General Instructions:

Read the following instructions very carefully and strictly follow them:

1. *This question paper contains **38** questions. **All** questions are **compulsory**.*
2. *This question paper is divided into **five** Sections – **A, B, C, D** and **E**.*
3. *In **Section A** – Question numbers **1** to **18** are multiple choice questions (MCQs) and question numbers **19** and **20** are Assertion – Reason based questions of **1** mark each.*
4. *In **Section B** – Question numbers **21** to **25** are Very Short Answer (VSA) type questions, carrying **2** marks each.*
5. *In **Section C** – Question numbers **26** to **31** are Short Answer (SA) type questions, carrying **2** marks each.*
6. *In **Section D** – Question numbers **32** to **35** are Long Answer (LA) type questions carrying **5** marks each.*
7. *In **Section E** – Question numbers **36** to **38** are **Case Study Based** questions carrying **4** marks each. Internal choice is provided in **2** marks questions in each case study.*
8. *There is no overall choice. However, an internal choice has been provided in **2** questions in Section **B**, **2** questions in Section **C**, **2** questions in Section **D** and **3** questions of **2** marks each in Section E.*
9. *Draw neat diagrams wherever required. Take $\pi = \frac{22}{7}$ wherever required, if not stated.*
10. *Use of calculator is **not allowed**.*

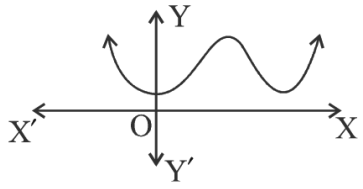
SECTION – A **$20 \times 1 = 20$**

Question numbers 1 to 20 are multiple choice questions of 1 mark each.

1. For any natural number n, 6^n ends with the digit:

a. 0 b. 6 c. 3 d. 2

2. The graph of $y = f(x)$ is given. The number of zeroes of $f(x)$ is:



a. 0 b. 1 c. 2 d. 4

3. If a pair of linear equations in two variables is represented by two coincident lines, then the pair of equations has:

a. a unique solution
b. two solutions
c. no solution
d. an infinite number of solutions

4. The common difference of the A.P.: $\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \ldots$ is:

a. $\sqrt{2}$ b. 1 c. $2\sqrt{2}$ d. $-\sqrt{2}$

5. If ΔABC and ΔDEF are similar such that 2 AB = DE and BC = 8 cm, then EF is equal to:

a. 4 cm b. 8 cm c. 12 cm d. 16 cm

6. The mid – point of the line segment joining the points $(5, -4)$ and $(6, 4)$ lies on:

a. $x - axis$
b. $y - axis$
c. origin
d. neither $x - axis$ nor $y - axis$

7. Given that $\sin\theta = \frac{a}{b}$, 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. $\frac{a}{\sqrt{b^2-a^2}}$

8. If $\cos A = \frac{1}{2}$, then the value of $\sin^2 A + 2\cos^2 A$ is:

a. $\frac{3}{2}$ b. $\frac{5}{4}$ c. -1 d. $\frac{1}{2}$

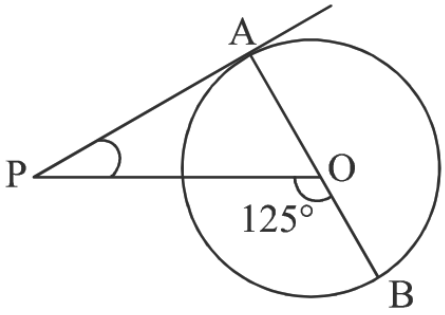
9. The string of a flying kite is tied to a point on the ground. The length of the string between the kite and the point on the ground is 80 m. The string makes an angle of 30° with the ground. The height of the kite above the ground is:

a. $20\sqrt{3}\, m$ b. $40\, m$ c. $40\sqrt{3}\, m$ d. $80\sqrt{3}\, m$

10. If TP and TQ are two tangents to a circle with centre O from an external point T so that $\angle POQ = 120°$, then $\angle PTQ$ is equal to:

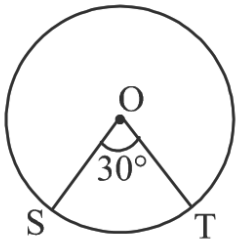
a. $60°$ b. $70°$ c. $80°$ d. $90°$

11. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 125°$, then the value of $\angle APO$ is equal to:



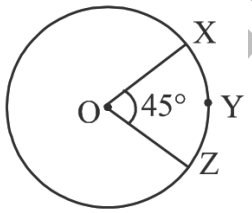
a. $25°$ b. $65°$ c. $90°$ d. $35°$

12. Shown in the given figure is a circle with centre O. The area of the minor sector is 7 cm^2. Area of the circle is:



a. $84\,\pi\ cm^2$ b. $\frac{84}{11}\ cm^2$ c. $84\ cm^2$ d. $\frac{\sqrt{84}}{\sqrt{\pi}}\ cm^2$

13. In the given figure, O is the centre of the circle. XYZ is an arc of the circle subtending an angle of $45°$ at the centre. If the radius of the circle is 32 cm, then the length of the arc XYZ is:



a. $4\pi\ cm$ b. $8\pi\ cm$ c. $64\pi\ cm$ d. $128\pi\ cm$

14. The radius of a sphere (in cm) whose volume is $36\pi\ cm^3$, is:

a. 3 b. $3\sqrt{3}$ c. $3^{\frac{2}{3}}$ d. $3^{\frac{1}{3}}$

15. If the mean and mode of a data are 12 and 21 respectively, then its median is:

a. 6 b. 13.5 c. 15 d. 14

16. A die is thrown once. Probability of getting a number other than 3 is:

a. $\frac{1}{6}$ b. $\frac{3}{6}$ c. $\frac{5}{6}$ d. 1

17. The HCF of 960 and 432 is:

a. 48 b. 54 c. 72 d. 36

18. The natural number 2 is:

a. a prime number
b. a composite number
c. prime as well as composite
d. neither prime nor composite

Directions: Question numbers 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

a. Both, Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
b. Both, Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the 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 polynomial $p(y) = y^2 + 4y + 3$ has two zeroes.
Reason (R): A quadratic polynomial can have at most two zeroes.

20. **Assertion (A):** The probability that a leap year has 53 Mondays is $\frac{2}{7}$.
Reason (R): The probability that a non – leap year has 53 Mondays is $\frac{5}{7}$.

SECTION – B

Question numbers 21 to 25 are Very Short Answer (VSA) type questions, carrying 2 marks each.

21. Do the points $P\ (1, 0), Q\ (-5, 0)$ and $R\ (-2, 5)$ form a triangle ? If so, name the type of triangle formed.

22. **(A)** If $tan\ \theta = \frac{24}{7}$, then find the value of $sin\ \theta + cos\ \theta$.

OR

(B) If $cot\ \theta\ = \frac{7}{8}$, then find the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$.

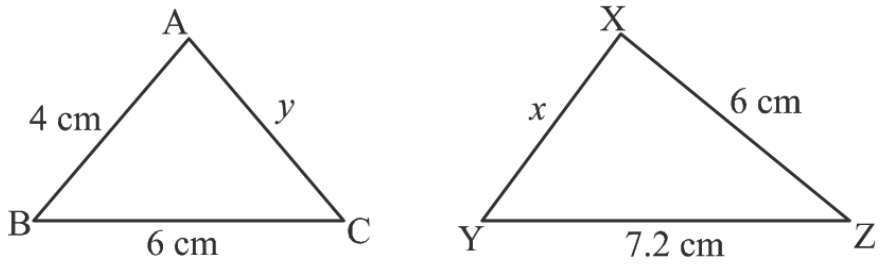
23. Two concentric circles are of radii 5 cm and 4 cm. Find the length of the chord of the larger circle which touches the smaller circle.

24. Find a quadratic polynomial whose zeroes are $\left(5 - 2\sqrt{3}\right)$ and $\left(5 + 2\sqrt{3}\right)$.

25. **(A)** In ΔABC, DE || BC. If AD = x, DB = $x - 2$, AE = $x + 2$ and EC = $x - 1$, then find the value of x.

OR

(B) In the figure given below, ΔABC ~ ΔXYZ, then find the values of x and y.



SECTION – C

Question numbers 26 to 31 are Short Answer (SA) type questions, carrying 3 marks each.

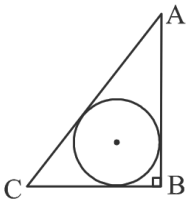
26. **(A)** If $x = h + a\ cos\ \theta, y = k + b\ sin\ \theta$, then prove that:

$\left(\frac{x-h}{a}\right)^2 + \left(\frac{y-k}{b}\right)^2 = 1$.

OR

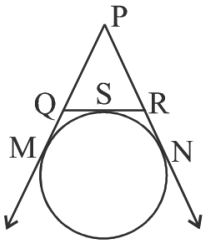
(B) Prove that: $\left(\frac{\tan A}{1+\sec A}\right) - \left(\frac{\tan A}{1-\sec A}\right) = 2\ cosec\ A$.

27. **(A)** In the given figure, ΔABC is a right triangle in which $\angle B = 90°$, AB = 4 cm and BC = 3 cm. Find the radius of the circle inscribed in the triangle ABC.



OR

(B) In the given figure, if a circle touches the side QR of ΔPQR at S and extended sides PQ and PR at M and N respectively, then prove that: $PM = \frac{1}{2}(PQ + QR + PR)$.



28. A right circular cylinder and a right circular cone have equal bases and equal heights. If their curved surface areas are in the ratio 8 : 5, then find the ratio between the radius of their bases to their height.
29. Two different coins are tossed simultaneously. What is the probability of getting:
(i) at least one head?
(ii) at most one tail?
(iii) a head and a tail?
30. Prove that $\sqrt{3}$ is an irrational number.
31. Find the ratio in which the $x - axis$ divides the line segment joining the points $(-6, 5)$ and $(-4, -1)$. Also, find the point of intersection.

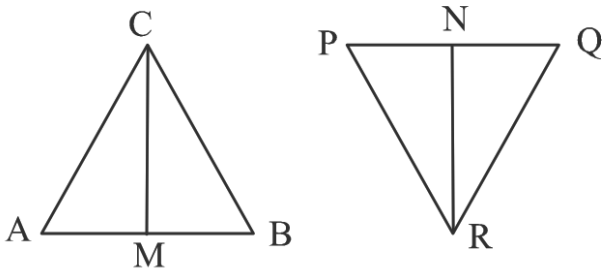
SECTION – D

Question numbers 32 to 35 are Long Answer (LA) type questions, carrying 5 marks each.

32. **(A)** State and prove Basic Proportionality Theorem.

OR

(B) In the given figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If ΔABC ~ ΔPQR, then prove that:



(i) ΔAMC ~ ΔPNR
(ii) ΔCMB ~ ΔRNQ

33. The marks obtained by 80 students of class X in a mock test of Mathematics are given below in the table. Find the **median** and the **mode** of the data:

Marks	Number of students
0 and above	80
10 and above	77
20 and above	72
30 and above	65
40 and above	55
50 and above	43
60 and above	28
70 and above	16
80 and above	10
90 and above	8
100 and above	0

34. Draw the graph of the pair of linear equations $x - y + 2 = 0$ and $4x - y - 4 = 0$. Calculate the area of the triangle formed by the lines so drawn and the $x - axis$.

35. **(A)** A faster train takes one hour less than a slower train for a journey of 200 km. If the speed of the slower train is 10 km/hr less than that of the faster train, find the speeds of the two trains.

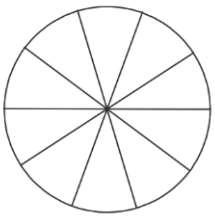
OR

(B) The sum of the areas of two squares is 640 m^2. If the difference in their perimeters is 64 m, find the sides of the two squares.

SECTION – E

Question numbers 36 to 38 are Case Study Based questions, carrying 4 marks each.

36. A brooch is crafted from silver wire in the shape of a circle with a diameter of 35 cm. The wire is also used to create 5 diameters, dividing the circle into 10 equal sectors as shown in figure.



Based on the above information, answer the following questions:

(i) What is the radius of the circle?

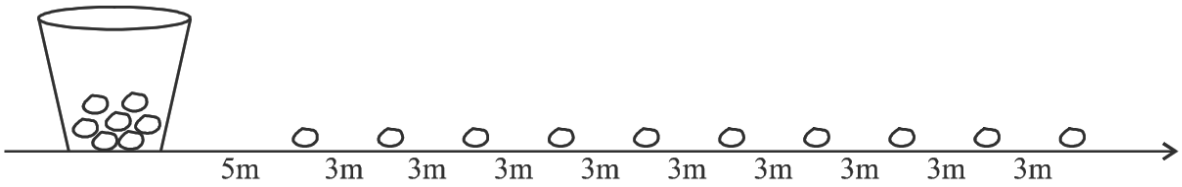
(ii) What is the circumference of the brooch?

(iii) (a) What is the total length of the silver wire required?

OR

(b) What is the area of each sector of the brooch?

37. In a potato race, a bucket is placed at the starting point, which is 5 m from the first potato. The other potatoes are arranged 3 m apart in a straight line, with a total of 10 potatoes, as shown in the figure:



A competitor starts from the bucket, picks up the nearest potato, runs back to the bucket to drop it in, then returns to pick up the next potato. This process continues until all the potatoes are in the bucket.

Based on the above information, answer the following questions:

(i) What is the distance covered to pick up the first potato and drop it in bucket?

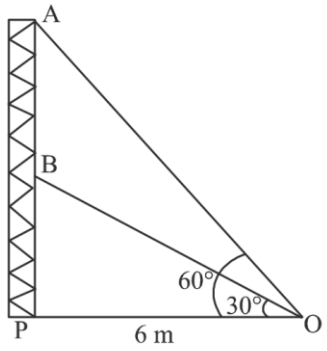
(ii) What is the distance covered to pick up the second potato and drop it in bucket?

(iii) (a) What is the total distance the competitor has to run?

OR

(b) If average speed of competitor is 5 m/s, then find the average time taken by competitor to put all the potatoes in the bucket.

38. 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. 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' (as shown in figure).



Distance between the base of the tower and point 'O' is 6 m. From point 'O', the angle of elevation of the top of the section 'B' is 30° and the angle of elevation of the top of section 'A' is 60°.

Based on the above information, answer the following questions:

(i) Find the length of the wire from the point O to the point of section B.

(ii) Find the length of the wire from the point O to the point of section A.

(iii) (a) Find the distance AB.

OR

(b) Find the area of ΔOPB.