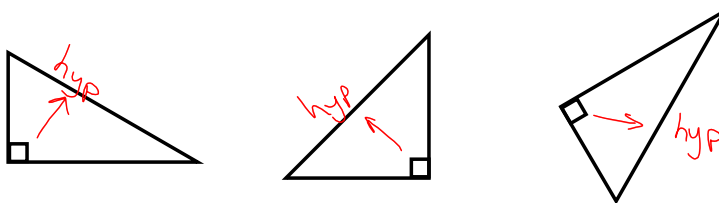# 5.5 Triangles

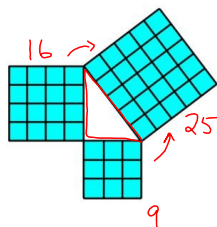*hyp*   *hyp*   *hyp*

Hypotenuse: The side opposite the 90° angle in a right triangle.
            The hypotenuse is the longest side in a right triangle.

Label the hypotenuse in each triangle above.

Pythagorean Theorem:

$$hypotenuse^2 = side^2 + side^2$$

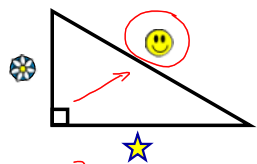side   *hypotenuse*   side

---

16   25   9

In a right triangle, the sum of the areas of the __squares__ on the two adjacent sides is __equal__ to the area of the __squares__ on the __hypotenuse__.
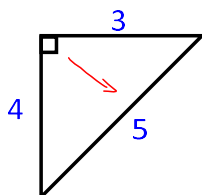
WARNING

This ONLY works if it is a right triangle!

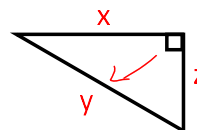
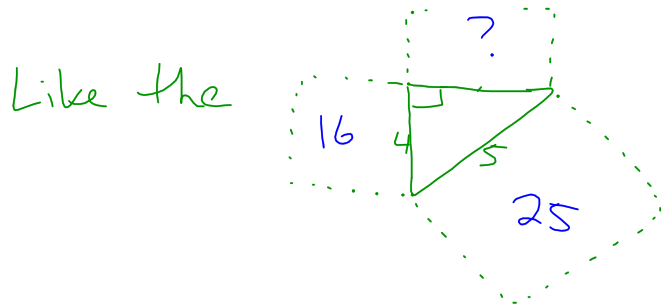Ex. 1 Write an equation for each triangle using the Pythagorean theorem.

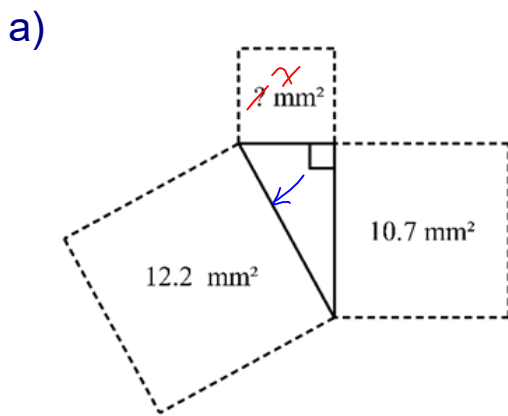3   4   5   x   z   y

$$☺^2 = ★^2 + ❀^2$$ $$5^2 = 3^2 + 4^2$$ $$y^2 = x^2 + z^2$$
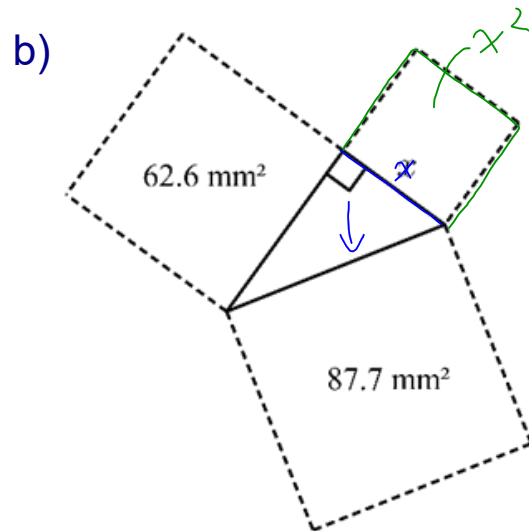
Like the

?

16 4 5

25

$25 = 16 + ?$

Ex. 2 Find the unknowns using the properties from Pythagorean Theorem.

a)

x mm²

10.7 mm²

12.2 mm²

$12.2 = 10.7 + x$
$12.2 - 10.7 = x$
$1.5 = x$
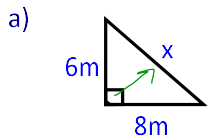
b)

x^2

62.6 mm²

x

87.7 mm²

$87.7 = 62.6 + x^2$
$87.7 - 62.6 = x^2$
$25.1 = x^2$
$\sqrt{25.1} = \sqrt{x^2}$
$5.01 \doteq x$

Ex. 3 Find the unknowns.

a)

6m, x, 8m

$$x^2 = 6^2 + 8^2$$
$$x^2 = 36 + 64$$
$$x^2 = 100$$
$$\sqrt{x^2} = \sqrt{100}$$
$$x = 10$$

b)

2m, 5m, a
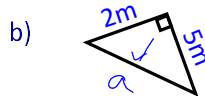
$$a^2 = 2^2 + 5^2$$
$$a^2 = 4 + 25$$
$$a^2 = 29$$
$$\sqrt{a^2} = \sqrt{29}$$
$$a \doteq 5.39$$

c)

13 cm, y, 5 cm
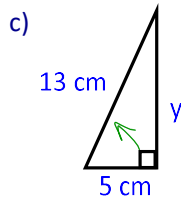
$$13^2 = 5^2 + y^2$$
$$169 = 25 + y^2$$
$$169 - 25 = y^2$$
$$144 = y^2$$
$$\sqrt{144} = y$$
$$12 = y$$

c)

2m, c, 4m, x, 5m
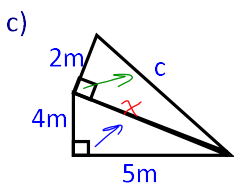
$$x^2 = 4^2 + 5^2$$
$$= 16 + 25$$
$$= 41$$

$$c^2 = 2^2 + x^2$$
$$c^2 = 4 + 41$$
$$c^2 = 45$$
$$c = \sqrt{45}$$
$$\doteq 6.7$$

$$\boxed{c = 6.7m}$$

Ex. 4 What is the length of the diagonal of a soccer field that is 80 m by 76 m?

76 m, 80 m
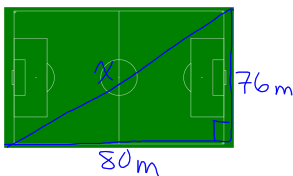
$$x^2 = 80^2 + 76^2$$
$$= 6400 + 5776$$
$$= 12176$$
$$x = \sqrt{12176}$$
$$\doteq 110.3$$

∴ The diagonal is 110.3m

Ex. 5 A 4 m long ladder is leaning at a point 2 m up the wall. Find the distance of the ladder from the wall.

2m, 4m, x
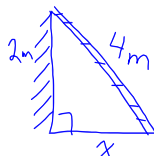
$$4^2 = 2^2 + x^2$$
$$16 = 4 + x^2$$
$$16 - 4 = x^2$$
$$12 = x^2$$
$$\sqrt{12} = x$$
$$3.5 \doteq x$$

∴ The ladder is 3.5m from the wall