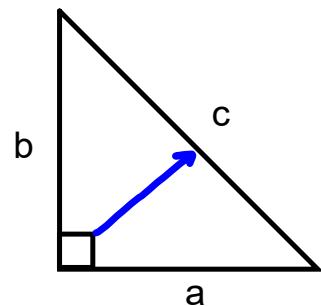


## Pythagorean Theorem

- Right Angle Triangle has one angle that  $90^\circ$
  - the side directly across to the right angle is always the longest side, it is the hypotenuse.
- We use "c" for the hypotenuse
- Legs are side "a" and "b"



## Pythagorean Theorem Equation:

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

area of the square  
off the hypotenuse

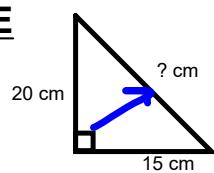
$$(c)^2 - (b)^2 = (a)^2$$

area of the square  
off the leg

### **Pythagorean Theorem Equation:**

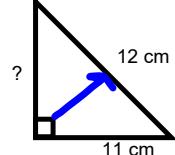
Then to find the length of the **HYPOTENUSE**

$$c = \sqrt{(a)^2 + (b)^2}$$



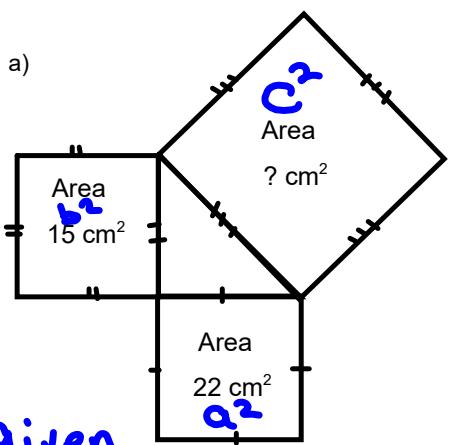
Then to find the length of a **LEG**

$$a = \sqrt{(c)^2 - (b)^2}$$



## Example)

Find the area of the indicated square:

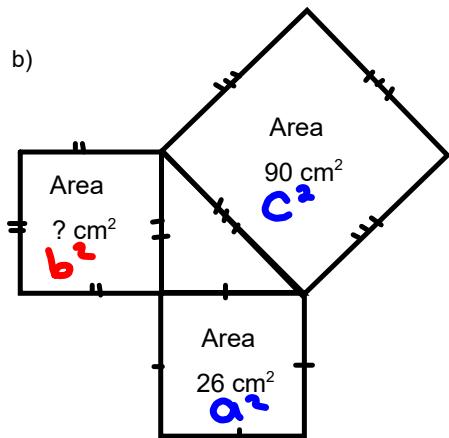


given  
 $a^2 = 22 \text{ cm}^2$   
 $b^2 = 15 \text{ cm}^2$

Missing  
 $c^2 = ?$

$$c^2 = \underbrace{a^2}_{22 \text{ cm}^2} + \underbrace{b^2}_{15 \text{ cm}^2}$$

$$c^2 = 37 \text{ cm}^2$$



given  
 $a^2 = 26 \text{ cm}^2$   
 $c^2 = 90 \text{ cm}^2$

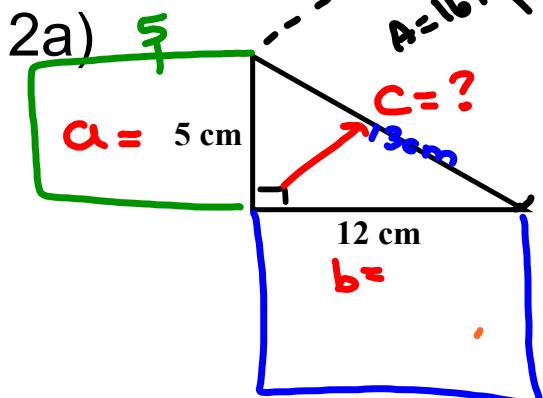
Missing  $b^2 = ?$

$$b^2 = c^2 - a^2$$

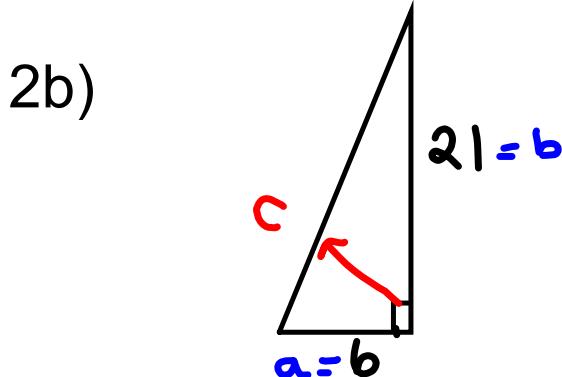
$$b^2 = 90 \text{ cm}^2 - 26 \text{ cm}^2$$

$$b^2 = 64 \text{ cm}^2$$

Examples: Find the length of the missing side.



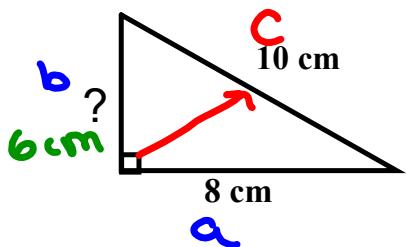
$$\begin{aligned}
 C^2 &= a^2 + b^2 \\
 C^2 &= (5\text{cm})^2 + (12\text{cm})^2 \\
 C^2 &= 25\text{cm}^2 + 144\text{cm}^2 \\
 C^2 &= 169\text{cm}^2 \\
 \sqrt{C^2} &= \sqrt{169\text{cm}^2} \\
 C &= 13\text{cm}
 \end{aligned}$$



$$\begin{aligned}
 C^2 &= a^2 + b^2 \\
 C^2 &= (6)^2 + (21)^2 \\
 C^2 &= 36 + 441 \\
 C^2 &= 477 \\
 \sqrt{C^2} &= \sqrt{477} \\
 C &\approx 21.8
 \end{aligned}$$

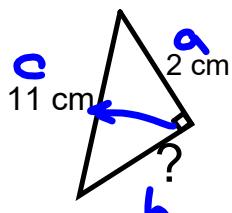
**Examples:** Find the length of the missing side.

3a)



$$\begin{aligned}
 b^2 &= c^2 - a^2 \\
 b^2 &= (10\text{ cm})^2 - (8\text{ cm})^2 \\
 b^2 &= 100\text{ cm}^2 - 64\text{ cm}^2 \\
 b^2 &= 36\text{ cm}^2 \\
 \sqrt{b^2} &= \sqrt{36\text{ cm}^2} \\
 b &= 6\text{ cm}
 \end{aligned}$$

3b)



$$\begin{aligned}
 b^2 &= c^2 - a^2 \\
 &= (11\text{ cm})^2 - (2\text{ cm})^2 \\
 b^2 &= 121\text{ cm}^2 - 4\text{ cm}^2 \\
 b^2 &= 117\text{ cm}^2 \\
 \sqrt{b^2} &= \sqrt{117\text{ cm}^2} \\
 b &\approx 10.8\text{ cm}
 \end{aligned}$$

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