

Newton's Academy

Science Part 2

Time: 2 Hours

Max. Marks: 40

Notes:

- i. All questions are compulsory.
- ii. Use of calculator is not allowed.
- iii. The numbers to the right of the questions indicate full marks.
- iv. In case of MCQ's [Q. No. 1(A)] only the first attempt will be evaluated and will be given credit.
- v. For every MCQ, the correct alternative (A), (B), (C) or (D) in front of sub-question number is to be written as an answer.
- vi. Draw proper figures for answers wherever necessary.
- vii. The marks of construction should be clear and distinct. Do not erase them.
- viii. Diagram is essential for writing the proof of the theorem.

Q.1. A. Four alternative answers are given for every sub-question. Select the correct alternative and write the alphabet of that answer:

[4]

- i. Out of the following which is the Pythagorean triplet?
 (A) (1, 5, 10) (B) (3, 4, 5) (C) (2, 2, 2) (D) (5, 5, 2)
- ii. Two circles of radii 5.5 cm and 3.3 cm respectively touch each other externally. What is the distance between their centres?
 (A) 4.4 cm (B) 2.2 cm (C) 8.8 cm (D) 8.9 cm
- iii. Distance of point (-3, 4) from the origin is _____.
 (A) 7 (B) 1 (C) 5 (D) 5
- iv. Find the volume of a cube of side 3 cm:
 (A) 27 cm³ (B) 9 cm³ (C) 81 cm³ (D) 3 cm³

B. Solve the following questions:

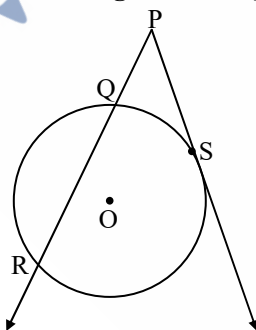
[4]

- i. The ratio of corresponding sides of similar triangles is 3 : 5, then find the ratio of their areas.
- ii. Find the diagonal of a square whose side is 10 cm.
- iii. □ABCD is cyclic. If ∠B = 110°, then find measure of ∠D.
- iv. Find the slope of the line passing through the points A(2, 3) and B(4, 7).

Q.2. A. Complete and write the following activities (Any two):

[4]

i.



In the figure given above, 'O' is the centre of the circle, seg PS is a tangent segment and S is the point of contact. Line PR is a secant.

If PQ = 3.6, QR = 6.4, find PS.

Solution:

$$\begin{aligned}
 PS^2 &= PQ \times \square && \dots(\text{tangent secant segments theorem}) \\
 &= PQ \times (PQ + \square)
 \end{aligned}$$

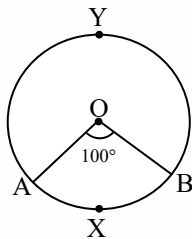
$$\begin{aligned}
 &= 3.6 \times (3.6 + 6.4) \\
 &= 3.6 \times \square \\
 &= 36 \\
 \therefore PS &= \square \qquad \dots(\text{by taking square roots})
 \end{aligned}$$

ii. If $\sec \theta = \frac{25}{7}$, find the value of $\tan \theta$.

Solution:

$$\begin{aligned}
 1 + \tan^2 \theta &= \sec^2 \theta \\
 \therefore 1 + \tan^2 \theta &= \left(\frac{25}{7}\right)^2 \\
 \therefore \tan^2 \theta &= \frac{625}{49} - \square \\
 &= \frac{625 - 49}{49} \\
 &= \frac{\square}{49} \\
 \therefore \tan \theta &= \frac{\square}{7} \qquad \dots(\text{by taking square roots})
 \end{aligned}$$

iii.



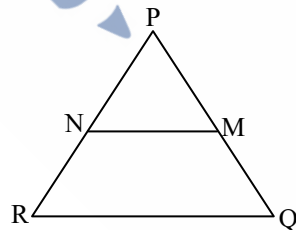
In the figure given above, O is the centre of the circle. Using given information complete the following table:

Type of arc	Name of the arc	Measure of the arc
Minor arc	<input type="text"/>	<input type="text"/>
Major arc	<input type="text"/>	<input type="text"/>

B. Solve the following sub-questions (Any four):

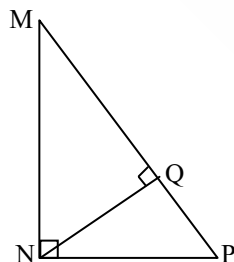
[8]

i.



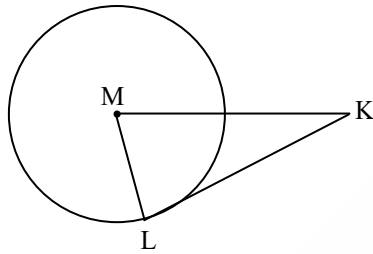
In ΔPQR , $NM \parallel RQ$. If $PM = 15$, $MQ = 10$, $NR = 8$, then find PN .

ii.



In ΔMNP , $\angle MNP = 90^\circ$, $\text{seg } NQ \perp \text{seg } MP$. If $MQ = 9$, $QP = 4$, then find NQ .

iii.



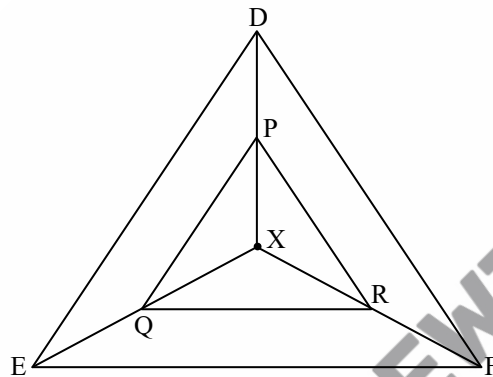
In the figure given above, M is the centre of the circle and seg KL is a tangent segment. L is a point of contact. If $MK = 12$, $KL = 6\sqrt{3}$, then find the radius of the circle.

- iv. Find the co-ordinates of midpoint of the segment joining the points (22, 20) and (0, 16).
- v. A person is standing at a distance of 80 metres from a Church and looking at its top. The angle of elevation is of 45° . Find the height of the Church.

Q.3. A. Complete and write the following activities (Any one):

[3]

i.



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 \parallel seg EF. Complete the activity and prove that seg PR \parallel seg DF.

Proof:

In $\triangle XDE$,
 PQ \parallel DE ... (Given)
 $\therefore \frac{XP}{PD} = \frac{QE}{DE}$... (Basic proportionality theorem)... (i)

In $\triangle XEF$,
 QR \parallel EF ... (Given)
 $\therefore \frac{XQ}{QE} = \frac{XR}{RF}$... () ... (ii)

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

\therefore seg PR \parallel seg DF ... (By converse of basic proportionality theorem)

- ii. If A(6, 1), B(8, 2), C(9, 4) and D(7, 3) are the vertices of $\square ABCD$, show that $\square ABCD$ is a parallelogram.

Solution:

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

\therefore Slope of line AB = $\frac{2-1}{8-6} = \frac{1}{2}$... (i)

\therefore Slope of line BC = $\frac{4-2}{9-8} = 2$... (ii)

\therefore Slope of line CD = $\frac{3-4}{7-9} = \frac{1}{2}$... (iii)

- \therefore Slope of line DA = $\frac{3-1}{7-6} = \square$... (iv)
 \therefore Slope of line AB = \square ... [From (i) and (iii)]
 \therefore line AB \parallel line CD
 \therefore Slope of line BC = \square ... [From (ii) and (iv)]
 \therefore line BC \parallel line DA

Both the pairs of opposite sides of the quadrilateral are parallel.

\therefore \square ABCD is a parallelogram.

B. Solve the following sub-questions (Any two):

[6]

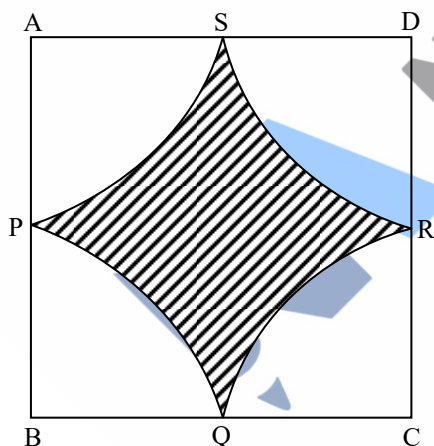
- i. If Δ PQR, point S is the mid-point of side QR. If PQ = 11, PR = 17, PS = 13, find QR.
- ii. Prove that, tangent segments drawn from an external point to the circle are congruent.
- iii. Draw a circle with radius 4.1 cm. Construct tangents to the circle from a point at a distance 7.3 cm from the centre.
- iv. A metal cuboid of measures 16 cm \times 11 cm \times 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? ($\pi = 3.14$)

Q.4. Solve the following sub-questions (Any two):

[8]

- i. In Δ ABC, PQ is a line segment intersecting AB at P and AC at Q such that seg PQ \parallel seg BC. If PQ divides Δ ABC into two equal parts having equal areas, find $\frac{BP}{AB}$.
- ii. 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 centre.

iii.



In the figure given above \square ABCD is a square of side 50 m. Points P, Q, R, S are midpoints of side AB, side BC, side CD, side AD respectively. Find area of shaded region.

Q.5. Solve the following sub-questions (Any one):

[3]

- i. Circles with centres A, B and C touch each other externally. If AB = 3 cm, BC = 3 cm, CA = 4 cm, then find the radii of each circle.
- ii. If $\sin \theta + \sin^2 \theta = 1$
show that: $\cos^2 \theta + \cos^4 \theta = 1$