VIVEK TUTORIALS

Preliminary Examination

Std: SSC (E.M) **Subject: Mathematics II** **Time: 2 Hours**

Date : 23/Jan/2020 **Max Marks: 40**

(i) All questions are compulsory.
(ii) Use of calculator is not allowed.
(iii) Total marks are shown on the right side of the question.

Q.1 (A) Choose the correct alternative: **4**

(1) ΔABC is such that AB = 3 cm, BC = 2 cm and CA = 2.S cm. If ΔDEF ~ ΔABC and EF = 4 cm, then perimeter of ΔDEF is
(a) 7.5 cm (b) 15 cm (c) 22.5 cm (d) 30 cm

(2) Tangents drawn from two ends of a diameter are _____.
(a) parallel (b) intersecting (c) non-planer (d) skew

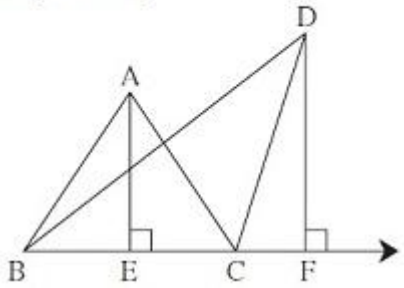
(3) If the area of a sector of a circle is 5/18 of the area of the circle, then the sector angle is equal to
(a) 60° (b) 90° (c) 100° (d) 120°

(4) Distance of point (-3,4) from the origin is _____.
(A) 7 (B) 1 (C) 5 (D) -5

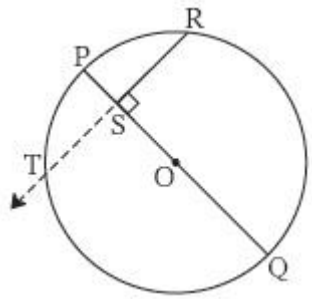
(B) Solve the following: **4**

(1) In below figure AE ⊥ seg BC, seg DF ⊥ line BC, AE = 4, DF = 6, then find

$$\frac{A(\Delta ABC)}{A(\Delta DBC)}$$



(2) In figure below, seg PQ is a diameter of a circle with centre O. R is any point on the circle. seg RS ⊥ seg PQ. Prove that, SR is the geometric mean of PS and SQ. [That is, $SR^2 = PS \times SQ$]



(3) Prove the following: $\tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$

(4) Find the distance between each of the following pairs of points: T(-3, 6), R(9, -10)

Q.2 (A) Complete the following activities:(Any TWO) **4**

(1) Find the coordinates of point P if P divides the line segment joining the points A(-1,7) and B(4,-3) in the ratio 2 : 3.

P(x, y) divides seg AB in the ratio 2 : 3.

$A(-1, 7) = (x_1, y_1)$

$B(4, -3) = (x_2, y_2)$

$m : n = 2 : 3$

By section formula,

$$x = \frac{mx_2 + nx_1}{m + n}; \text{ and } y = \frac{my_2 + ny_1}{m + n}$$

$$= \frac{2 \times 4 + 3 \times (-1)}{2 + 3} \text{ and } \frac{2 \times \square + 3 \times (7)}{2 + \square}$$

$$= \frac{8 - 3}{5} \text{ and } \frac{-6 + \square}{5}$$

$$= \frac{5}{5} \text{ and } \square$$

$x = 1$ and $y = 3$

$\therefore$ The coordinates of point P are (1, 3).

(2) Measure of an arc of a circle is 80 cm and its radius is 18 cm. Find the length of the arc. ($\pi = 3.14$)

For a sector, $r = 18$ cm, $\theta = 80$

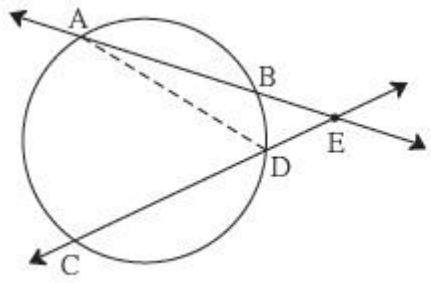
Length of an arc = $\square \times 2\pi r$

$= \square \times 2 \times 3.14 \times \square$

$= 3.14 \times 8$

$= \square$

(3) Prove that, if two lines containing chords of a circle intersect each other outside the circle, then the measure of angle between them is half the difference in measures of the arcs intercepted by the angle.



Given : Chords AB and CD intersect at $\square$ in the $\square$ of the circle.

To prove: $\angle\square = \frac{1}{2}[m(\text{arc AC}) - m(\square)]$

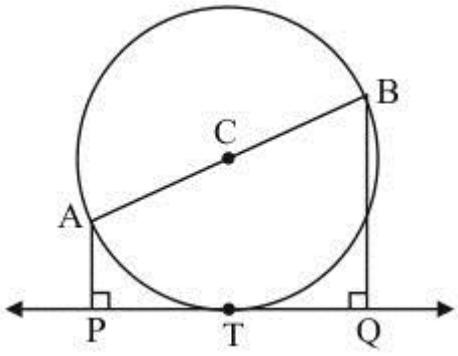
Construction: Draw seg AD.

Consider angles of Δ AED and its exterior angle and write the proof.

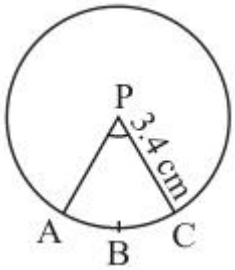
(B) Solve the following: (Any FOUR) **8**

(1) Draw any circle. Take any point A on it and construct tangent at A without using the centre of the circle.

(2) In figure below, seg AB is a diameter of a circle with centre C. Line PQ is a tangent, which touches the circle at point T. seg AP $\perp$ line PQ and seg BQ $\perp$ line PQ. Prove that, seg CP $\cong$ seg CQ.

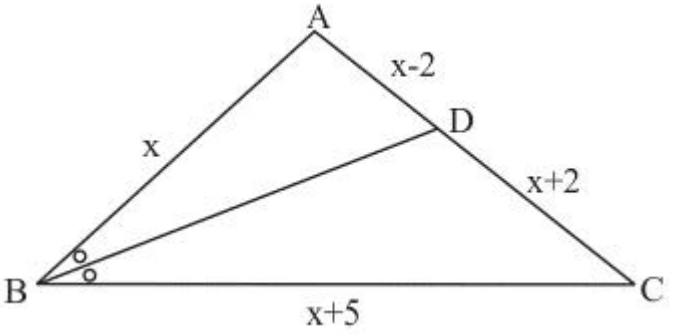


(3) In figure below, radius of circle is 3.4 cm and perimeter of sector P – ABC is 12.8 cm. Find A(P – ABC)



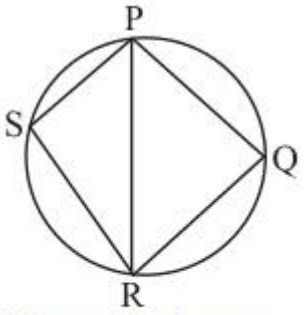
(4) A metal parallelopiped of measures 16 cm x 11cm x 10 cm was melted to make coins. How many coins were made if the thickness and diameter of each coin was 2 mm and 2 cm respectively?

(5) In ΔABC, seg BD bisects ∠ABC. If AB = x, BC = x + 5, AD = x – 2, DC = x + 2, then find the value of x.



Q.3 (A) Complete the following activity:(Any ONE) **3**

(1) In figure below, □ PQRS is cyclic. Side PQ ≅ side RQ. ∠PSR = 110°, Find-



(1) measure of ∠PQR
(2) m(arc PQR)
(3) m(arc QR)
(4) measure of ∠PRQ

□ PQRS is a cyclic quadrilateral [Given]
∴ ∠PQR + ∠PSR = 180°
[Opposite angles of cyclic quadrilateral are supplementary]
∴ ∠PQR + 110° = 180°
∴ ∠PQR = 180° - 110° = [ ] 1
∠PSR = ½ m (arc PQR)
[Inscribed angle theorem]
∴ 110° = ½ m (arc PQR)
∴ m (arc PQR) = [ ] 2
In ΔPQR, side PQ ≅ side RQ [Given]
∴ ∠PQR ≅ ∠QPR
.....3 [Isosceles triangle theorem]
In ΔPQR,
∠PQR + ∠PRQ + ∠QPR = 180°
[Sum of all angles of a triangle is 180°]
∴ 70° + ∠QPR + ∠QPR = 180° [From 1 & 2]
∴ 2∠QPR = 180° - 70°
∴ 2∠QPR = [ ]
∴ ∠QPR = [ ] ……..4
∠QPR = ½ m (arc QR)
[ ]
∴ 55° = ½ x m (arc QR) [From 3]
∴ m (arc QR) = 110°
∠PRQ = [ ] [From 3 & 4]

(2) Determine whether the following points are collinear: A(-4,4), K(-2, 5/2), N(4, -2)

$A(-4, 4) = (x_1, y_1)$

$K(-2, \frac{5}{2}) = (x_2, y_2)$

$N(4, -2) = (x_3, y_3)$

Slope of line $AK = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{\frac{5}{2} - 4}{-2 - (-4)}$

$= \left(\frac{\square}{2}\right) \div (\square)$

$= \frac{-3}{2} \div 2$

$= \frac{-3}{2} \times \square$

$\therefore$ Slope of line $AK = \square$ .....(i)

Slope of line $AN = \frac{y_3 - y_1}{x_3 - x_1}$

$= \frac{-2 - 4}{4 - (-4)}$

$= \frac{-6}{4 + 4}$

$= \square$

$\therefore$ Slope of line $AN = \frac{-3}{4}$ .....(ii)

$\therefore$ Slope of line AK = Slope of line $\square$

.....[From (i) and (ii)]

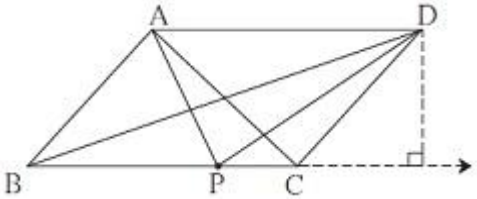
Also, they have a common point A.

$\therefore$ Point A, K and N are collinear points.

(B) Solve the following: (Any TWO) **6**

(1) A kite is flying at a height of 60 m above the ground. The string attached to the kite is tied at the ground. It makes an angle of 60° with the ground. Assuming that the string is straight, find the length of the string. ($\sqrt{3} = 1.73$)

(2) ABCD is a parallelogram. P is any point on side BC. Find two pairs of triangles with equal areas.



(3) How many solid cylinders of radius 10 cm and height 6 cm can be made by melting a solid sphere of radius 30 cm?

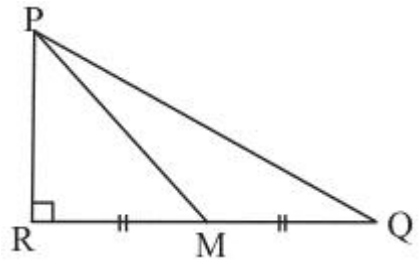
(4) Pranali and Prasad started walking to the East and to the North respectively, from the same point and at the same speed. After 2 hours distance between them was $15\sqrt{2}$ km. Find their speed per hour.

Q.4 Solve the following: (Any TWO) **8**

(1) In ΔPQR, $\angle Q = 90°$, seg QM is median. $PQ^2 + QR^2 = 169$. Draw a circumcircle of ΔPQR.

(2) Draw a circle of radius 3.4 cm and centre E. Take a point F on the circle. Take another point A such that E-F-A and FA = 4.1 cm. Draw tangents to the circle from point A.

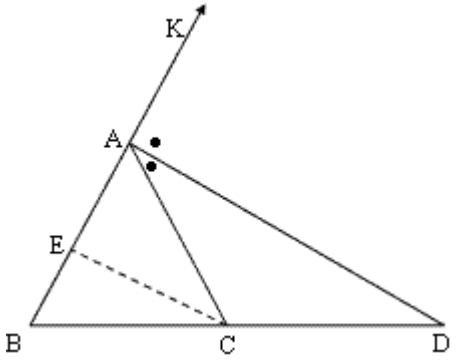
(3) In the figure below, M is the midpoint of QR. ∠PRQ = 90°. Prove that, $PQ^2 = 4PM^2 - 3PR^2$.



Q.5 Solve the following: (Any ONE) **3**

(1) In the following figure, AD is the bisector of the exterior ∠A of ΔABC. Seg AD intersects the side BC produced in D. Prove that:

$$\frac{BD}{CD} = \frac{AB}{AC}$$



(2) Prove that $(1 + \tan\theta)^2 + (1 + \cot\theta)^2 = (\sec\theta + \operatorname{cosec}\theta)^2$.

-------- All the Best --------