# SATISH SCIENCE ACADEMY

**DHANORI PUNE-411015**

## GEOMERTY

### Class 10 - Mathematics - II

**Time Allowed: 2 hours** **Maximum Marks: 40**

**General Instructions:**

1. All questions are compulsory.
2. Use of a calculator is not allowed.
3. The numbers to the right of the questions indicate full marks.
4. In case of MCQs Q. No. 1(A) only the first attempt will be evaluated and will be given credit.
5. Draw proper figures wherever necessary.
6. The marks of construction should be clear. Do not erase them.
7. Diagram is essential for writing the proof of the theorem.

1. **[8]**

(a) **Four alternative answers for each of the following sub-questions are given. Choose the correct alternative and write its alphabet:**

i. In a right angled triangle; if the sum of the squares of sides making right angle is 169, then what is the length of hypotenuse? **[1]**

a) 5 b) 12

c) 15 d) 13

ii. If $\tan\theta = \sqrt{3}$, then the value of $\theta$ is _____. **[1]**

a) $45^\circ$ b) $60^\circ$

c) $30^\circ$ d) $90^\circ$

iii. Distance of point $(-3, 4)$ from the origin is _____. **[1]**

a) -5 b) 5

c) 7 d) 1

iv. Two circles of radii 5.5 cm and 3.3 cm respectively touch each other externally. What is the distance between their centres? **[1]**

a) 8.9 cm b) 2.2 cm

c) 4.4 cm d) 8.8 cm

(b) **Solve the following sub-questions :**

i. If $\triangle ABC \sim \triangle PQR$ and $AB : PQ = 2 : 3$, then find the value of $\frac{A(\triangle ABC)}{A(\triangle PQR)}$. **[1]**

ii. Chord $AB$ and chord CD of a circle with centre O are congruent. If $m(\text{arc}\, AB) = 120^\circ$, then find the $m(\text{arc}\, CD)$. **[1]**

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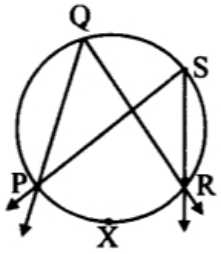
iii. Find the diagonal of a square whose side is 10 cm. **[1]**

iv. Find the coordinates of the midpoint of the segment joining the points (22, 20) and (0, 16). **[1]**

2. **[12]**

(a) **Complete any two activities and rewrite it :**

i. Prove that, angles inscribed in the same arc are congruent. **[2]**




Given: $\angle PQR$ and $\angle PSR$ are inscribed in the same arc.

Arc PXR is intercepted by the angles.

To prove: $\angle PQR \cong \angle PSR$

Proof:

$m\angle PQR = \frac{1}{2}\, m(\text{arc}\, PXR) \ldots$ (i) $\square$

$m\angle \square = \frac{1}{2}\, m(\text{arc}\, PXR) \ldots (ii) \square$

$\therefore m\angle \square = m\angle PSR$ ...[From (i) and (ii)]

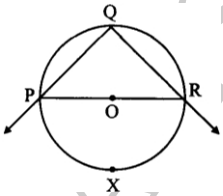
$\therefore \angle PQR \cong \angle PSR$ ...[Angles equal in measure are congruent]

ii. If $\cos\theta = \frac{3}{5}$, then find $\sin\theta$. **[2]**

iii. Find the surface area of a sphere of radius 3.5 cm. **[2]**

(b) **Solve any four of the following sub-questions :**

i. In the given figure, $\angle PQR$ is inscribed in the semicircle PQR. Complete the following activity to find measure of $\angle PQR$. **[2]**




Activity:

$m(\text{arc}\, PQR) = 180^\circ \ldots$ [measure of semicircle]

$\therefore m(\text{arc}\, PXR) = \square$

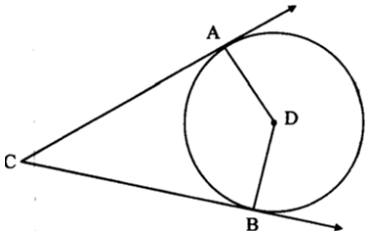
$\therefore \angle PQR = \frac{1}{2}\, m(\text{arc}\, \square)$ ...$\square$

$= \frac{1}{2} \times 180^\circ$

$\therefore \angle PQR = \square$

ii. Find the length of the hypotenuse of a rightangled triangle if remaining sides are 9 cm and 12 cm. **[2]**

iii. **[2]**




In the above figure, a circle with centre D touches the sides of $\angle ACB$ at A and B. If $\angle ACB = 52^\circ$, complete the activity to find the measure of $\angle ADB$.

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In $\square ABCD$,

$\angle CAD = \angle CBD = \square^\circ \ldots$ [ Tangent theorem ]

$\therefore \angle ACB + \angle CAD + \angle CBD + \angle ADB = \square^\circ$

$\therefore 52^\circ + 90^\circ + 90^\circ + \angle ADB = 360^\circ$

$\therefore \angle ADB + \square^\circ = 360^\circ$

$\angle ADB = 360^\circ - 232^\circ$

$\therefore \angle ADB = \square^\circ$

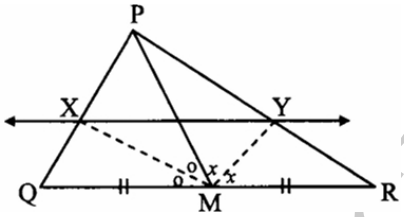
iv. Find the slope of the line passing through the points $A(4, 7)$ and $B(2, 3)$. **[2]**

v. If the length of an arc of sector of a circle is 20 cm and if radius 7 cm, find the area of the sector. **[2]**

3. **[9]**

(a) **Complete any one activity of the following and rewrite it :**

i. In $\triangle PQR$, seg $PM$ is a median. Angle bisectors of $\angle PMQ$ and $\angle PMR$ intersect side $PQ$ and side $PR$ in points $X$ and $Y$ respectively. Prove that $XY \| QR$. **[3]**




In $\triangle PMQ$

Ray MX is the bisector of $\angle PMQ$

$\therefore \frac{MP}{MQ} = \frac{\square}{\square}$ ....(i) [Theorem of angle bisector]

Similarly, in $\triangle PMR$, Ray MY is bisector o $\angle PMR$

$\therefore \frac{MP}{MR} = \frac{\square}{\square}$ ...(ii) [Theorem of angle bisector]

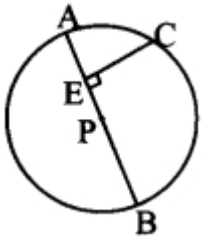
But $\frac{MP}{MQ} = \frac{MP}{MR}$ ... (iii) [As M is the midpoint of QR]

Hence MQ = MR

$\frac{PX}{\square} = \frac{\square}{YR}$ ... [From (i), (ii) and (iii)]

$\therefore XY \| QR$ ... [Converse of basic proportionality theorem]

ii. In the given figure, seg $AB$ is a diameter of a circle with centre $P$. $C$ is any point on the circle. seg $CE \perp$ seg $AB$. Prove that $CE$ is the geometric mean of AE and EB. Write the proof with the help of following steps: **[3]**




i. Draw ray CE. It intersects the circle at D.

ii. Show that CE = ED.

iii. Write the result using theorem of intersection of chords inside a circle.

iv. Using CE = ED, complete the proof.

(b) **Solve any two of the following sub-questions :**

i. Complete the following activity to find the co-ordinates of point $P$ which divides seg $AB$ in **[3]**

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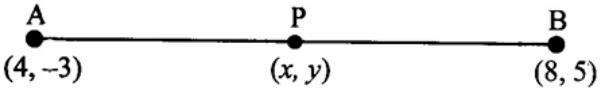
the ratio 3 : 1 where $A(4,-3)$ and $B(8,5)$.

**Activity:**




$\therefore$ By section formula,

$x = \frac{mx_2+nx_1}{\square}$,

$y = \frac{\square}{m+n}$

$\therefore x = \frac{3\times8+1\times4}{3+1}, y = \frac{3\times5+1\times(-3)}{3+1}$

$= \frac{\square+4}{4} = \frac{\square-3}{4}$

$\therefore x = \square \therefore y = \square$

ii. Draw a circle with centre **O** and radius 3.4 cm. Draw a chord MN of length $5.7\ cm$ in it. Construct tangents at points $M$ and $N$ to the circle. **[3]**

iii. In $\triangle PQR$, seg $PM$ is a median, $PM = 9$ and $PQ^2 + PR^2 = 290$. Find the length of $QR$. **[3]**

4. **Solve any two of the following sub-questions :** **[8]**

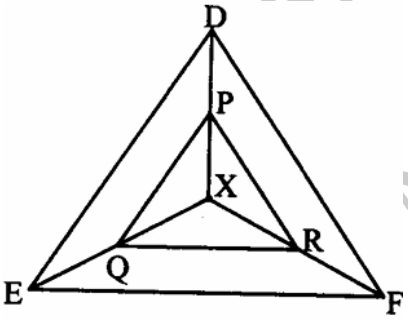
(a) A straight road leads to the foot of the tower of height 48 m. From the top of the tower the angles of depression of two cars standing on the road are $30^\circ$ and $60^\circ$ respectively. Find the distance between the two cars. $(\sqrt{3} = 1.73)$ **[4]**

(b) A cylinder of radius 12 cm contains water up to the height 20 cm. A spherical iron ball is dropped into the cylinder and thus water level raised by 6.75 cm. What is the radius of the iron ball? **[4]**

(c) Draw a circle of radius 2.7 cm and draw a chord $PQ$ of length 4.5 cm. Draw tangents at points $P$ and $Q$ without using the centre. **[4]**

5. **Solve any one of the following sub-questions :** **[3]**

(a) In the given figure, $X$ is any point in the interior of the triangle. Point $X$ is joined to the vertices of triangle. seg $PQ \parallel$ seg $DE$, seg QR ∥ seg EF. Complete the activity and prove that seg PR ∥ seg DF. **[3]**




Proof:

In $\triangle XDE$,

$PQ \parallel DE$ ...[Given]

$\therefore \frac{XP}{PD} = \frac{\square}{QE}$ ...(i) [Basic proportionality theorem]

In $\triangle XEF$,

$QR \parallel EF$ ...[Given]

$\frac{XQ}{\square} = \frac{XR}{\square}$ ...(ii) [□]

$\therefore \frac{XP}{PD} = \frac{\square}{\square}$ ...[From (i) and (ii)]

$\therefore$ seg $PR \parallel$ seg DF ...[By converse of basic proportionality theorem]

(b) Prove that, Angles inscribed in the same arc are congruent. **[3]**

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