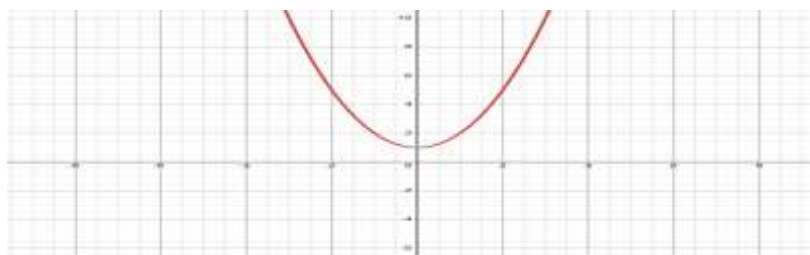Q1.   There are two pairs of natural numbers whose LCM is 78 and HCF is 13. The number are:
(a) 13, 39 & 26, 78
(b) 26, 39 & 13, 78
(c) 13, 26 & 39, 78
(d) 26, 78 & 13, 39

Q2.   The graph of a quadratic polynomial is shown below. The nature of its roots is:

(a) Two distinct real roots
(b) Exactly one real root
(c) Two equal real roots
(d) No real roots
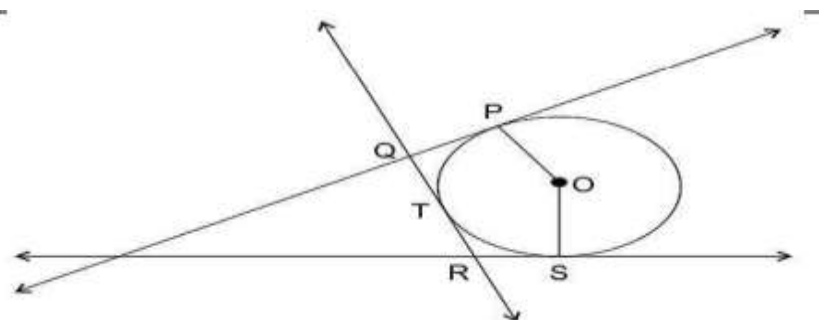
Q3.   If $f(x) = ax^2 + bx + c$ has no real zeroes and $a + b + c = 0$, then
(a) $c = 0$
(b) $c > 0$
(c) $c < 0$
(d) data not sufficient

Q4.   The pair of equations y= 5 and y = 6 has
(a) one solution
(b) two solutions
(c) infinitely many solutions
(d) no solution

Q5.   Shown below is a circle with centre O having tangents at points P, T and S. If QR = 12 cm and the radius of the circle is 7 cm, what is the perimeter of the polygon PQTRSO?

(a) 26 cm
(b) 31 cm

(c) 38 cm

(d) data insufficient

Q6. In the quadratic equation $6x^2 - gx + 2 = 0$, the sum of the roots is equal to three times their product. What is the value of g?

(a) -6

(b) -1/6

(c) 1

(d) 6

Q7. What is/are the roots of $3x^2 = 6x$?
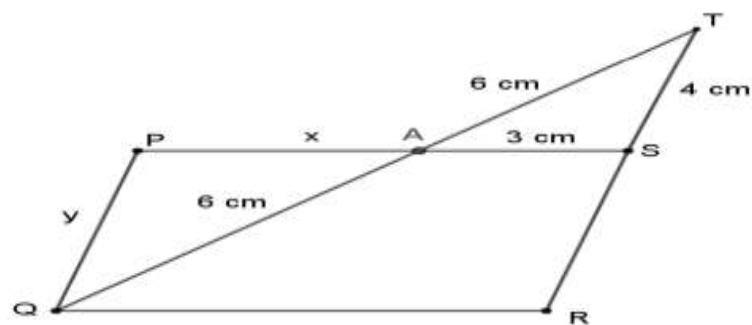
(a) only 2

(b) only 3

(c) 0 and 6

(d) 0 and 2

Q8. Find the value of the expression $1 - 6 + 2 - 7 + 3 - 8 + \ldots$ 50 terms (A.P)

(a) 125

(b) -125

(c) 250

(d) -250

Q9. In a game, a player must gather 20 flags positioned 5 meters apart in a straight line. The starting point is 10 meters away from the first flag. The player starts from the starting point, collects the 20 flags and comes back to the starting point to complete one round. What will be the total distance covered by a player upon completing one round?

(a) 105 m

(b) 210 m

(c) 220 m

(d) 1150 m

Q10. In given figure, PQRS is a parallelogram, if AT = AQ = 6 cm, AS = 3 cm and TS = 4 cm, then

(a) x = 4, y = 5

(b) x = 2, y = 3

(c) x = 1, y = 2

(d) x = 3, y = 4

Q11. If $4 \cot \theta - 5 = 0$, then the value of $\dfrac{5 \sin \theta - 4 \cos \theta}{5 \sin \theta + 4 \cos \theta}$ is:

(a) 5/3

(b) 5/6

(c) 0

(d) 1/6

Q12. Which of the following is true with respect to trigonometric ratios?

(a) sin82° > sin42°

(b) cos47° > cos16°

(c) tan45° = cot90°

(d) none of the above

Q13. If the distance between the points (4, p) and (1, 0) is 5, then the value of p is

(a) 4

(b) -4

(c) ± 4

(d) 0.4

Q14. A circular pond needs to be fenced along its circumference. One-fourth of the fencing is already done, which cost Rs 750 at the rate of Rs 50 per metre. How many metres of the pond still need to be fenced?

(a) 15

(b) 20

(c) 45

(d) 60

Q15. Two solid right circular cylinders A and B have the same radius and same height. In cylinder B, a small cylindrical portion is cut from the bottom and placed on the top of the same cylinder. No material is added or removed in the process. With respect to cylinders A and B, which of the following is correct?

(a) Both the volume and total surface area are different

(b) Both the volume and total surface area are the same

(c) Volume is the same but total surface area is different

(d) Volume is different but total surface area is the same

Q16. If the length of the shadow of a tower is decreasing, then the angle of elevation of the sun is

(a) decreasing

(b) increasing

(c) same

(d) can't say

Q17. Ginny flipped a fair coin three times and tails came up each time. Ginny wants to flip the coin again. What is the probability of getting heads in the next coin flip?

(a) 0

(b) 0.25

(c) 0.5

(d) 1

Q18. The mean of 10 numbers is 12.5. The mean of first six is 15 and last five is 10. Then the sixth number is:

(a) 10

(b) 20

(c) 15

(d) 25

Q19. How many tangents can be drawn from an external point to a circle?
(a) 1
(b) 2
(c) between 1 and 5
(d) infinitely many

Q20. The median of a given data set is y. Each data value is multiplied by 100, then the new median is:
(a) y
(b) 100y
(c) 50y
(d) 0

Section B (5x2 = 10)

Q21. Find the values of x and y: $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$ & $\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$

OR

Solve for x and y: 3(2x + y) = 7xy & 3(x + 3y) = 11xy

Q22. A boy of height 90cm is walking away from the base of a lamp post at a speed of 1.2m/sec. If the lamp is 3.6m above the ground, find the length of his shadow after 4 seconds.

OR

Prove that the perimeters of two similar triangles are in the same ratio as their corresponding sides.

Q23. A boy organizes a game in which a player throws a ball at random onto a rectangular chart paper of dimensions 10 cm × 20 cm with his eyes closed. On the chart paper, an equilateral triangular region of side 2 cm and a circular region of radius 7 cm are marked, as shown in the figure. The player wins the game if the ball lands inside either the triangular region or the circular region. Find the probability that the player wins the game.

Q24. The HCF and LCM of two numbers are 33 and 264 respectively. When the first number is divided by 2 exactly, the quotient obtained is 33. Find the numbers.

Q25. Derive the values of sin30° and sin60° geometrically.

OR

If secθ = x + 1/ 4x, then prove that secθ + tanθ = 2x or 1/2x

SECTION C (6x3 = 18)

Q26. What will be the least possible number of planks, if there pieces of timber 42m, 49m and 63m long must be divided into planks of the same length.

OR

Floor of a room measures 12m x 9m. Find the minimum number of complete square marble slabs of equal size required to cover the entire floor.

Q27. The ages of two friends A and P differ by 3years. P's father Q Is twice as old as P and A is twice as old as his/her sister K. The ages of K and Q differ by 30 years. Find the ages of A and A.

OR

A train covered a certain distance at a uniform speed. If the train would have been 6km/h faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6km/h, it would have taken 6 hours more than the scheduled time. Find the length of journey.

Q28. If (secA + tanA)(secB + tanB)(secC + tanC) = (secA - tanA)(secB - tanB)(secC - tanC), prove that each of the sides is equal to ±1.
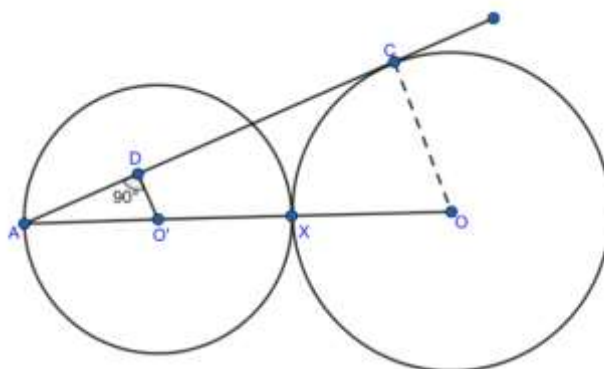
OR

Prove:

$$\left(\frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta}\right)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

Q29. A cone made up of paper has height 3h and vertical angle 2α. It contains two other cones of height 2h and h and vertical angles 4α and 6α respectively. Find the ratio of the two volumes in between the cones.

OR

Water flows through a cylindrical pipe, whose inner radius is 1cm, at the rate of 80cm/s in an empty cylindrical tank, the radius of whose base is 40cm. What is the rise of water level in tank in half an hour?

Q30. If (-2, 3), (4, -3) and (4, 5) are the mid-points of the sides of a triangle, find the coordinates of its centroid.

Q31. In the figure given below, equal circles with centres O and O' touch each other at X. OO' is produced to meet a circle O' at A. AC is tangent to the circle whose centre is O. O'D is perpendicular to AC. Find the value of $\frac{AO'}{AO}$
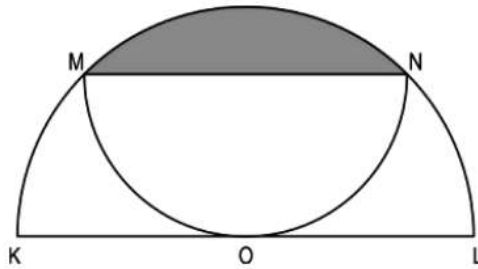
From a point P, two tangents PA and PB are drawn to a circle with centre O. If OP=diameter of the circle, show that △APB is equilateral.

SECTION D (4x5 = 20)

Q32.   A semi-circle MON is inscribed in another semi-circle. Radius OL of the larger semi-circle is 6cm. Find the area of the shaded segment in terms of π.
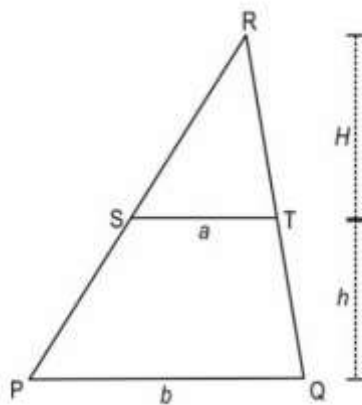
In an equilateral triangle of side 24 cm, a circle is inscribed touching its sides. Find the area of the remaining portion of the triangle. (Take √3 = 1.732)

Q33.   The ratio of the sum of n terms of two AP's is $(7n + 1):(4n + 27)$. Find the ratio of their m^{th} terms.
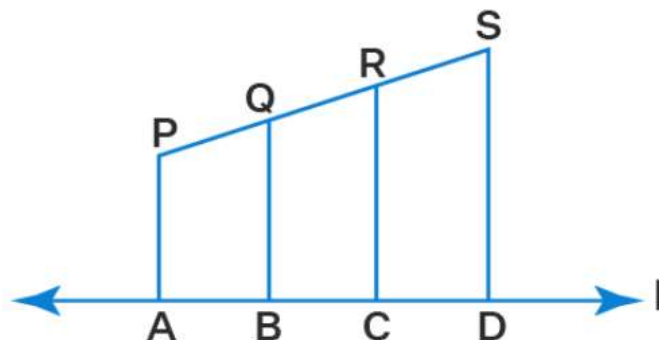
If there are $(2n + 1)$ terms in an AP, then prove that the ratio of the sum of odd terms and the sum of even terms is $(n + 1):n$.

Q34.   In the figure below, ST ∥ PQ. All measurements are in units. Prove that the area of the trapezium PQTS is $[0.5(a+b)h]$.
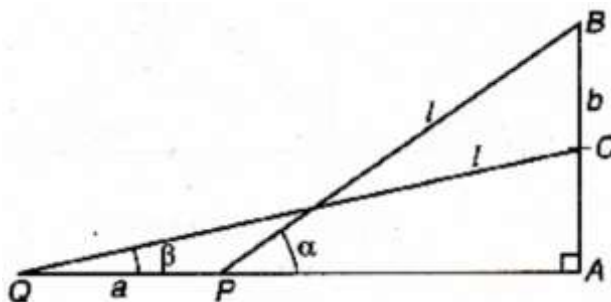
In the figure shown below PA, QB, RC and SD are all perpendiculars to a line l. AB = 6 cm, BC = 9 cm, CD = 12 cm and SP = 36 cm. Find PQ, QR and RS.

Q35.   A ladder rests against a wall at an angle α to the horizontal. Its foot is pulled away from the wall through a distance a, so that slides a distance b down the wall making an angle β with the horizontal. Prove: $\dfrac{a}{b} = \dfrac{\cos\alpha - \cos\beta}{\sin\beta - \sin\alpha}$

OR

From an aeroplane vertically above a straight horizontal road, the angles of depression of two consecutive mile stones on opposite sides of the aeroplane are observed to be α and β. Show that the height in miles of aeroplane above the road is given by:

$$\frac{\tan\alpha\,\tan\beta}{\tan\alpha + \tan\beta}$$