Exercise 8.10

1.

Sol:

Let the length of the shortest side be x cm

Given that the length of the largest side is 5cm more than that of smaller side

$\Rightarrow$ longest side = (x + 5)cm

And also, given that

Hypotenuse = 25cm

So, let us consider a right angled triangle ABC right angled at B

We have, hypotenuse (AC) = 25 cm

BC = x cm and AB = (x + 5)cm

Since, ABC is a right angled triangle

We have, $(BC)^2 + (AB)^2 = (AC)^2$

$\Rightarrow x^2cm^2 + (x+5)^2cm^2 = (25)^2cm^2$

$\Rightarrow x^2 + x^2 + 10x + 25 = 625$

$\Rightarrow 2x^2 + 10x - 600 = 0$

$\Rightarrow 2(x^2 + 5x - 300) = 0$

$\Rightarrow x^2 + 5x - 300 = 0$

$\Rightarrow x^2 + 20x - 15x + (20x - 15) = 0$

$\Rightarrow x(x+20) - 15(x+20) = 0$

$\Rightarrow (x+20)(x-15) = 0$

$\Rightarrow (x+20)=0 \; or \; (x-15)=20$

2.

Sol:

Using Pythagoras theorem,

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

$\Rightarrow (2y)^2 cm^2 + (3x)^2 cm^2 = \left(9\sqrt{5}\right)^2 cm^2$

$\Rightarrow 4y^2 + 9x^2 = 81 \times 5$

$\Rightarrow 4y^2 + 9x^2 = 405$

$\Rightarrow 4(90 - x^2) + 9x^2 = 405 \quad [\because x^2 + y^2 = 90]$

$\Rightarrow 4 \times 90 - 4x^2 + 9x^2 = 405$

$\Rightarrow 5x^2 = 405 - 360$

$\Rightarrow 5x^2 = 405 - 360$

$\Rightarrow 5x^2 = 45$

$\Rightarrow x^2 = 9$

$\Rightarrow x = \sqrt{3^2} \;\Rightarrow x = \pm 3$

$Since, x \; cannot \; be \; a \; negative \; value. So \; x = 3cm$

We have,

$x^2 + y^2 = 90$

$\Rightarrow y^2 = 90 - (3)^2$

$\Rightarrow y^2 = 90 - 9$

$\Rightarrow y^2 = 81 \;\Rightarrow y = \sqrt{81} \;\Rightarrow y = \pm 9$

Since, y cannot be a negative value. So, y = 9cm

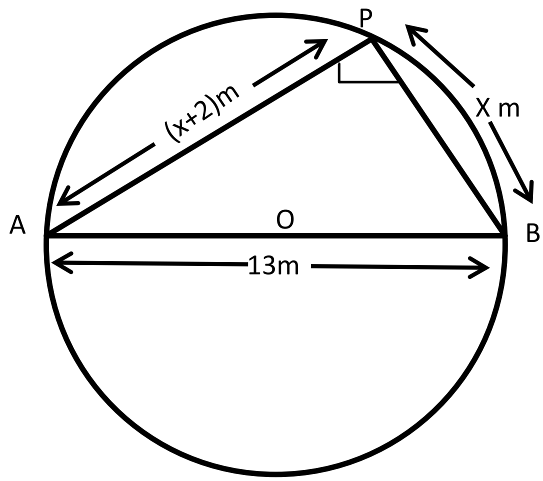
∴ hence, the length of the smaller side is 3 cm and the length of the longer side is 9cm.

3.

Sol:

Yes, it is possible to do so as in the given condition

This can be proved as below,



Let P be the required location of the pole such that its distance from gate B is x meter i.e. BP = x meters and also AP – BP = 7m

⇒ AP = BP + 7m = (x + 7)m

Since, AB is a diameter and P is a point on the boundary of the semi-circle, ΔAPB is right angled triangle, right angled at P.

Using Pythagoras theorem,

$(AB)^2 = (AP)^2 + (BP)^2$

⇒ $(13)^2 m^2 = (x+7)^2 m^2 + (x)^2 m^2$

⇒ 169 = $x^2 + 14x + 49 + x^2$

⇒ $2x^2 + 14x + 49 - 169 = 0$

⇒ $2x^2 + 14x - 120 = 0$

⇒ $2(x^2 + 7x - 60) = 0$

⇒ $x^2 + 7x - 60 = 0$

⇒ $x^2 + 12x - 5x - (12 \times -5) = 0$

⇒ $x(x + 12) - 5(x + 12) = 0$

⇒ $(x + 12)(x - 5) = 0$

⇒ x + 12 = 0 or x – 5 = 0

⇒ x = −12 or x = 5

Since, x cannot be a negative value, So x = 5

⇒ BP = 5m

Now, AP = (BP + 7)m = (5 + 7)m = 12 m

∴ The pole has to be erected at a distance 5 mtrs from the gate B and 12 m from the gate A.

4.

Sol:

120 m, 90 m