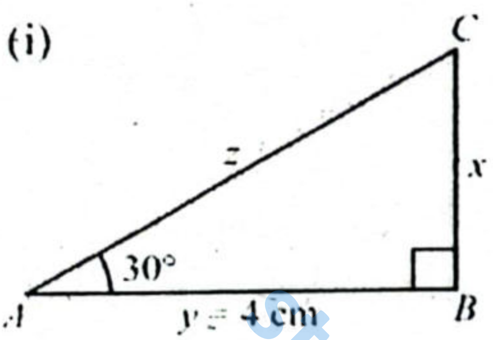
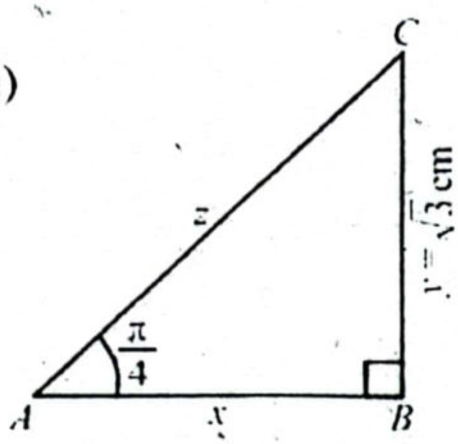
# Exercise 6.5

1. Find the values of $x, y$ and $z$ from the following right angled triangles.

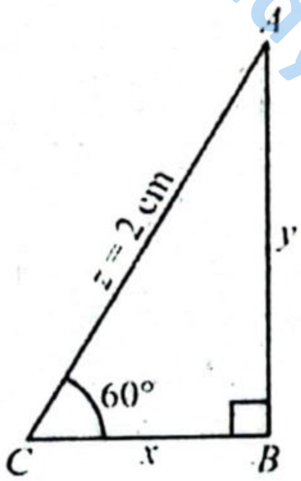
(i)



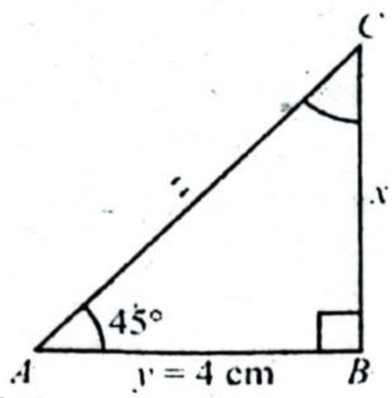

(ii)




(iii)




(iv)




***Solution:***

(i)

$\frac{x}{y} = \tan 30 = \frac{1}{3a} \quad z^2 = x^2 + y^2 = \frac{16\times 3}{9} + 4^2 = 5.33 + 16 = 21.33$

$x = 4\times\frac{1}{\sqrt{3}} = \frac{4\sqrt{3}}{3} = 2.31 \quad \therefore \underline{z} = 4.62, \quad \underline{x} = 2.31; \quad m\angle C = 60''$

(ii) $x = y = \sqrt{3}$ ,

$\angle A = 45°$

$Z^2 = x^2 + y^2 = 3 + 3 = 6$

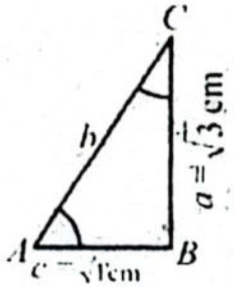
$\therefore \quad Z = \sqrt{6} = 2.45$

(iii) $x^2 + y^2 = z^2 = 4.00333 = \sqrt{4.00} = 2$

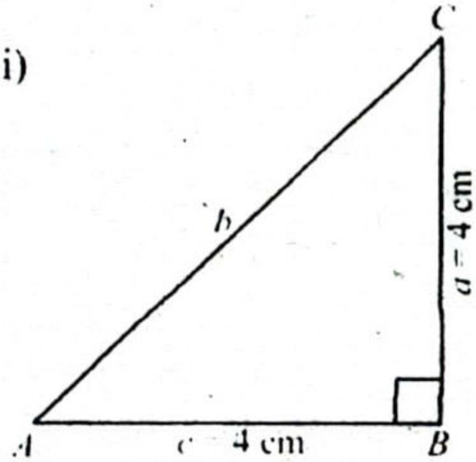
(iv) $AB = 1cm, \ BC = 1cm, \ AC = \sqrt{2}$

**2. Find the unknown side and angles of the following triangles.**

(i)




(ii)




**(i)** In the given triangle:

- $a = \sqrt{3}$ cm
- $c = 1$ cm
- The angle at $B$ is a right angle (90°).

**Step 1: Finding the unknown side $b$**

We can use the Pythagorean theorem to find the unknown side $b$, which states that for a right triangle:

Substituting the given values:

$$b^2 = a^2 + c^2$$

$$= 3 + 1 = 4$$

$$b = 2 \qquad \text{...(ii)}$$

$$\angle A = 60^o$$

$$\angle C = 30^o$$

**(ii)** In the given triangle:

- The right-angled triangle sides $a = 4$ cm, $c = 4$ cm, and the angle at $B = 90°$.
- The task is to find the unknown side $b$ and the angles at $A$ and $C$.

**Step 1: Finding the unknown side $b$**

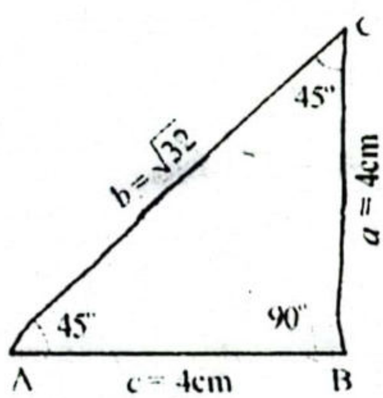
Using the Pythagorean theorem for a right-angled triangle:

*Substitute* the given values:

$$b^2 = a^2 + c^2$$

$$= 4^2 + 4^2 = 32$$

$$b = \sqrt{32}$$



$= 5.66$

$\angle A = \angle C = 45^o$

**3.** **Each side of a square field is 60*m* long. Find the lengths of the diagonals of the field.**

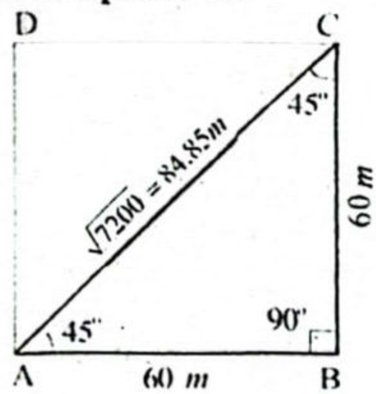
**Solve the following triangles when $m\angle B = 90°$:**

To find the length of the diagonal of a square, we can use the Pythagorean theorem. In a square, the diagonal divides the square into two right-angled triangles, where the sides of the square are the legs of the triangle, and the diagonal is the hypotenuse.

The side of the square = 60 m.

The formula for the length of the diagonal $d$ of a square is:

$$d = \sqrt{s^2 + s^2}$$




Since both sides are equal, we have:

$$d = \sqrt{2s^2}$$

Substituting the value of $s = 60$ m:

$$d = \sqrt{2 \times 60^2}$$

$$d = \sqrt{2 \times 3600}$$

$$d = \sqrt{7200}$$

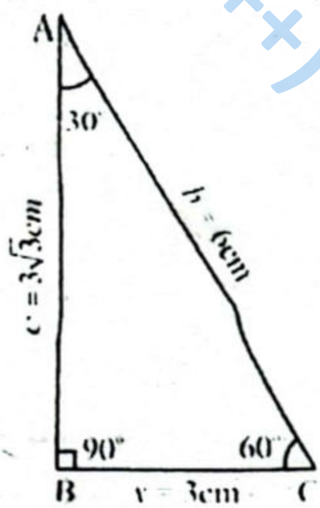
$$d \approx 84.85 \text{ m.}$$

Thus, the length of the diagonal of the square field is approximately 84.85 m.

**Solve the following right angled triangles when:**

**4.** $m\angle C = 60°,\ c = 3\sqrt{3}\text{cm}$

$$\frac{3\sqrt{3}}{x} = \tan 60$$




$$x = \frac{3\sqrt{3}}{\tan 60} = \frac{3\sqrt{3}}{\sqrt{3}} = 3$$

$$b^2 = 3\sqrt{3} + (3)^2 = 27 + 9 = 36$$

$$\therefore\ b = 6$$

**5.** $\boldsymbol{m\angle C = 45^\circ,\ a = 8\text{ cm}}$

$\angle C = 45,\ a = 8\text{ cm},$

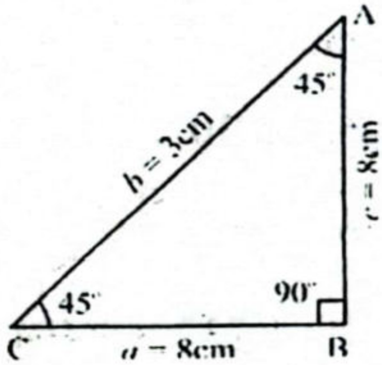
$b^2 = a^2 + c^2$

$= 64 + 64 = 128$

$b = \sqrt{128} = 11.31\text{ cm}$

$\angle A = 90^\circ - 45^\circ = 45^\circ$

$c = 8\text{ cm}$




**6.** $\boldsymbol{a = 12\text{cm},\ c = 6\text{ cm}}$

$a = 12\text{cm},\ c = 6\text{cm},\quad \angle B = 90^\circ$

$b^2 = a^2 + c^2$

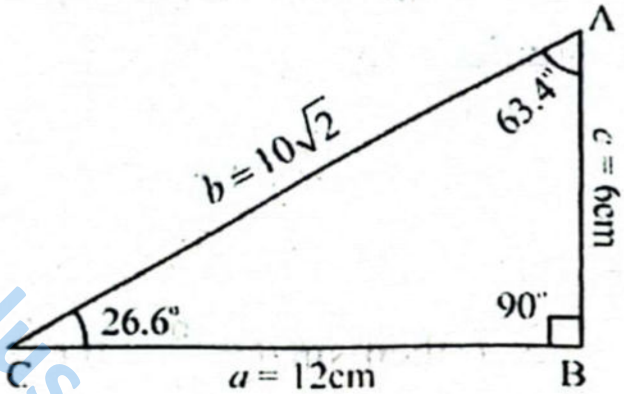
$b^2 = (12)^2 + (6)^2$

$b^2 = 144 + 36 = 200$

$b = 10\sqrt{2}$

$\cos C = \dfrac{12}{10\sqrt{2}} = \dfrac{12}{14.14} = 0.84$

$m\angle C = 26.6^\circ,\ m\angle A = 63.4^\circ$




**7.** $\boldsymbol{m\angle A = 60^\circ,\ c = 4\text{cm}}$

$m\angle A = 60^\circ \ \therefore \angle C = 90^\circ - 60^\circ = 30^\circ$

$\dfrac{a}{4} = \tan 60$

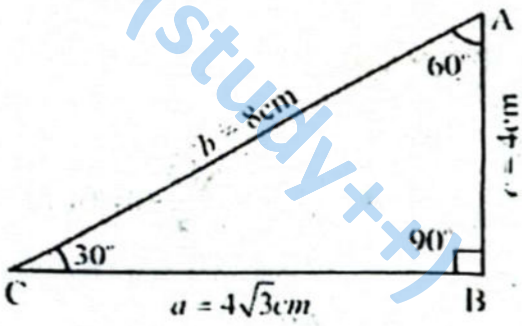
$a = 4\sqrt{3}$

$b^2 = a^2 + c^2$

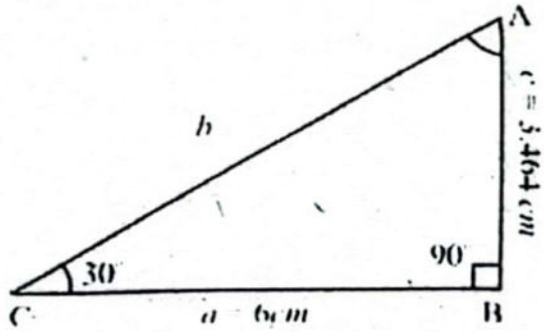
$= (4\sqrt{3})^2 + (4)^2$

$= 48 + 16 = 64$

$b = 8\text{ cm}$



**8.** $m\angle A = 60°,\ c = 4cm$




$\frac{c}{a} = \tan 30$

$c = 6.\tan 30 \quad \therefore \quad c = 6 \times \tan 30$

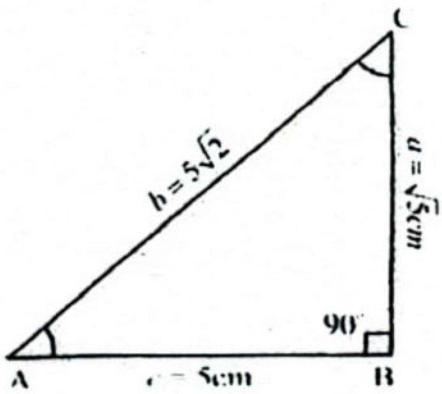
$c = 6 . \frac{1}{\sqrt{3}} = \frac{6 \times \sqrt{3}}{3} = 2\sqrt{3}$

$c = 2 \times 1.732 = 3.464$

$b^2 = a^2 + c^2 = 36 + 11.999 = 47.999$

$b = 6.9281$

**9.** $b = 10cm,\ a = 6\ cm,\ \angle B = 90°$




…ording to fig.

$c^2 = b^2$

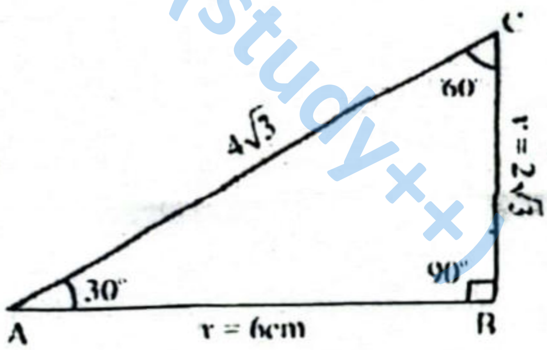
$c^2 = b^2 - a^2 = 100 - 36 = 64$

$c = \sqrt{64} = 8$

$\theta = \angle A$ then $\sin\theta = \frac{6}{10} = 0.6$

$\therefore \theta = 36.9°$

**10.** $m\angle A = 30°,\ b = 4\sqrt{3}cm$



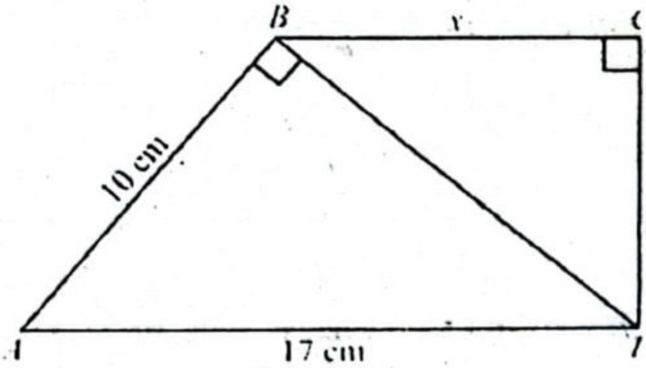

$\frac{x}{4\sqrt{3}} = \cos 30°$

$x = \cancel{4}^{2}\sqrt{3} \times \frac{\sqrt{3}}{\cancel{2}} = 6cm$

$\frac{y}{4\sqrt{3}} = \cos 60$

$y = 4\sqrt{3} \times \frac{1}{2} = 2\sqrt{3}$ cm

**11. Calculate the length $x$ adjoining figure.**




From the fig. ABD is a right angled triangle

(By Pythagoras Theorem)

$\therefore \quad AD^2 = AB^2 + BD^2$

$(BD)^2 = (AD)^2 - (AB)^2$

$= (17)^2 - (10)^2$

$BD^2 = 289 - 100 = 189 \quad \therefore (A)$

$\Delta BDC$ is right angled triangle

$x^2 + (CD)^2 = (BD)^2$

$x^2 = (BD)^2 - (CD)^2$

$x^2 = 189 - (8)^2$

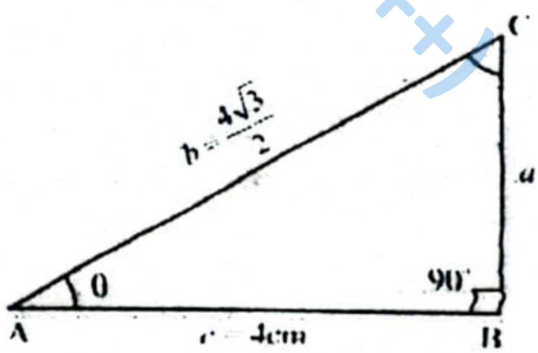
$x^2 = 189 - 64$

$= 125$

$x = 5\sqrt{5}$

**12.** $b = \dfrac{4\sqrt{3}}{2} cm, \quad c = 4\text{cm}$

$b = \dfrac{4\sqrt{3}}{2}, c = 4cm, \; m\angle B = 90$




$\cos\theta \quad = \dfrac{4}{\frac{4\sqrt{3}}{2}} = \dfrac{\cancel{4} \times 2}{\cancel{4}\sqrt{3}} = \dfrac{2}{\sqrt{3}}$

$\cos\theta \quad = \dfrac{2}{\sqrt{3}}$

$\cos\theta \; > 1$ which is not possible. Hence, given data cannot form a triangle.

Moreover $b^2 - c^2 = a^2$

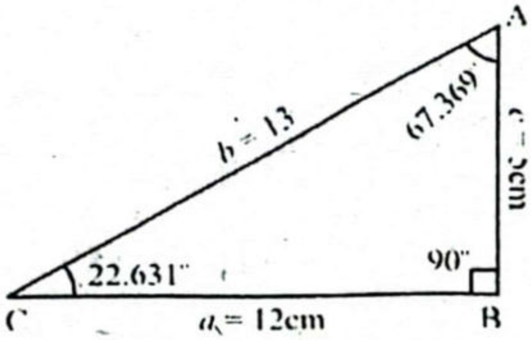
or $a^2 = \frac{{}^{2}\cancel{4}\sqrt{3}}{\cancel{2}} = (4)^2 = 2\sqrt{3} = 16$

$a^2 = 3.464 - 16 = 16 = -12.536$

side '$a$' is negative. Hence triangle is not possible.

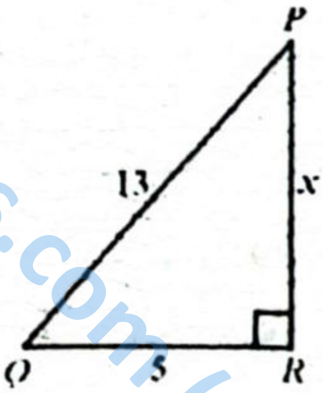
**13. $a = 12$ cm, $c = 5$cm**

$a = 12$ cm, $c = 5$cm. $\angle B = 90^\circ$




$$b^2 = a^2 + c^2$$
$$= (12)^2 + (5)^2 = 144 + 25 = 169$$
$$b = 13$$
$$\cos C = \frac{12}{13} = 0.9230$$
$$\angle C = 22.631^\circ$$

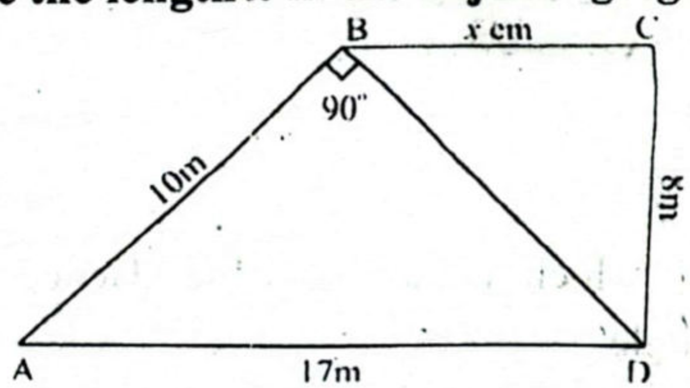
**10.** Let $Q$ and $R$ be the two points on the same bank of a canal. The point $P$ is placed on the other bank straight to point $R$. Find the width of the canal and the angle $PQR$.




***Solution:*** $PQ = 13m$ ; $QR = 5m$

$$x^2 = (13)^2 - (5)^2$$
$$= 169 - 25$$
$$x^2 = 144$$
$$x = 12m$$

**11. Calculate the length $x$ in the adjoining figure.**



$ABD$ is a right angled triangle

$$(AD)^2 = (AB)^2 + (BD)^2$$

$$(BD)^2 = (AD)^2 - (AB)^2$$

$$= (17)^2 - (10)^2$$

$$= 289 - 100$$

$$BD^2 = 189 \quad \dots \text{(i)}$$

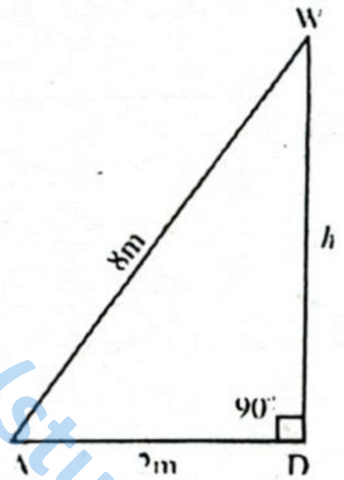
$BCD$ is a right angled triangle

$$x^2 + 8^2 = (BD)^2$$

$$x^2 = (189) - 64 \quad \text{From (i)}$$

$$x = \sqrt{125} = 11.18m$$

**12.** **If the ladder is placed along the wall such that the foot of the ladder is 2m away from the wall. If the length of the ladder is 8m, find the height of the wall?**




***Solution:***

The ladder acts as the hypotenuse of the triangle, the distance from the foot of the ladder to the wall is one of the legs, and the height of the wall is the other leg.

Let:

- $h$ be the height of the wall (the vertical leg),
- 2 m be the distance from the foot of the ladder to the wall (the horizontal leg),
- 8 m be the length of the ladder (the hypotenuse).

Using the Pythagorean theorem:

$$h^2 + 2^2 = 8^2$$

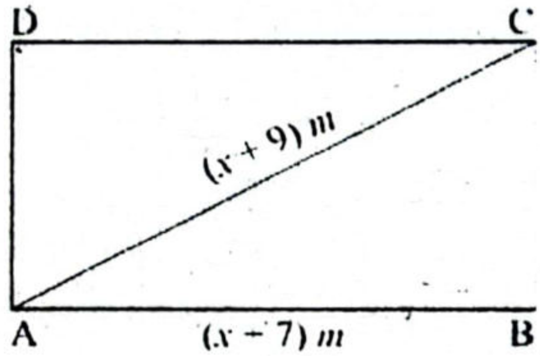
$$h^2 + 4 = 64$$

$$h^2 = 64 - 4 = 60$$

$$h = \sqrt{60} \approx 7.75 \text{ m}$$

So, the height of the wall is approximately 7.75 m.

**13.** The diagonal of a rectangular field $ABCD$ is $(x+9)m$ and the sides are $(x+7)m$ and $x$ m. Find the value of $x$.




$$(x+9)^2 = (x+7)^2 + x^2$$
$$x^2 + 81 + 18x = x^2 + 49 + 14x + x^2$$
$$x^2 + 18x + 81 = 2x^2 + 14x + 49$$
$$2x^2 + 14x - 18x - x^2 + 49x - 81 = 0$$
$$x^2 - 4x - 32 = 0$$
$$x(x-8) + 4(x-8) = (x+4)(x-8) = 0$$
$\therefore$ $x = 8m$ ($\because$ $x$ is not $-4$.)

**14. Calculate the value of '$x$' in each case.**

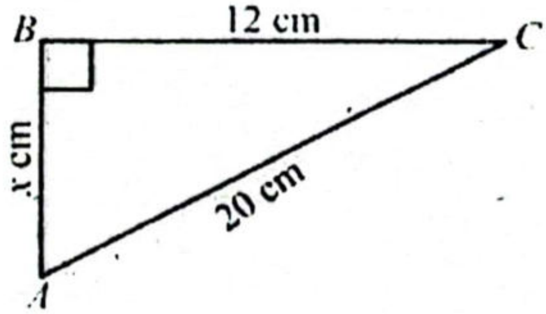
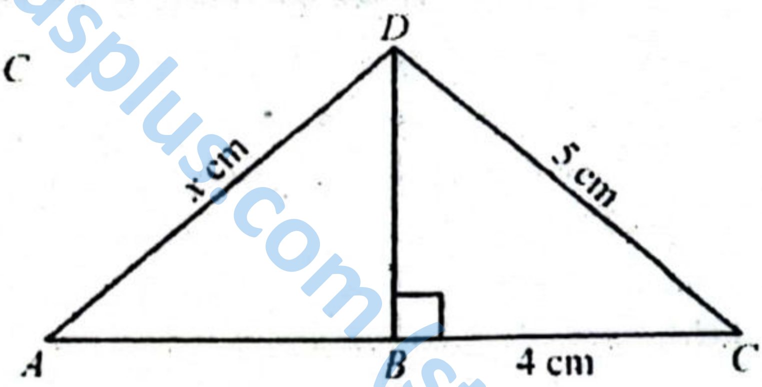



**Fig (a)**




$m\overline{AB} = m\overline{BC}$

**Fig (b)**

**Calculate the value of $x$.**

**In fig (a)**

$$AC^2 = (AB)^2 + (BC)^2$$
$$(AB)^2 = (AC)^2 - (BC)^2$$
$$= (20)^2 - (12)^2$$
$$= 400 - 144$$
$$(AB)^2 = 256$$

$x^2 = 256$

$x = \sqrt{256} = 16cm$

Fig (b) In $\Delta BDC$

$(BD)^2 = (DC)^2 - (BC)^2 = 25 - 16 = 9$

In $\Delta ABD$

$(AD)^2 = (AB)^2 - (BD)^2$

$= (4cm)^2 + 9 = 16 + 9 = 25$

$AD = \sqrt{25} = 5$ Ans.