MSBSHSE Class 10 Mathematics Question Paper 2019 Paper II with Solutions

1. (A) Solve the following questions (Any four): [4]

i. If ΔABC ~ ΔPQR and ∠A = 60°, then ∠P = ?

Solution:

Given,

ΔABC ~ ΔPQR

We know that the corresponding angles of similar triangles are equal.

Therefore, ∠A = ∠P = 60°

ii. In right-angled ΔABC, if ∠B = 90°, AB = 6, BC = 8, then find AC.

Solution:

Given,

In right-angled ΔABC:

∠B = 90°, AB = 6, BC = 8

AC = Hypotenuse

By Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$= (6)^2 + (8)^2$

= 36 + 64

= 100

AC = 10

iii. Write the length of the largest chord of a circle with a radius of 3.2 cm.

Solution:

Given,

Radius of circle = 3.2 cm

We know that the longest chord of a circle is the diameter of that circle.

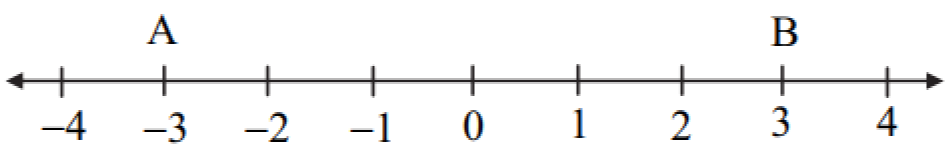
Diameter = 2 × Radius

= 2 × 3.2

= 6.4 cm

Hence, the length of the largest chord of a circle is 6.4 cm.

iv. From the given number line, find d(A, B):



Solution:

From the given,
Coordinate of A = -3
Coordinate of B = 3
3 > -3
d(A, B) = Greater coordinate - Smaller coordinate
= 3 - (-3)
= 3 + 3
= 6 units

v. Find the value of sin 30° + cos 60°.

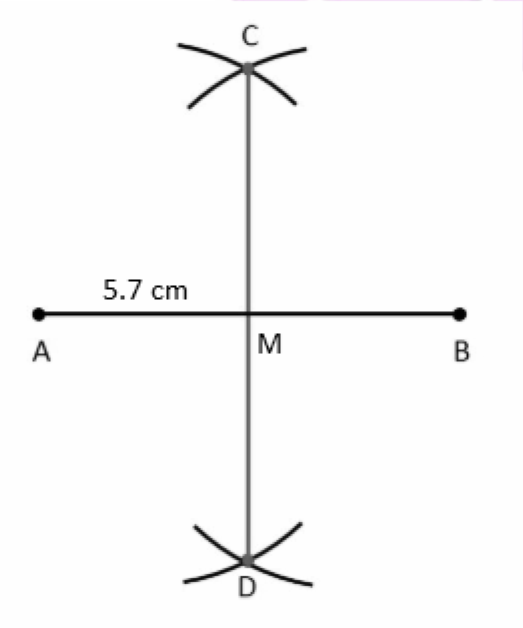
Solution:
sin 30° + cos 60°
= (½) + (½)
= (1 + 1)/2
= 2/2
= 1

vi. Find the area of a circle of radius 7 cm.

Solution:
Given,
Radius of circle = r = 7 cm
Area of circle = πr^2
= (22/7) × 7 × 7
= 154 cm^2

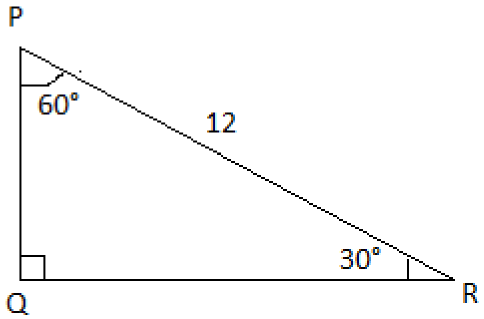
(B) Solve the following questions (Any two): **[4]**
i. Draw seg AB of length 5.7 cm and bisect it.

Solution:



ii. In right-angled triangle PQR, if ∠P = 60°, ∠R = 30°, and PR = 12, then find the values of PQ and QR.

Solution:
Given,
∠P = 60°, ∠R = 30°, and PR = 12
∠P + ∠Q + ∠R = 180°
60° + ∠Q + 30° = 180°
∠Q = 180° - 90°
∠Q = 90°



sin 30° = PQ/PR
½ = PQ/12
PQ = 12/2
PQ = 6
cos 30° = QR/PR
√3/2 = QR/12
QR = (12√3)/2 = 6√3

iii. In a right circular cone, if the perpendicular height is 12 cm and radius is 5 cm, then find its slant height.

Solution:
Given,
The perpendicular height of right circular cone = h = 12 cm
Radius = r = 5 cm
Slant height = l
= $\sqrt{(r^2 + h^2)}$
= $\sqrt{[(5)^2 + (12)^2]}$
= √(25 + 144)
= √169
= 13 cm
Therefore, the slant height is 13 cm.

2. (A) Choose the correct alternative: [4]
i. ΔABC and ΔDEF are equilateral triangles. If A(ΔABC) : A(ΔDEF) = 1 : 2 and AB = 4, then what is the length of DE?
(A) 2√2 (B) 4 (C) 8 (D) 4√2

Solution:
Correct answer: (D)

A(ΔABC) : A(ΔDEF) = 1 : 2
Area of ΔABC = (√3/4) × (Side)²
= (√3/4) × 4²
= 4√3
Area of ΔDEF = 2 * Area of ΔABC
= 2 * 4√3
= 8√3
Let DE = EF = FD = x
Area of ΔDEF = (√3/4) × x²
8√3 = (√3/4) × x²
$x^2 = 32$
x = 4√2
Therefore, DE = 4√2

ii. Out of the following which is a Pythagorean triplet?
(A) (5, 12, 14) (B) (3, 4, 2) (C) (8, 15, 17) (D) (5, 5, 2)

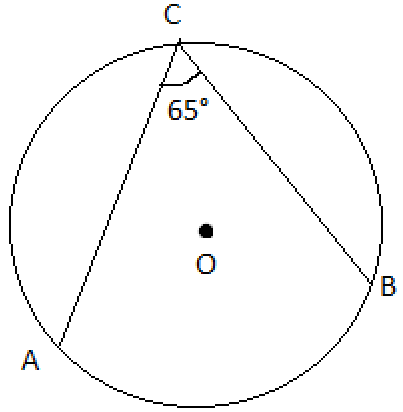
Solution:
Correct answer: (C)

By Pythagoras theorem,
$(8)^2 + (15)^2$
= 64 + 225
= 289
= (17)2
Therefore, (8, 15, 17) is a Pythagorean triplet.

iii. ∠ACB is inscribed in arc ACB of a circle with centre O. If ∠ACB = 65°, find m(arc ACB):
(A) 130° (B) 295° (C) 230° (D) 65°

Solution:
Correct answer: (C)

Given,
∠ACB = 65°



∠ACB = 1/2 m(arc AB)
m(arc AB) = 2∠ACB = 2(65°) = 130°

m(arc ACB) = 360° - m(arc AB)
= 360° - 130°
= 230°

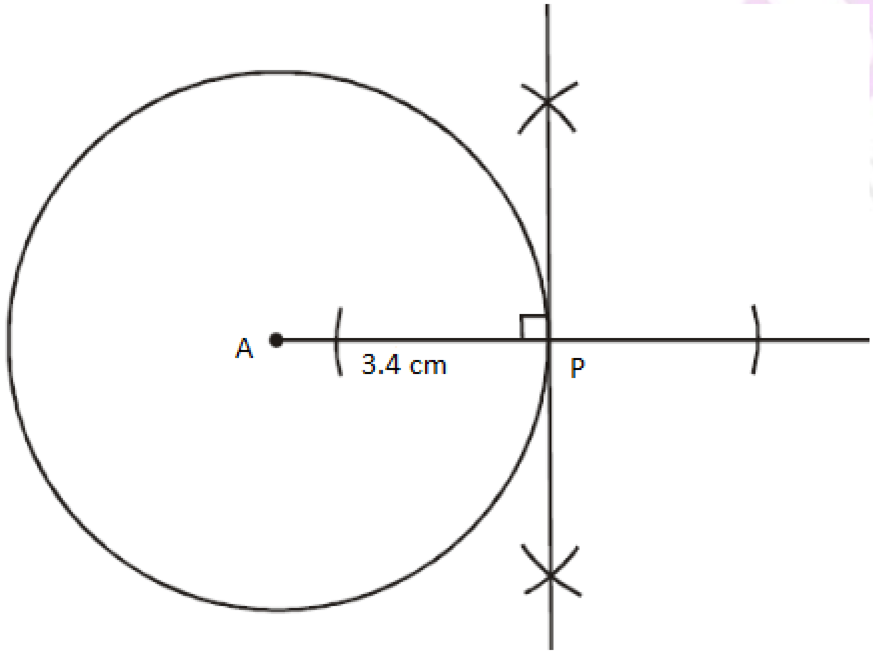
iv. $1 + \tan^2\theta = ?$
(A) $\sin^2\theta$ (B) $\sec^2\theta$ (C) $\text{cosec}^2\theta$ (D) $\cot^2\theta$

Solution:
Correct answer: (B)

We know that,
$\sec^2\theta - \tan^2\theta = 1$
$\sec^2\theta = 1 + \tan^2\theta$

(B) Solve the following questions (Any two): [4]
i. Construct a tangent to a circle with centre A and radius 3.4 cm at any point P on it.

Solution:



ii. Find the slope of a line passing through the points A(3, 1) and B(5, 3).

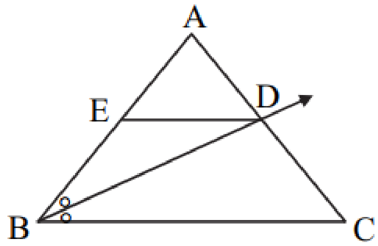
Solution:
Let the given points be:
A(3, 1) = (x_1, y_1)
B(5, 3) = (x_2, y_2)
Slope of the line passing through the points (x_1, y_1) and (x_2, y_2)
= $(y_2 - y_1)/ (x_2 - x_1)$
= (3 - 1)/ (5 - 3)
= 2/2
= 1
Therefore, the slope of the line AB is 1.

iii. Find the surface area of a sphere of radius 3.5 cm.

Solution:
Given,
Radius of the sphere = r = 3.5 cm
The surface area of the sphere = $4\pi r^2$
= 4 × (22/7) × 3.5 × 3.5
= 154 cm^2
Therefore, the surface area of the sphere is 154 cm^2.

3. (A) Complete the following activities (Any two): **[4]**

i.



In ΔABC, ray BD bisects $\angle ABC$.

If A–D–C, A–E–B and seg ED || side BC, then prove that: $\frac{AB}{BC} = \frac{AE}{EB}$.

Proof:

In ΔABC, ray BD is bisector of $\angle ABC$.

$\therefore \quad \frac{AB}{BC} = \boxed{\frac{\quad}{\quad}}$ …(i)(By angle bisector theorem)

In ΔABC, seg DE || side BC

$\therefore \quad \frac{AE}{EB} = \frac{AD}{DC}$ …(ii) $\boxed{\qquad\qquad}$

$\therefore \quad \frac{AB}{\square} = \frac{\square}{EB}$ …[From (i) and (ii)]

Solution:

Proof:

In ΔABC, ray BD is bisector of $\angle ABC$.

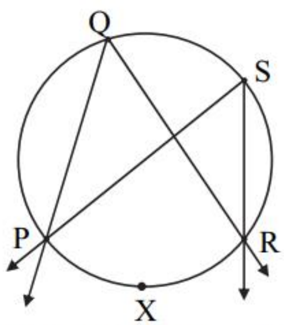
$\therefore \quad \frac{AB}{BC} = \boxed{\frac{AD}{DC}}$ ...(i)(By angle bisector theorem)

In ΔABC, seg DE || side BC

$\therefore \quad \frac{AE}{EB} = \frac{AD}{DC}$ ...(ii) Midpoint theorem

$\therefore \quad \frac{AB}{\boxed{BC}} = \frac{\boxed{AE}}{EB}$ ...[From (i) and (ii)]

ii.



Prove that, angles inscribed in the same arc are congruent.

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:

$m\angle PQR = \frac{1}{2} m(\text{arc } PXR)$ ...(i) $\boxed{}$

$m\angle \boxed{} = \frac{1}{2} m(\text{arc } PXR)$ ...(ii) $\boxed{}$

$\therefore \quad m\angle \boxed{} = m\angle PSR$ ...[From (i) and (ii)]

$\therefore \quad \angle PQR \cong \angle PSR$ ...(Angles equal in measure are congruent)

Solution:

Proof:

$m\angle PQR = \frac{1}{2} m(\text{arc } PXR)$ ...(i) Inscribed angle th.

$m\angle \boxed{PSR} = \frac{1}{2} m(\text{arc } PXR)$ ...(ii) Inscribed angle th.

$\therefore \quad m\angle \boxed{PQR} = m\angle PSR$ ...[From (i) and (ii)]

$\therefore \quad \angle PQR \cong \angle PSR$ ...(Angles equal in measure are congruent)

iii. How many solid cylinders of radius 6 cm and height 12 cm can be made by melting a solid sphere of radius 18 cm?

Activity: Radius of the sphere, r = 18 cm

For cylinder, radius R = 6 cm, height H = 12 cm

$$\therefore \quad \text{Number of cylinders can be made} = \frac{\text{Volume of the sphere}}{\boxed{}}$$

$$= \frac{\frac{4}{3}\pi r^3}{\boxed{}}$$

$$= \frac{\frac{4}{3} \times 18 \times 18 \times 18}{\boxed{}}$$

$$= \boxed{}$$

Solution:

$$\therefore \quad \text{Number of cylinders can be made} = \frac{\text{Volume of the sphere}}{\boxed{\text{Volume of cylinder}}}$$

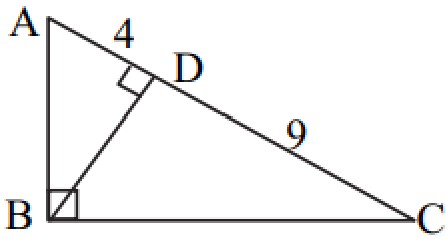
$$= \frac{\frac{4}{3}\pi r^3}{\boxed{\pi r^2 h}}$$

$$= \frac{\frac{4}{3} \times 18 \times 18 \times 18}{\boxed{6 \times 6 \times 12}}$$

$$= \boxed{18}$$

(B) Solve the following questions (Any two): **[4]**

i. In right-angled ΔABC, BD ⊥ AC.



If AD = 4, DC = 9, then find BD.

Solution:
Given,
BD ⊥ AC in the right triangle ABC.
AD = 4, DC = 9
$BD^2 = AD \times DC$
$= 4 \times 9$
$= 36$
$BD = \sqrt{36}$
BD = 6

ii. Verify whether the following points are collinear or not:
A (1, -3), B (2, -5), C (-4, 7).

Solution:
Given,
A (1, -3) = (x_1, y_1)
B (2, -5) = (x_2, y_2)
C (-4, 7) = (x_3, y_3)
Area of triangle ABC = $\frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$
$= \frac{1}{2} [1(-5 - 7) + 2(7 + 3) - 4(-3 + 5)]$
$= \frac{1}{2} [-12 + 2(10) - 4(2)]$
$= \frac{1}{2} [-12 + 20 - 8]$
$= \frac{1}{2} [20 - 20]$
$= \frac{1}{2} (0)$
$= 0$
Therefore, the given points are collinear.

iii. If sec θ = 25/7, then find the value of tan θ.

Solution:
Given,
sec θ = 25/7
We know that,
$\sec^2\theta - \tan^2\theta = 1$
$\tan^2\theta = \sec^2\theta - 1$
$= (25/7)^2 - 1$
$= (625/49) - 1$
$= (625 - 49)/49$
$= 576/49$
$\tan^2\theta = (24/7)^2$

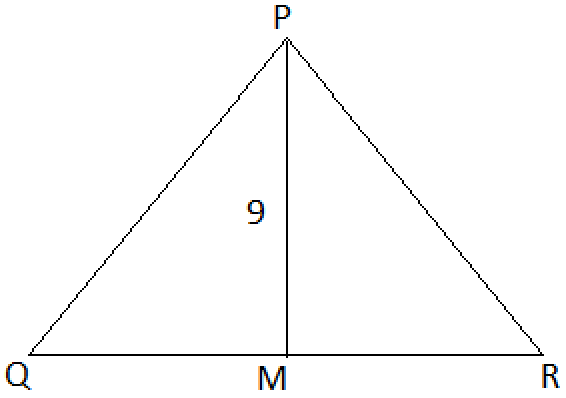
tan θ = 24/7

4. Solve the following questions (Any three): [9]

i. In ΔPQR, seg PM is a median, PM = 9 and $PQ^2 + PR^2 = 290$. Find the length of QR.

Solution:

Given,



$PQ^2 + PR^2 = 290$

By Apollonius theorem,

$PQ^2 + PR^2 = 2PM^2 + 2QM^2$

$290 = 2[(9)^2 + QM^2]$

$290/2 = 81 + QM^2$

$QM^2 = 145 - 81$

$QM^2 = 64$

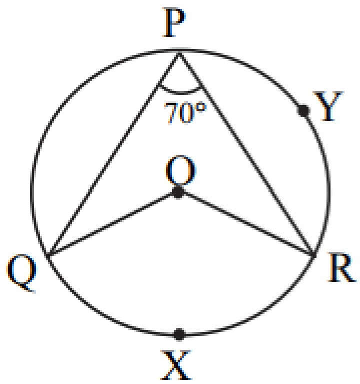
QM = 8

QR = 2 × QM

= 2 × 8

= 16

ii. In the given figure, O is the centre of the circle. ∠QPR = 70° and m(arc PYR) = 160°, then find the value of each of the following:



(a) m(arc QXR)

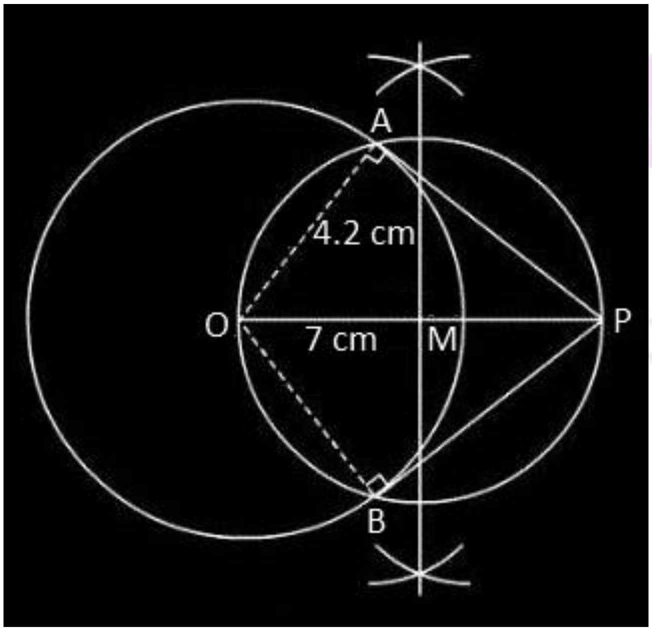
(b) ∠QOR

(c) ∠PQR

Solution:
Given,
∠QPR = 70°
m(arc PYR) = 160°
(a) ∠QPR = 1/2 m(arc QXR)
70° × 2 = m(arc QXR)
m(arc QXR) = 140°
Now,
(b) ∠QOR = 2∠QPR
= 2 × 70°
= 140°
(c) ∠PQR = 1/2 m(arc PXR)
= (1/2) × 160°
= 80°

iii. Draw a circle with a radius of 4.2 cm. Construct tangents to the circle from a point at a distance of 7 cm from the centre.

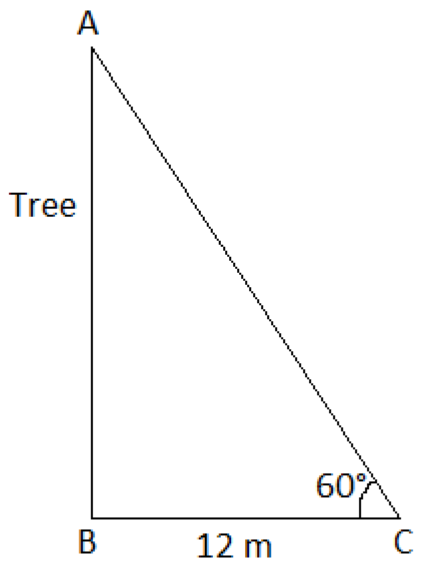
Solution:



Therefore, PA and PB are the tangents to the circle.

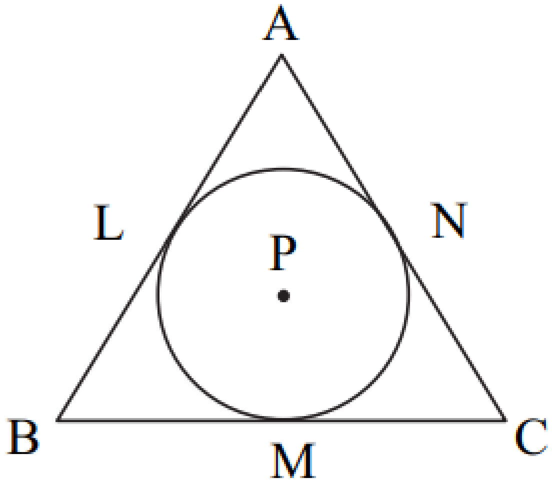
iv. When an observer at a distance of 12 m from a tree looks at the top of the tree, the angle of elevation is 60°. What is the height of the tree? (√3 = 1.73)

Solution:
Let AB be the tree and C be the point of observation.



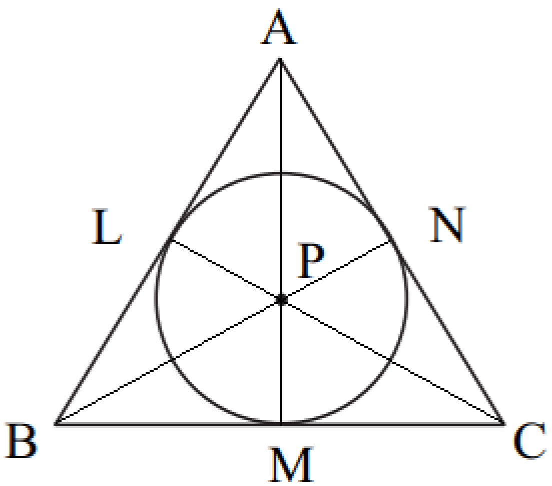
In right triangle ABC,
tan 60° = AB/BC
√3 = AB/12
AB = 12√3
= 12 × 1.73
= 20.76 m
Hence, the height of the tree is 20.76 m.

5. Solve the following questions (Any one): [4]
i. A circle with centre P is inscribed in the ΔABC. Side AB, side BC, and side AC touch the circle at points L, M, and N respectively. Radius of the circle is r.



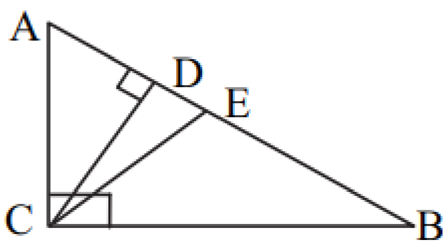
Prove that: A(ΔABC) = 1/ 2 (AB + BC + AC) × r.

Solution:
Given,
P is the centre of the circle.
Construction:
Join PL, PM, PN, and APM, BPN, CPL.



Proof:
PM ⊥ BC
PN ⊥ AC
PL ⊥ AB
PM = PN = PN = r (Radius of incircle)
A(Δ ABC) = A(Δ APB) + (Δ APC) + (Δ BPC)
= (1/2) AB × PL + (1/2) AC × PN + (1/2) BC × PM
= (1/2) AB × r + (1/2) AC × r + (1/2) BC × r
= (1/2) [AB + AC + BC] × r
Hence proved.

ii. In ΔABC, ∠ACB = 90°. seg CD ⊥ side AB and seg CE is the angle bisector of ∠ACB.
Prove that: $AD/BD = AE^2/BE^2$.



Solution:
Given,
In ΔABC, ∠ACB = 90°.
seg CD ⊥ side AB
seg CE is the angle bisector of ∠ACB
AE/EB = AC/CB (property of angle bisector of a triangle)
$AE^2/BE^2 = AC^2/CB^2$....(i)
In triangle ACB,
m∠ACB = 90° (given)
seg CD ⊥ hypotenuse AB (given)
By RHS criterion,

Δ ACB ~ Δ ADC ~ Δ CDB....(ii)
Now,
ΔADC ~ ΔACB
AC/AB = AD/AC (corresponding sides of similar triangles)
AC^2 = AB × AD....(iii)
Also,
ΔCDB ~ ΔACB
CB/AB = DB/CB (corresponding sides of similar triangles)
CB^2 = AB × CB....(iv)
From (i), (iii), and (iv),
AE^2/BE^2 = (AB × AD)/ (AB × DB)
AE^2/BE^2 = AD/DB
Hence proved.

6. Solve the following questions (Any one): [3]
i. Show that the points (2, 0), (-2, 0) and (0, 2) are the vertices of a triangle. Also, state with the reason the type of the triangle.

Solution:
Let the given points be:
A(2, 0) = (x1, y1)
B(-2, 0) = (x2, y2)
C(0, 2) = (x3, y3)
Using the distance formula,

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(-2-2)^2 + (0-0)^2}$$

$$= \sqrt{(-4)^2}$$

$$= \sqrt{16}$$

$$= 4$$

$$AC = \sqrt{(x_3 - x_1)^2 + (y_3 - y_1)^2}$$

$$= \sqrt{(0-2)^2 + (2-0)^2}$$

$$= \sqrt{(-2)^2 + (2)^2}$$

$$= \sqrt{4+4}$$

$$= \sqrt{8}$$

$$= 2\sqrt{2}$$

And

$$BC = \sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2}$$

$$= \sqrt{\left(0 - (-2)^2\right) + (2-0)^2}$$

$$= \sqrt{(0+2)^2 + (2-0)^2}$$

$$= \sqrt{(2)^2 + (2)^2}$$

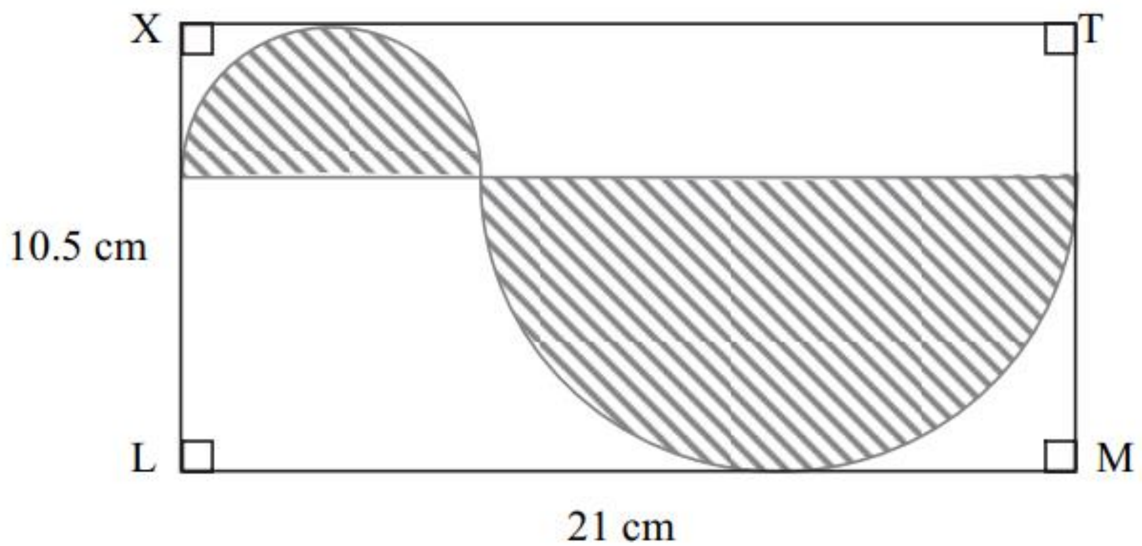
$$= \sqrt{8}$$

$$= 2\sqrt{2}$$

AC = BC

Therefore, ΔABC is an isosceles triangle.
Also,
$AC^2 + BC^2 = (2\sqrt{2})^2 + (2\sqrt{2})^2$
$= 4(2) + 4(2)$
$= 8 + 8$
$= 16$
$= 4^2$
$= AB^2$
Hence, it is a right angle isosceles triangle.

ii.



In the above figure, XLMT is a rectangle. LM = 21 cm, XL = 10.5 cm. The diameter of the smaller semicircle is half the diameter of the larger semicircle. Find the area of the non-shaded region.

Solution:
Given,
XLMT is a rectangle.
LM = 21 cm
XL = 10.5 cm
Let d be the diameter of smaller semicircle and D be the diameter of the larger semicircle.
According to the given,
d = D/2....(i)
From the given figure,
OP = LM = 21 cm
OP = D + d
21 = D + (D/2)
21 = (2D + D)/2
3D = 42
D = 42/3
D = 14 cm
d = D/2 = 14/2 = 7 cm
Now,
Radius of the larger semicircle = R = 14/2 = 7 cm

Radius of the smaller semicircle = r = 7/2 cm
Area of the non-shaded region = Area of rectangle - [Area of the smaller semicircle + Area of the larger semicircle]
= LM × XL - [($\pi r^2/2$) + ($\pi R^2/2$)]
= (21 × 10.5) - π [{$(7/2)^2$/ 2} + $(7)^2$/2]
= 220.5 - π [(49/8) + (49/2)]
= 220.5 - 49π [(1/8) + (1/2)]
= 220.5 - 49π [(1 + 4)/8]
= 220.5 - 49 × (22/7) × (5/8)
= 220.5 - (385/4)
= 220.5 - 96.25
= 124.25
Hence, the area of non-shaded region is 124.25 cm^2.