

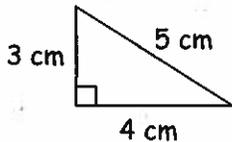
# Pythagoras and Angles

## Sides of Right Triangles

- For any right-triangle, the length of the longest side (called the hypotenuse) can be related to the length of the other two sides. The hypotenuse is always across from the right (90°) angle.

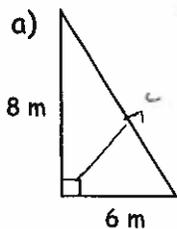
Sum of Squares Rule:  $a^2 + b^2 = c^2$

- The sum of the squares of the legs (a and b) of the triangle is equal to square of the hypotenuse (c).



- Knowing this formula, we can solve for an unknown side.

Ex/ Find the missing lengths.

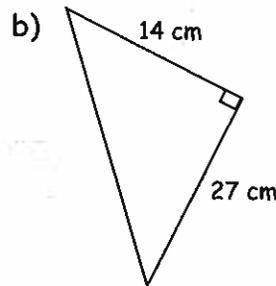


$$8^2 + 6^2 = c^2$$

$$100 = c^2$$

$$\sqrt{100} = c$$

$$10 = c$$



$$27^2 + 14^2 = c^2$$

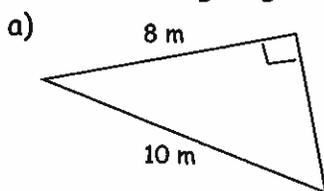
$$925 = c^2$$

$$\sqrt{925} = c$$

$$c = 30.41 \text{ cm}$$

- We can also solve for either of the legs if we know the hypotenuse.

Ex/ Find the missing lengths.



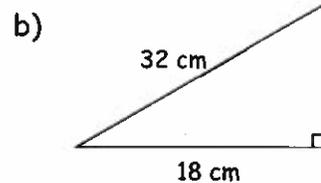
Rearrange

$$8^2 + b^2 = 10^2$$

$$b^2 = 10^2 - 8^2$$

$$b^2 = 64$$

$$b = 8$$



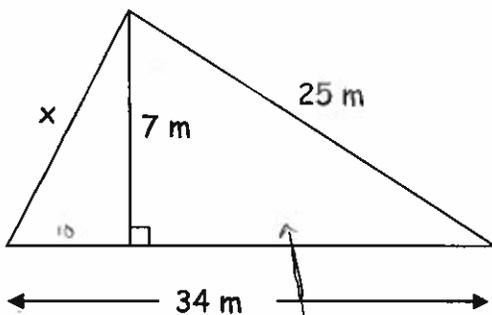
$$18^2 + b^2 = 32^2$$

$$b^2 = 32^2 - 18^2$$

$$b^2 = 700$$

$$b = 26.46 \text{ cm}$$

Ex/ Calculate the missing length.



$$7^2 + b^2 = 25^2$$

$$b^2 = 25^2 - 7^2$$

$$b^2 = 576$$

$$b = 24$$

$$34 - b = 10$$

$$10^2 + 7^2 = x^2$$

$$149 = x^2$$

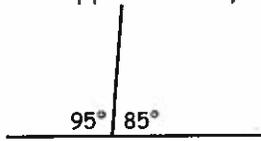
$$x = 12.21 \text{ m}$$

Find this side

## Angle Properties

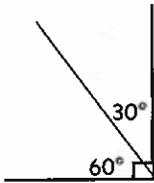
- When a straight line is divided into two or more angles, the resulting angles always add to  $180^\circ$ . They are called supplementary angles.

i.e.



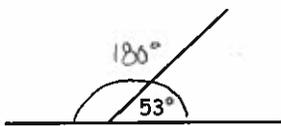
- A right angle is shown by a little square, and it is  $90^\circ$ . When it is broken into parts, we call the angles complimentary.

i.e.



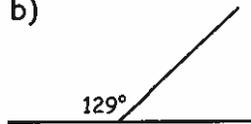
Ex/ Determine the missing angle.

a)



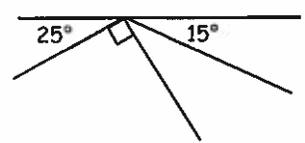
$$180 - 53 = 127^\circ$$

b)



$$180 - 129 = 51^\circ$$

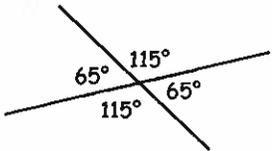
c)



$$180 - 25 - 90 - 15 = 50^\circ$$

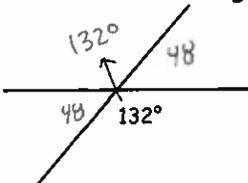
- When two or more straight lines cross, the angles that are across from one another are always equal.

i.e.



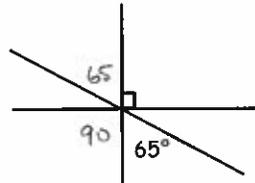
Ex/ Determine the missing angles.

a)



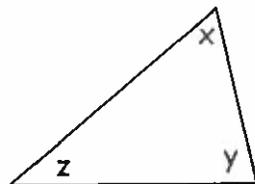
$$180 - 132 = 48^\circ$$

b)



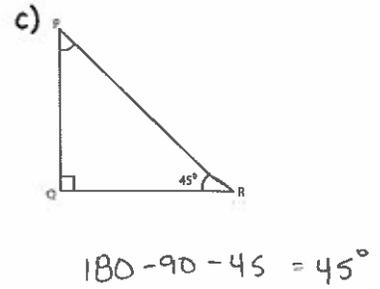
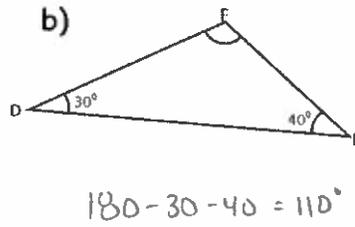
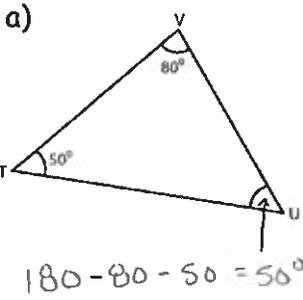
$$180 - 90 - 65 = 25^\circ$$

- The inside angles of a triangle always add to  $180^\circ$ .



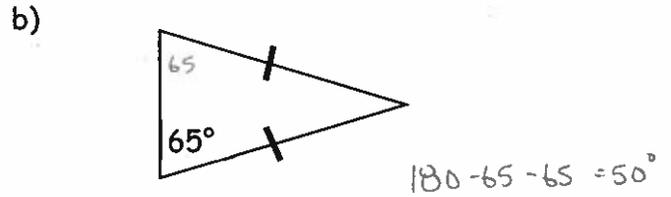
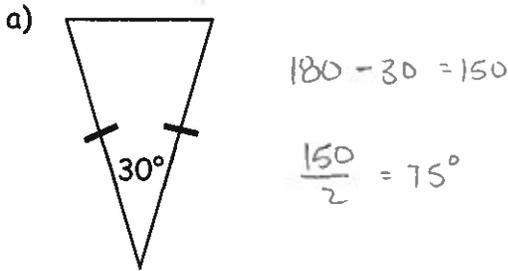
$$x + y + z = 180^\circ$$

Ex/ Find the unknown angle.

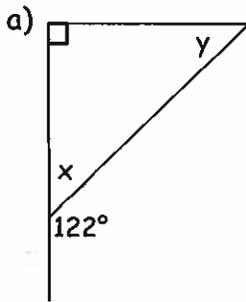


- If a triangle is isosceles, it has 2 equal sides which are shown by dashes. The angles across from the equal sides are also equal.

Ex/ Determine the missing angles.

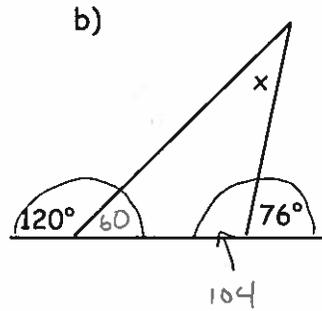


Ex/ Find the unknown angles.

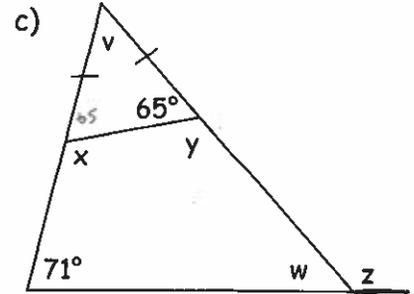


$$x = 180 - 122 = 58^\circ$$

$$y = 180 - 90 - 58 = 32^\circ$$



$$x = 180 - 60 - 104 = 16^\circ$$



$$v = 180 - 65 - 65 = 50^\circ$$

$$x = 180 - 65 = 115^\circ$$

$$y = 115^\circ$$

$$w = 180 - 50 - 71 = 59^\circ$$

$$z = 180 - 59 = 121^\circ$$

Homework: Pythagoras and Angles