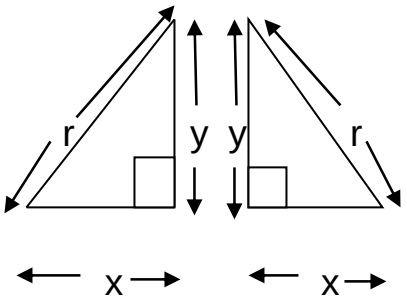
CHAPTER SEVEN

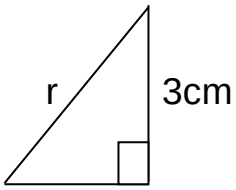
Pythagoras Theorem

Introduction:



- Each of the two drawn figures shows a right angle triangle.
- An ancient mathematician made studies with respect to the right angle triangle, and came out with a theorem.
- From the Pythagoras theorem, $r^2 = x^2 + y^2 => r = \sqrt{x^2 + y^2}$

Q1.



4cm

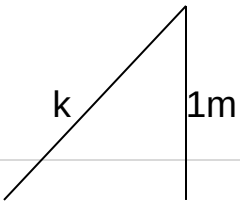
Find the value of r.

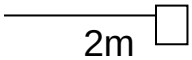
Soln.

From Pythagoras theorem $r^2 = 4^2 + 3^2$,

$\therefore r^2 = 16 + 9, => r^2 = 25 => r = \sqrt{25} = 5cm.$

Q2





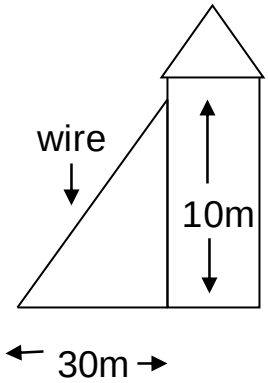
Determine the length marked k.

Soln.

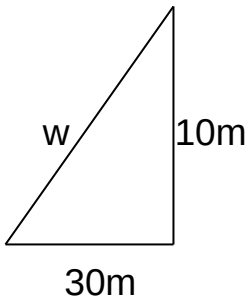
According to Pythagoras theorem, $k^2 = 2^2 + 1^2 => k^2 = 4 + 1, => k^2 = 5, \therefore k = \sqrt{5}$.

Q3. One end of a wire is fixed to a point 10m up a building. The other end is fixed to the ground, at a point which is 30m away from the foot of the building. Find the length of the wire.

Soln



From this diagram we can get the next diagram;



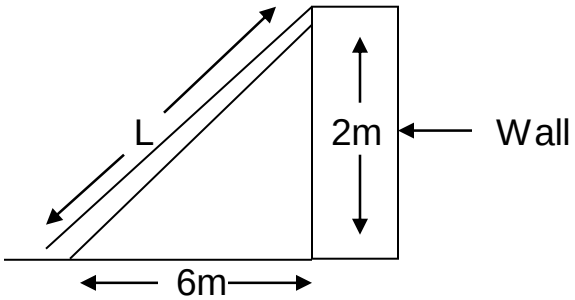
Where w = the length of the wire.

From Pythagoras theorem,

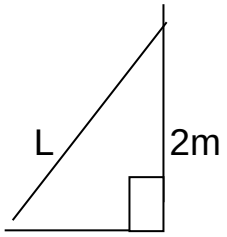
$W^2 = 30^2 + 10^2, => W^2 = 900 + 100, => W^2 = 1000, \therefore W = \sqrt{1000}$

Q4. A ladder leans against a wall. The foot of the ladder is on the same horizontal level as the foot of the wall and is 6m away from the wall. The top of the ladder reaches the top of the wall which is 2m high. Determine the length of the ladder.

Soln.



Let L = the length of the ladder. This diagram can be represented mathematically as shown next:



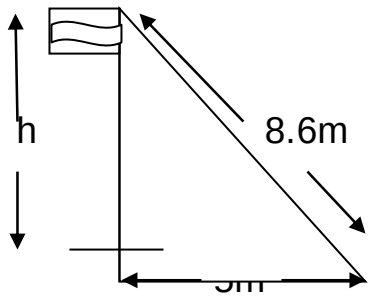
6m

From Pythagoras theorem, $l^2 = 6^2 + 2^2 => l^2 = 36 + 4, => l^2 = 40, => l = \sqrt{40} => l = 6.3$.

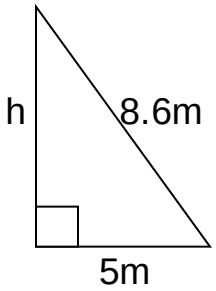
∴ The length of the ladder is 6.3m.

Q5. A rope which is 8.6m long has its one end fixed to the top of a flag pole. If its other end is fixed to a point on the ground, which is 5m away from the foot of the pole, determine the height of the flag pole.

Soln.



Let h = the height of the flag pole.

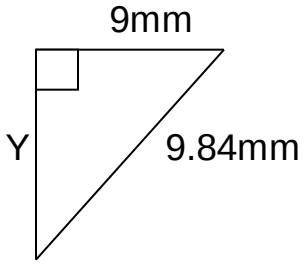


From Pythagoras theorem, $8.6^2 = h^2 + 5^2, \therefore 74 = h^2 + 25 => 74 - 25 = h^2, => 49 = h^2,$

$\therefore h = \sqrt{49} = 7.$

$\therefore The\ height\ of\ the\ flag\ pole = 7m.$

Q6.

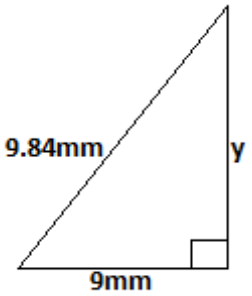


For the give diagram, calculate the length y.

.

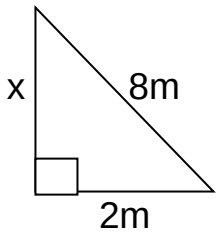
Soln.

Rotate the given figure into the position shown next:



From Pythagoras theorem, $9.84^2 = y^2 + 9^2, => 97 = y^2 + 81, => 97 - 81 = y^2, => y^2 = 16, \therefore y = \sqrt{16} => y = 4mm.$

Q7. Calculate the length marked x in the given figure:



Soln.

From Pythagoras theorem,$x^2 + 2^2 = 8^2, \therefore x^2 + 4 = 64 => x^2 = 64 - 4 = 60, \quad => x^2 = 60 => x = \sqrt{60} = 7.74 => x = 7.7m.$