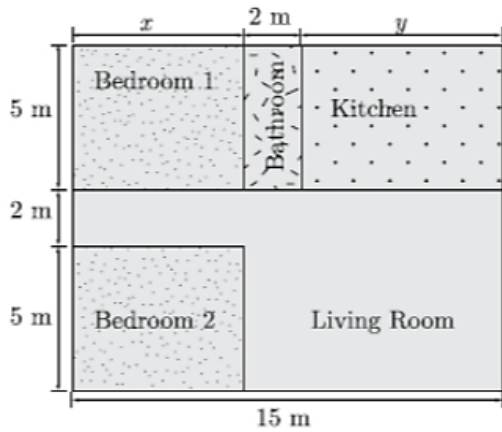
i. Which pair of linear equations does describe this situation? (1)

ii. What is the length of the outer boundary of the layout? (1)
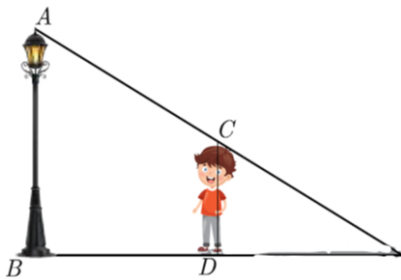
iii. What is the area of the bedroom 1? (2)

OR

What is the area of living room in the layout? (2)

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

Priyanshu 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 Priyanshu? (1)

ii. What is the minimum time after which his shadow will become larger than his original height? (1)

iii. What is the distance of Priyanshu from pole at this point? (2)

OR

What will be the length of his shadow after 4 seconds? (2)

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

Jagdish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.
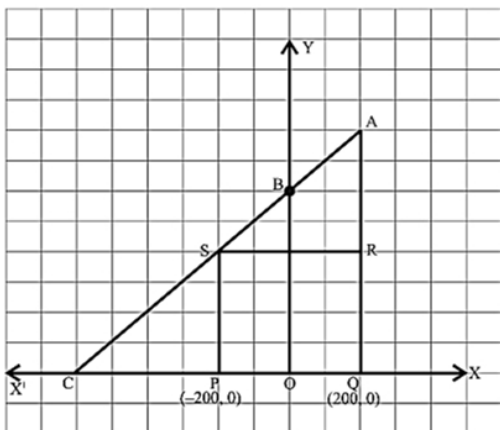
i. Taking O as origin, coordinates of P are (-200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S? (1)

ii. What is the area of square PQRS? (1)

iii. What is the length of diagonal PR in square PQRS? (2)

OR

If S divides CA in the ratio K : 1, what is the value of K, where point A is (200, 800)? (2)