

Newton's Academy

Mathematics Part - II

Time: 2 Hours

Max. Marks: 40

Note:

- 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 MCQs [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) with sub-question number is to be written as an answer.
- vi. Draw the 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.

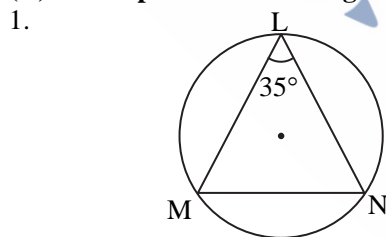
Q.1. (A) Four alternative answers are given for every subquestion. Select the correct alternative and write the alphabet of that answer: [4]

1. If a, b, c are sides of a triangle and $a^2 + b^2 = c^2$, name the type of triangle:
 (A) Obtuse angled triangle (B) Acute angled triangle
 (C) Right angled triangle (D) Equilateral triangle
2. Chords AB and CD of a circle intersect inside the circle at point E. If $AE = 4, EB = 10, CE = 8$, then find ED:
 (A) 7 (B) 5 (C) 8 (D) 9
3. Co-ordinates of origin are _____.
 (A) (0, 0) (B) (0, 1) (C) (1, 0) (D) (1, 1)
4. If radius of the base of cone is 7 cm and height is 24 cm, then find its slant height:
 (A) 23 cm (B) 26 cm (C) 31 cm (D) 25 cm

(B) Solve the following sub-questions: [4]

1. If $\Delta ABC \sim \Delta PQR$ and $\frac{A(\Delta ABC)}{A(\Delta PQR)} = \frac{16}{25}$, then find $AB : PQ$.
2. In $\Delta RST, \angle S = 90^\circ, \angle T = 30^\circ, RT = 12$ cm, then find RS.
3. If radius of a circle is 5 cm, then find the length of longest chord of a circle.
4. Find the distance between the points $O(0, 0)$ and $P(3, 4)$.

Q.2. (A) Complete the following activities (any two): [4]



In the above figure, $\angle L = 35^\circ$, find:

- i. $m(\text{arc } MN)$
- ii. $m(\text{arc } MLN)$

Solution:

i. $\angle L = \frac{1}{2} m(\text{arc } MN)$... (By inscribed angle theorem)

$\therefore \square = \frac{1}{2} m(\text{arc } MN)$

$\therefore 2 \times 35 = m(\text{arc } MN)$

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

ii. $m(\text{arc MLN}) = \square - m(\text{arc MN}) \dots(\text{Definition of measure of arc})$
 $= 360^\circ - 70^\circ$
 $\therefore m(\text{arc MLN}) = \square$

2. Show that, $\cot\theta + \tan\theta = \text{cosec}\theta \times \sec\theta$

Solution:

L.H.S = $\cot\theta + \tan\theta$
 $= \frac{\cos\theta}{\sin\theta} + \frac{\sin\theta}{\cos\theta}$
 $= \frac{\square}{\sin\theta \times \cos\theta} + \frac{\square}{\sin\theta \times \cos\theta}$
 $= \frac{1}{\sin\theta \times \cos\theta} \dots \square$
 $= \frac{1}{\sin\theta} \times \frac{1}{\square}$
 $= \text{cosec}\theta \times \sec\theta$

L.H.S = R.H.S

$\therefore \cot\theta + \tan\theta = \text{cosec}\theta \times \sec\theta$

3. Find the surface area of a sphere of radius 7 cm.

Solution:

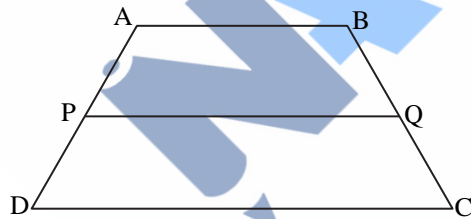
Surface area of sphere = $4\pi r^2$
 $= 4 \times \frac{22}{7} \times \square^2$
 $= 4 \times \frac{22}{7} \times \square$
 $= \square \times 7$

\therefore Surface area of sphere = \square sq.cm.

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

[8]

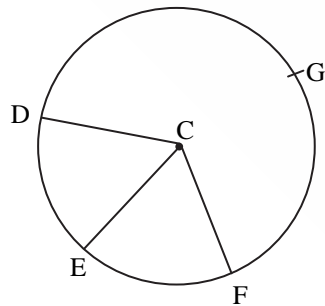
1.



In trapezium ABCD side $AB \parallel$ side $PQ \parallel$ side DC . $AP = 15$, $PD = 12$, $QC = 14$, find BQ .

2. Find the length of the diagonal of a rectangle whose length is 35 cm and breadth is 12 cm.

3.



In the given figure points G, D, E, F are points of a circle with centre C, $\angle ECF = 70^\circ$, $m(\text{arc DGF}) = 200^\circ$.

Find:

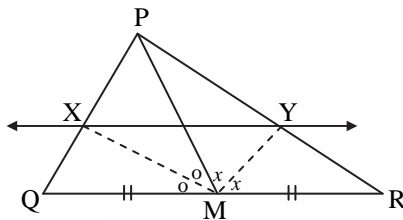
- i. $m(\text{arc DE})$ ii. $m(\text{arc DEF})$.

4. Show that points A(-1, -1), B(0, 1), C(1, 3) are collinear.
5. A person is standing at a distance of 50 m from a temple looking at its top. The angle of elevation is of 45°. Find the height of the temple.

Q.3. (A) Complete the following activities (any one):

[3]

1.



In ΔPQR , 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 $XY \parallel QR$.
Complete the proof by filling in the boxes.

Solution:

In ΔPMQ ,

Ray MX is the bisector of $\angle PMQ$

$$\therefore \frac{MP}{MQ} = \frac{PX}{PQ} \quad \dots\text{(I) [Theorem of angle bisector]}$$

Similarly, in ΔPMR , Ray MY is bisector of $\angle PMR$

$$\therefore \frac{MP}{MR} = \frac{PY}{PR} \quad \dots\text{(II) [Theorem of angle bisector]}$$

$$\text{But } \frac{MP}{MQ} = \frac{MP}{MR} \quad \dots\text{(III) [As M is the midpoint of QR]}$$

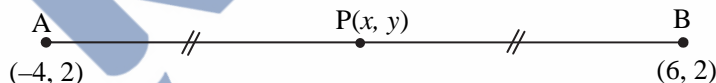
Hence $MQ = MR$

$$\therefore \frac{PX}{PQ} = \frac{PY}{PR} \quad \dots\text{[From (I), (II) and (III)]}$$

$$\therefore XY \parallel QR \quad \dots\text{[Converse of basic proportionality theorem]}$$

2. Find the co-ordinates of point P where P is the midpoint of a line segment AB with A(-4, 2) and B(6, 2).

Solution:



Suppose, $(-4, 2) = (x_1, y_1)$ and $(6, 2) = (x_2, y_2)$ and co-ordinates of P are (x, y)

\therefore According to midpoint theorem,

$$x = \frac{x_1 + x_2}{2} = \frac{-4 + 6}{2} = \frac{2}{2} = 1$$

$$y = \frac{y_1 + y_2}{2} = \frac{2 + 2}{2} = \frac{4}{2} = 2$$

\therefore Co-ordinates of midpoint P are (1, 2)

(B) Solve the following sub-questions (any two):

[6]

1. In ΔABC , seg AP is a median. If $BC = 18$, $AB^2 + AC^2 = 260$, find AP .
2. Prove that, "Angles inscribed in the same are congruent".
3. Draw a circle of radius 3.3 cm. Draw a chord PQ of length 6.6 cm. Draw tangents to the circle at points P and Q.
4. The radii of circular ends of a frustum are 14 cm and 6 cm respectively and its height is 6 cm. Find its curved surface area. ($\pi = 3.14$)

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

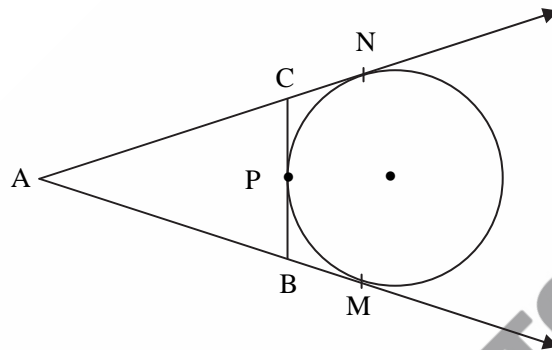
[8]

1. In $\triangle ABC$, seg $DE \parallel$ side BC . If $2A(\triangle ADE) = A(\square DBCE)$, find $AB : AD$ and show that $BC = \sqrt{3} DE$.
2. $\triangle SHR \sim \triangle SVU$. In $\triangle SHR$, $SH = 4.5$ cm, $HR = 5.2$ cm, $SR = 5.8$ cm and $\frac{SH}{SV} = \frac{3}{5}$, construct $\triangle SVU$.
3. An ice-cream pot has a right circular cylindrical shape. The radius of the base is 12 cm and height is 7 cm. This pot is completely filled with ice-cream. The entire ice-cream is given to the students in the form of right circular ice-cream cones, having diameter 4 cm and height is 3.5 cm. If each student is given one cone, how many students can be served?

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

[3]

1.



A circle touches side BC at point P of the $\triangle ABC$, from out-side of the triangle. Further extended lines AC and AB are tangents to the circle at N and M respectively.

Prove that: $AM = \frac{1}{2}(\text{Perimeter of } \triangle ABC)$

2. Eliminate θ if $x = r \cos \theta$ and $y = r \sin \theta$.