1/ Verify that the Δs having the following measure of sides are right angled triangle

i) $a = 5^{cm}$ $b = 12^{cm}$ $c = 13^{cm}$

Apply the Pythagoras Theorem

$(hyp)^2 = (base)^2 + (perp)^2$

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

$(13)^2 = (12)^2 + (5)^2$

$169 = 144 + 25$

$169 = 169$

yes it is a right angled Δ

ii) $a = 1.5$ cm $b = 2$ cm

$c = 2.5$ cm

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

$(2.5)^2 = (1.5)^2 + (2)^2$

$6.25 = 2.25 + 4$

$6.25 = 6.25$

yes it is a right angled Δ.

iii) $a = 9$cm, $b = 12$ cm; $c = 15$cm

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

$(15)^2 = (9)^2 + (12)^2$

$225 = 81 + 144$

$225 = 225$

yes it is a right angled Δ

iv) $a = 16$ cm, $b = 30$cm, $c = 34$ cm

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

$(34)^2 = (16)^2 + (30)^2$

$1156 = 256 + 900$

$1156 = 1156$

yes it is a right angled Δ

2/ Verify that a^2+b^2, a^2-b^2 and $2ab$ are the measure of the sides of a right angled triangle where a, and b are any two real numbers $(a > b)$

Sol. See on next Page.

Sol: Q2

$$(a^2+b^2)^2 = (a^2-b^2)^2 + (2ab)^2$$

$$a^4+b^4+2a^2b^2 = a^4+b^4-2a^2b^2 + 4a^2b^2$$

$$a^4+b^4+2a^2b^2 = a^4+b^4+2a^2b^2$$

Yes these given measurements are the sides of right angled Δ

3/ The three sides of a triangle are of measure 8, x and 17 respectively. For what value of x will it become base of a right angled triangle?

Sol:- According to Pythagoras theorem we have:

$$(17)^2 = x^2 + 8^2$$

$$289 = x^2 + 64$$

$$289 - 64 = x^2$$

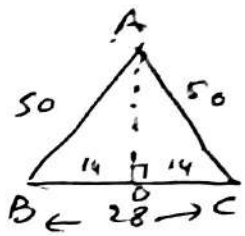
$$\sqrt{225} = \sqrt{x^2}$$

$$\boxed{15 = x}$$

4/ In an isosceles Δ, the Base $\overline{BC} = 28$cm and $\overline{AB} = \overline{AC} = 50$cm If $\overline{AD} \perp \overline{BC}$ then find

i) Length of AD
ii) Area of ΔABC

Sol: Because AD is perpendicular to Base so it will bisect $\overline{BC}$.



i.e $\boxed{\overline{BD} = \overline{DC} = 14\text{cm}}$

because now ABD is a right triangle so Apply Pythagoras Theorem we have.

$$(50)^2 = (AD)^2 + (14)^2$$

$$2500 = (AD)^2 + 196$$

$$2500 - 196 = (AD)^2$$

$$\sqrt{2304} = \sqrt{(AD)^2}$$

(i) $\boxed{48\text{cm} = (AD)}$

ii) Area of $\Delta = \frac{1}{2} \times \text{base} \times \text{height}$

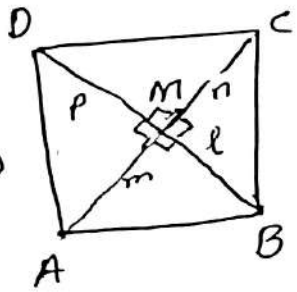
$$= \frac{1}{2} \times 28^{14} \times 48 \text{ cm}^2$$

$$\boxed{\text{Area of } \Delta = 672 \text{ cm}^2}$$

Exercise 15

5/ In a quadrilateral ABCD, the diagonal $\overline{AC}$ and $\overline{BD}$ are perpendicular to each other. Prove that $m\overline{AB}^2 + m\overline{CD}^2 = m(\overline{AD})^2 + m\overline{BC}^2$

Sol.



Given:

Diagonal $AC \perp BD$

To Prove:

$$m\overline{AB}^2 + m\overline{CD}^2 = m\overline{AD}^2 + m\overline{BC}^2$$

Let $\overline{AM} = m$

$\overline{BM} = l$

$\overline{CM} = n$

$\overline{DM} = p$

Now According to Pythagoras Theorem we have.

$$m|\overline{AB}|^2 = m^2 + l^2 \quad \text{— (i)}$$

$$m\overline{CD}^2 = p^2 + n^2 \quad \text{— (ii)}$$

Now by adding Eq (i) and (ii) we have.

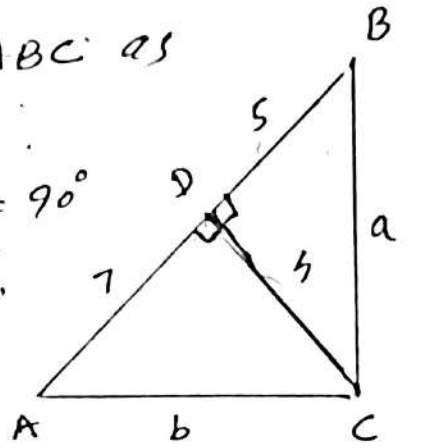
$$m\overline{AB}^2 + m\overline{CD}^2 = m^2 + l^2 + p^2 + n^2$$

$$m\overline{AB}^2 + m\overline{CD}^2 = m^2 + p^2 + l^2 + n^2$$

$$m\overline{AB}^2 + m\overline{CD}^2 = mA\overline{D}^2 + m\overline{BC}^2$$

Hence proved.

6/ i) In the $\triangle ABC$ as shown in the fig $m\angle ACB = 90°$ and $\overline{CD} \perp \overline{AB}$. Find the lengths a, h and b if $m\overline{BD} = 5cm$, $m\overline{AD} = 7cm$



Sol: In $\triangle BDC$ we have

$$a^2 = 5^2 + h^2 \quad \text{— (i)}$$

$$b^2 = 7^2 + h^2 \quad \text{— (ii)}$$

add Eq (i) and (ii)

$$a^2 + b^2 = 5^2 + 7^2 + h^2 + h^2$$

$$a^2 + b^2 = 25 + 49 + 2h^2$$

$$a^2 + b^2 = 74 + 2h^2 \quad \text{— (iii)}$$

In $\triangle ABC$ we have.

$$a^2 + b^2 = (12)^2 \quad \text{— (iv)}$$

$\therefore$ from Eq (iii) and (iv)

$$(12)^2 = 74 + 2h^2$$

$$144 = 74 + 2h^2$$

$$144 - 74 = 2h^2$$

$$70 = 2h^2$$

$$35 = h^2 \quad \text{— (v)}$$

$$\sqrt{35} = h$$ (by taking Square root)

6/ Now from Eq (i) and (iv) we have

$a^2 = 5^2 + h^2$

$a^2 = 25 + 35$

$\sqrt{a^2} = \sqrt{60}$

$a = \sqrt{4 \times 15}$

$\boxed{a = 2\sqrt{15}}$ — (vi)

Now from Eq (ii) and (v) we have

$b^2 = 7^2 + h^2$

$b^2 = 49 + 35$

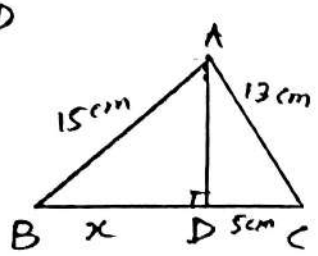
$b^2 = 84$

$\sqrt{b^2} = \sqrt{84}$

$b = \sqrt{21 \times 4}$

$\boxed{b = 2\sqrt{21}}$

ii) First find $\bar{AD}$



$\bar{AD}^2 + \bar{CD}^2 = \bar{AC}^2$

$\bar{AD}^2 + 5^2 = 13^2$

$\bar{AD}^2 = 13^2 - 5^2$

$AD^2 = 169 - 25 = 144$

$\sqrt{\bar{AD}^2} = \sqrt{144}$.

$AD = \sqrt{144} = 12$ cm.

Now in ΔABD we have

$\bar{AB}^2 = \bar{AD}^2 + x^2$

$\bar{AB}^2 = 144 + x^2$

$15^2 = 144 + x^2$

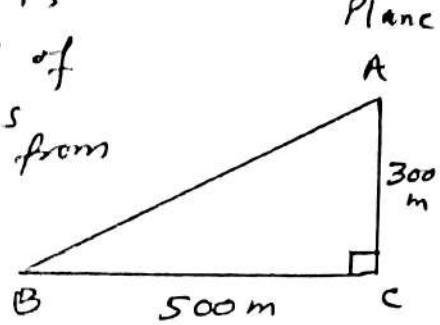
$225 - 144 = x^2$

$81 = x^2$

$\sqrt{81} = \sqrt{x^2}$

$\boxed{9 = x}$

7/ A plane is at a height of 300 m and is 500 m away from the air port as shown in figure.



How much distance will it travel to land at the air port?

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

$= (500)^2 + (300)^2$

$= 250000 + 90000$

$(AB)^2 = 340000$

$\sqrt{(AB)^2} = \sqrt{340000}$

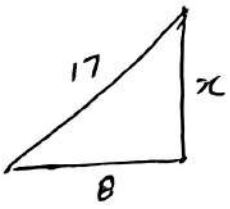
$AB = \sqrt{34 \times 10000}$

$\boxed{AB = 100\sqrt{34}}$

Exercise 15

8/ A ladder 17m long rest against a vertical wall. The foot of the ladder is 8m away from the base of the wall. How high up the wall will the ladder reach?

Sol: Let height = x



$(17)^2 = (8)^2 + x^2$

$289 = 64 + x^2$

$289 - 64 = x^2$

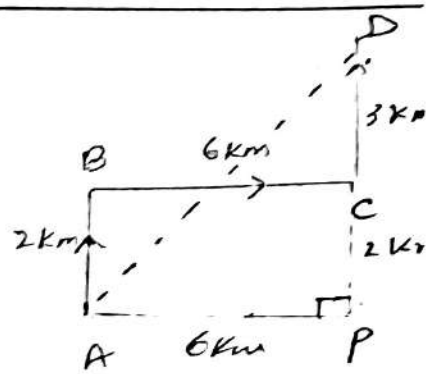
$225 = x^2$

$\sqrt{225} = \sqrt{x^2}$

$\boxed{15 = x}$

Construction:

Join A to D. and Extend CD to P. Such that CP = AB = 2Km and Join A to P. and we have A D P is right triangle.



$(AD)^2 = (AP)^2 + (PD)^2$

$(AD)^2 = (6)^2 + (5)^2$

$= 36 + 5^2$

$= 36 + 25$

$(AD)^2 = 61$

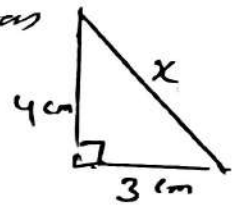
$\boxed{AD = \sqrt{61}}$ Km.

Review Exercise 15 (Page 243)

9/ A student travels to his school by the route as shown in the fig. find m$\bar{AD}$, the direct distance from his house to school.

2/ Find the unknow value in each of the following figure

According to Pythagoras theorem



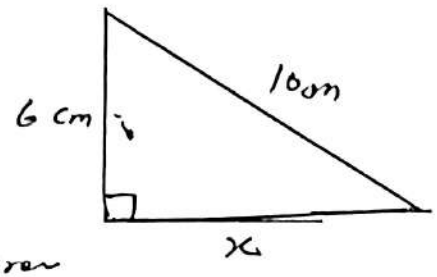
$x^2 = 4^2 + 3^2$

$x^2 = 16 + 9$

$\sqrt{x^2} = \sqrt{25}$

$\boxed{x = 5}$

2/ (ii)



According to Pythagoras Theorem we have

$(10)^2 = (6)^2 + x^2$

$10^2 - 6^2 = x^2$

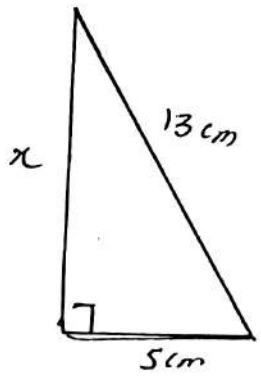
$100 - 36 = x^2$

$64 = x^2$

$\sqrt{64} = \sqrt{x^2}$

$\boxed{8 = x}$

iii)



$(13)^2 = x^2 + 5^2$

$13^2 - 5^2 = x^2$

$169 - 25 = x^2$

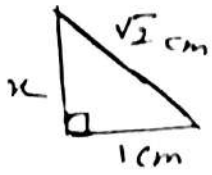
$144 = x^2$

$\sqrt{144} = \sqrt{x^2}$

$\boxed{12 = x}$

iv)

According to Pythagoras Theorem



$(hyp)^2 = (Base)^2 + (Perpendicular)^2$

$(\sqrt{2})^2 = (1)^2 + x^2$

$2 = 1 + x^2$

$2 - 1 = x^2$

$1 = x^2$

$\sqrt{1} = \sqrt{x^2}$

$\boxed{1 = x}$