Octahedral classes, kharadi

2nd floor, yashwant plaza, near bank of India,

Class 10 - Mathematics
Maths Prelim 2

Maximum Marks: 80   **Time Allowed: 3 hours**

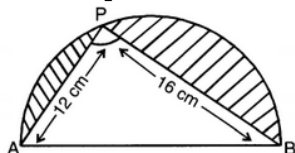### Section A

1. Answer the following   **10**

   a) Determine the values of m and n so that the following system of linear equations have infinite number of solutions:
      (2m - 1)x + 3y - 5 = 0
      3x + (n - 1)y - 2 = 0

   b) The equation $ax^n + by^n + c = 0$ represents a straight line if

   c) For what value of a the following pair of linear equation has infinitely many solution?
      ax - 3y = 1
      -12x + ay = 2

   d) In a deer park, the number of heads and the number of legs of deer and human visitors were counted and it was found that there were 39 heads and 132 legs. Find the number of deer and human visitors in the park.

   e) A thin wire is in the shape of a circle of radius 77 cm. It is bent into a square. Find the side of the square $\left(\text{Taking}, \pi = \frac{22}{7} \right)$

   f) In the given figure, AB is the diameter where AP = 12 cm and PB = 16 cm. Taking the value of π as 3, find the perimeter of the shaded region.

   g) The area of two concentric circles forming a ring are 154 cm^2 and 616 cm^2. Find the breadth of the ring.

   h) The circumference of two circles are in the ratio 4 : 9. Find the ratio of their area.

   i) Find the 6th term from the end of the A.P. 17,14,11,..., - 40

   j) What is the common difference of an A.P. in which $a_{21} - a_7 = 84$?

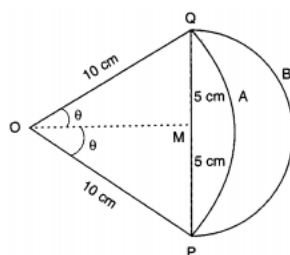2. Answer the following   **10**

   a) P(5, -3) and Q(3, y) are the points of trisection of the line segment joining A(7, -2) and B (1, -5). Find y.

   b) Find the area of the triangle with vertices (0 ,0) (6 ,0) and (0 ,5).

   c) Find the co-ordinates of the point on the y-axis which is equidistant from the points A(5,3) and B(1, -5).

   d) Find the distance between the following pairs of points: (a, b), (-a, -b)

   e) Is series $\sqrt{3}, \sqrt{6}, \sqrt{9}, \sqrt{12}, \ldots \ldots$ an A.P.? Give reason.

   f) Find the 10th term of the AP 2, 7, 12,...

   g) Evaluate $\cot^2 30° - 2\cos^2 60° - \frac{3}{4}\sec^2 45° - 4 \sec^2 30°$.

   h) If tan A = cot B, prove that A + B = 90°.

   i) Prove the trigonometric identity: $\mathrm{cosec}\theta(1+ \cos\theta)(\mathrm{cosec}\theta - \cot\theta) = 1$.

   j) Prove the trigonometric identity:
      $\tan^2\theta \cos^2\theta = 1 - \cos^2\theta$

Section B

3. Answer any 6   **12**

   a) The diameter of a wheel of a bus is 90 cm which makes 315 revolutions per minute. Determine its speed in km/h.

   b) The areas of two circles are in the ratio 4 : 9. What is the ratio between their circumferences?

   c) Prove that: $\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$

   d) Prove the following identity, where the angles involved are acute angles for which the expressions are defined. $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$

   e) For what value of k will the equations x + 2y + 7 = 0 , 2x + ky + 14 = 0 represent coincident lines?

   f) Solve the following system of equations:

      3x - 7y +10=0

      y - 2x -3=0

   g) Find the values of k for which the points A(k + 1, 2k), B(3k, 2k + 3) and C(5k - 1,5k) are collinear.

   h) Find the co-ordinates of the points which divide the line segment joining the points (–4, 0) and (0, 6) in four equal parts.

<center>**Section C**</center>

4. Answer any 8   **24**

   a) The sum of first n terms of three arithmetic progressions are S_1, S_2 and S_3 respectively. The first term of each A.P. is 1 and common differences are 1, 2 and 3 respectively. Prove that $S_1 + S_3 = 2S_2$

   b) An AP consists of 21 terms. The sum of the three terms in the middle is 129 and of the last three is 237. Find the AP.

   c) Father's age is three times the sum of the ages of his two children. After 5 years, his age will be twice the sum of the ages of two children. Find the age of father.

   d) A two-digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.

   e) If (0, -3) and (0, 3) are the two vertices of an equilateral triangle, find the coordinates of its third vertex.

   f) Find k so that the point P (-4, 6) lies on the line segment joining A (k, 10) and B (3, - 8). Also, find the ratio in which P divides AB.

   g) A wire when bent in the form of an equilateral triangle encloses an area of $121\sqrt{3}$ cm^2. If the wire is bent in the form of a circle, find the area enclosed by the circle,$\left(\text{ Use } \pi = \frac{22}{7}\right)$

   h) Figure shows two arcs, A and B. Arc A is part of the circle with centre O and radius OP. Arc B is part of the circle with centre M and radius PM, where M is the mid-point of PQ. Show that the area enclosed by the two arcs is equal to $25\left(\sqrt{3} - \frac{\pi}{6}\right)$ cm^2 .
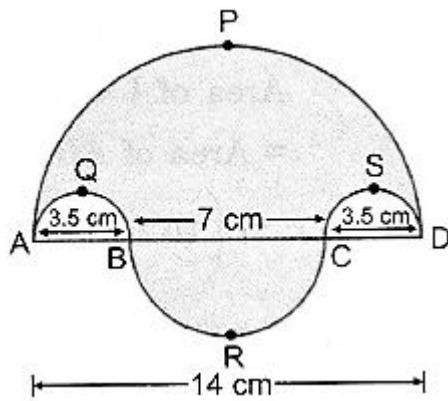

   i) If A, B, C are itnerior angles of $\triangle$ABC, show that $\csc^2(\frac{B+C}{2})$ - $\tan^2(\frac{A}{2})$ = 1.

   j) Prove the identity:

      $(cosec\theta - \sin\theta)(\sec\theta - \cos\theta) = \frac{1}{\tan\theta + \cot\theta}$

<center>**Section D**</center>

5. Answer any 6   **24**

   a) Two digit number is obtained by either multiplying the sum of digits by 8 and then subtracting 5 by multiplying the difference of digits by 16 and then adding 3. Find the number.

   b) Find the area of the shaded region in Figure, $\widehat{APD}, \widehat{AQB}, \widehat{BRC}$ and $\widehat{CSD}$, are semi-circles of diameter 14 cm, 3.5 cm, 7 cm and 3.5 cm respectively.$\left(\text{ Use } \pi = \frac{22}{7}\right)$.

c) The 13th term of an AP is 4 times its 3rd term. If its 5th term is 16, find the sum of its first 10 terms.

d) Solve the AP: (-4) + (-1) + 2 + 5 + ---- + x = 437.

e) Prove the trigonometric identity:

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

f) If cosec A = 2, find the value of $\frac{1}{\tan A} + \frac{\sin A}{1+\cos A}$.

g) A(1, -2), B(2, 3), C(-3, 2) and D (-4 ,-3) are the vertices of parallelogram ABCD, By taking AB as the base, find the height of the parallelogram.