

Warm Up

1. Simplify: $\sqrt{20}$

$$\sqrt{4 \cdot 5} = 2\sqrt{5}$$

2. Simplify: $(\sqrt{3})(\sqrt{6})$

$$\sqrt{18} = \sqrt{2 \cdot 9} = 3\sqrt{2}$$

3. Rationalize the denominator:

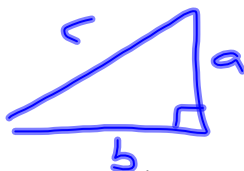
$$\frac{5 \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{5\sqrt{10}}{10}$$

$$\frac{1\sqrt{10}}{2}$$

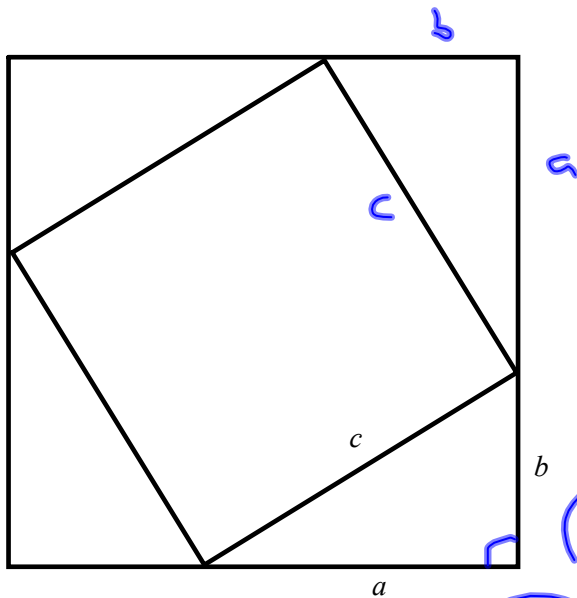
7-1 NOTES ON THE PYTHAGOREAN THEOREM

Pythagorean Theorem

In a right triangle, $a^2 + b^2 = c^2$



Proof of the Pythagorean Theorem



Area
Big Square = 4 triangles + Area
Small Square

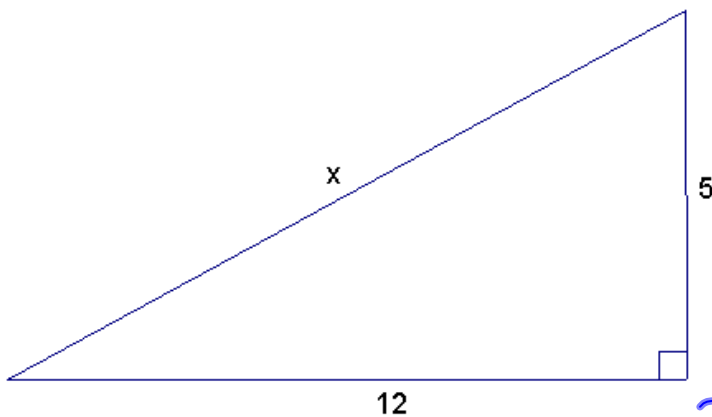
$$(a+b)^2 = \frac{4 \cdot a \cdot b}{2} + c^2$$

$$(a+b)(a+b)$$

$$a^2 + \cancel{2ab} + b^2 = \cancel{2ab} + c^2$$

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

Ex 1 Find the length of the hypotenuse



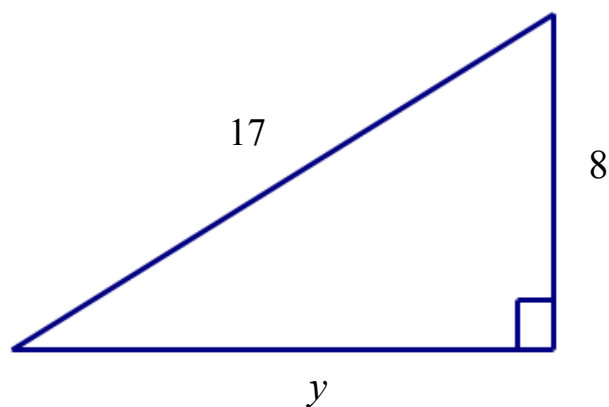
$$12^2 + 5^2 = x^2$$

$$144 + 25 = x^2$$

$$169 = x^2$$

$$13 = x$$

Ex 2 Find the length of the missing side



$$\begin{aligned}y^2 + 8^2 &= 17^2 \\y^2 + 64 &= 289 \\y^2 &= 225 \\y &= 15\end{aligned}$$

Pythagorean Triples -

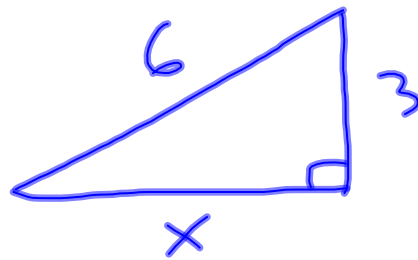
$$3, 4, 5 \rightarrow 6, 8, 10$$

$$5, 12, 13$$

$$7, 24, 25$$

$$8, 15, 17$$

- Ex 3 A 6 foot long ramp leads up to a 3 foot high ledge. How far is the base of the ramp from the base of the ledge?



$$3^2 + x^2 = 6^2$$

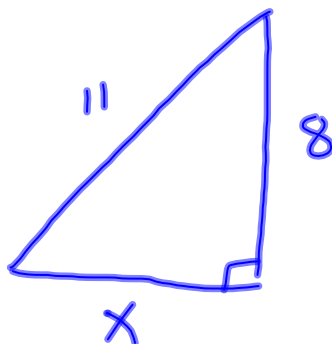
$$9 + x^2 = 36$$

$$x^2 = 27$$

$$x = \sqrt{27} = \sqrt{9 \cdot 3} = 3\sqrt{3}$$

$$x \approx 5.196 \text{ ft.}$$

- Ex 4 An 11 foot long ladder is leaning up against the side of a building. The window is 8 feet off the ground. How far away does the ladder need to be from the building to reach the window?



$$8^2 + x^2 = 11^2$$

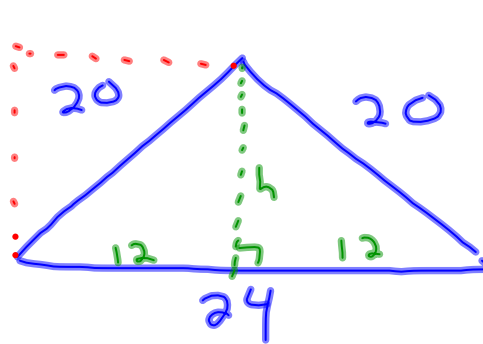
$$64 + x^2 = 121$$

$$x^2 = 57$$

$$x \approx 7.55 \text{ ft.}$$

$$x = \sqrt{57}$$

- Ex 5 Find the area of an isosceles triangle with side lengths 20 in, 20 in, and 24 in.

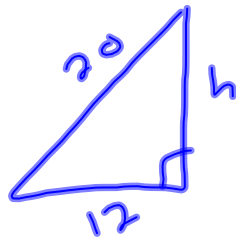


$$h^2 + 12^2 = 20^2$$

$$h^2 + 144 = 400$$

$$h^2 = 256$$

$$h = 16 \text{ in}$$

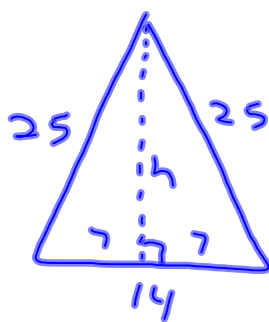


$$A = \frac{1}{2} \cdot b \cdot h$$

$$A = \frac{1}{2} \cdot 24 \cdot 16$$

$$A = 192 \text{ in}^2$$

- Ex 6 Find the area of an isosceles triangle with side lengths 25 cm, 25 cm, and 14 cm.



$$h^2 + 7^2 = 25^2$$

$$h^2 + 49 = 625$$

$$h^2 = 576$$

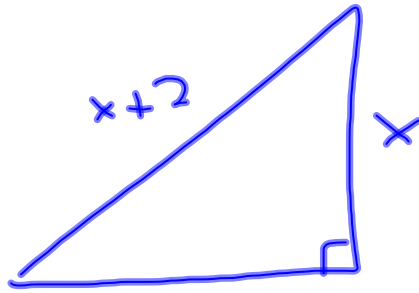
$$h = 24$$

$$A = \frac{h \cdot b}{2}$$

$$= \frac{24 \cdot 14}{2}$$

$$A = 168 \text{ cm}^2$$

Ex. 7 The lengths of the sides of a right triangle are $x - 2$, x , and $x + 2$. Solve for x .



$$(x-2)^2 + x^2 = (x+2)^2$$