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

27. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height h. At a point on the plane, the angles of elevation of the bottom and the top of the flag staff are α and β, respectively. Prove that the height of the tower is $\dfrac{h\tan\alpha}{\tan\beta - \tan\alpha}$.

Or

The angle of elevation of the top of a tower 30 m high from the foot of another tower in the same plane is 60° and the angle of elevation of the top of the second tower from the foot of the first tower is 30°. Find the distance between the two towers and also the height of the other tower.

28. Prove that in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
Using the above result prove the following: In $\triangle ABC$, D is the mid-point of BC, $AE \perp BC$. If AC >AB then show that $AB^2 = AD^2 - BC.DE + \frac{1}{4} BC^2$.

29. A toy is in the form of a right circular cylinder with a hemisphere on one end and a cone on the other. The height and radius of the cylindrical part are 13 cm and 5 cm respectively. The radius of hemisphere and base of the conical part are same as that of the cylinder. Calculate the surface area of the toy, if the height of the cone is 12cm. (Take $\pi = \dfrac{22}{7}$).

30. Find the mean, mode and median for the following data :

Class	5 - 15	15 - 25	25 - 35	35 - 45	45 - 55	55 - 65	65 - 75
Frequency	2	3	5	7	4	2	2

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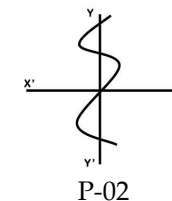Ph: 6450282, 2424758 Mob: 92294 97622

Mathematics
(Sample Paper - I)

Section - A
(1 mark questions)

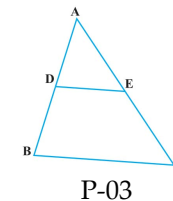1. If $\dfrac{p}{q}$ is a rational number (q ≠ 0), what is the condition on q so that the decimal representation of $\dfrac{p}{q}$ is terminating?

2. Write the number of zeros of the polynomial y = f(x) whose graph is given in figure P-02.

3. In the given figure P-03, DE ∥ BC. AD = 1 cm and BD = 2 cm. What is the ratio of the area of $\triangle ABC$ to that of $\triangle ADE$?

P-02   P-03

4. For what value of k the quadratic equation $x^2 - k x + 4 = 0$ has equal roots?

5. In right triangle ABC, right-angled at C, if tan A = 1, write the value of sin A cos B.

6. If the nth term of AP -3, 3, 9, 15……… is 141, find the value of n.

7. A cylinder, a cone and a hemisphere are of equal base and have same height .What is the ratio of their volumes?

8. Two tangents TP and TQ are drawn from an external point T to a circle with centre O .If they are inclined to each other at an angle 120°, then what is the value of ∠POQ?

9. A card is drawn from a well shuffled deck of playing cards. What is the probability of getting a queen of red color?

10. Find the median class of the following distribution:

Class	0 - 5	5-10	10-15	15-20	20-25
Frequency	5	9	12	18	6

Section - B
(2 marks questions)

11. Solve: $4x + \dfrac{6}{y} = 15, \ 6x - \dfrac{8}{y} = 14$.

12. Without using trigonometric table, find the value of:
    $4 (\cos^4 60° + \sin^4 30°) - 3 (\cos^2 45° + \sin^2 90°)$.

13. Find the area of Quadrilateral ABCD whose vertices are A(-5,-3), B(4,-6), C(2,-1) and D(1,2).

14. In ΔABC, D and E are points on sides AB and AC such that $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

    and ∠ADE = ∠ACB. Prove that ΔABC is an isosceles triangle.

15. A die is thrown once. Find the probability of getting
    (i) a prime number, (ii) a number less than 6.

    Or

    All the queens, jacks and diamonds have been removed from a pack of 52 cards. The remaining cards are well shuffled and a card is drawn at random. Find the probability that it is a:
    (i) face card,   (ii) black card.

Section - C
(3 marks questions)

16. Use Euclid's division lemma to show that the cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8.

    Or

    Show that $3 + 2\sqrt{5}$ is irrational.

17. If α and β be two zeroes of the quadratic polynomial p(x) = 2x² – 5x + 8, evaluate:

    (i) α² + β²   (ii) $\dfrac{\alpha^2}{\beta} + \dfrac{\beta^2}{\alpha}$.

18. Draw the graphs of the following equations:
    2x – 3y + 6 = 0, 2x + 3y – 18 = 0, y – 2 = 0.
    Find the vertices of the triangle so obtained.

19. If the 8th term of an A.P. is 37 and the 15th term is 15 more than the 12th term, find the A.P. Hence find the sum of the first 15 terms of the A.P.

20. Prove that: $\sqrt{\dfrac{\sec\theta - 1}{\sec\theta + 1}} + \sqrt{\dfrac{\sec\theta + 1}{\sec\theta - 1}} = 2 \csc\theta$.

    Or

   Prove that: $\dfrac{\sin\theta}{\cot\theta + \csc\theta} = 2 + \dfrac{\sin\theta}{\cot\theta - \csc\theta}$.

21. Find the ratio in which the line 3x + y – 9 = 0 divides the line segment joining the points (1, 3) and (2, 7).

22. Find the point on the x-axis which is equidistant from the points (2, -5) and (-2, 9). Hence find the area of the triangle formed by these points.

23. Construct a triangle with sides 6 cm, 7 cm and 8 cm and then construct a

    triangle similar to the above triangle but each side of which is $\dfrac{7}{5}$ times the

    corresponding side of the first triangle.

24. A circle touching the side BC of a ΔABC at P and touching AB and AC produced at Q and R respectively (figure P-24). If AB = 4.4 cm, BC = 3 cm and AC = 4 cm, find the length of the tangent AQ.

25. Four equal circles, each of radius 7cm touch each other as shown in figure P-25A. Find the area included between them.
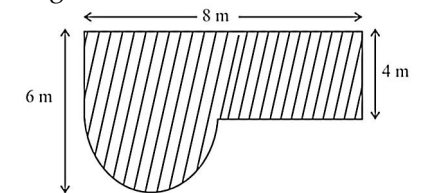
    Or

    Find the area of the shaded field shown in figure P-25B.
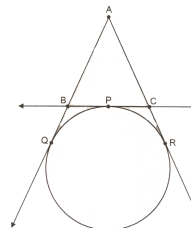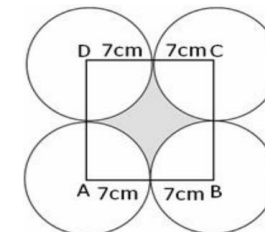
P-24   P-25A   P-25B

Section - D
(6 marks questions)

26. At present Asha's age (in years) is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present ages of both Asha and Nisha.

    Or