12.1 The Pythagorean Theorem

Common Core Standards

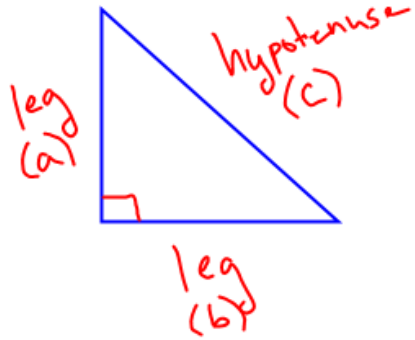
8.G.7
Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.6
Explain a proof of the Pythagorean Theorem and its converse

Vocabulary

- Legs - In a right triangle, the 2 sides that form the right angle

- hypotenuse - the side opposite the right angle

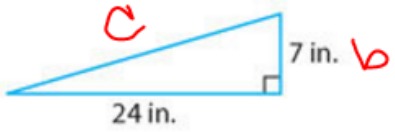


The Pythagorean Theorem

- In a right triangle, the sum of the squares of the lengths of the legs is equal to the length of the square of the length of the hypotenuse. $a^2 + b^2 = c^2$

Find the length of the missing side.

A



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

$24^2 + 7^2 = c^2$

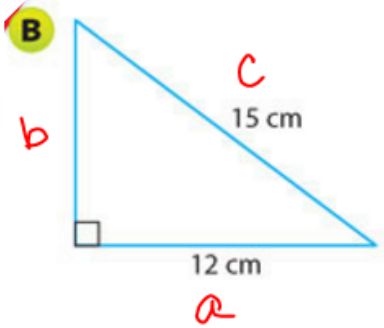
$576 + 49 = c^2$

$\sqrt{625} = \sqrt{c^2}$

$\sqrt{625} = c$

$25_{in} = c$

B



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

$12^2 + b^2 = 15^2$

$144 + b^2 = 225$

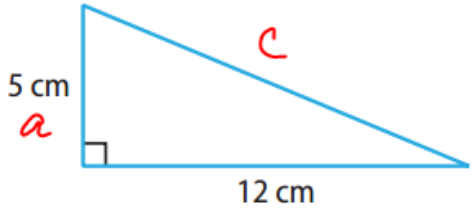
$-144 \quad -144$

$\sqrt{b^2} = \sqrt{81}$

$b = \sqrt{81}$

$b = 9_{cm}$

Find the length of the missing side.



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

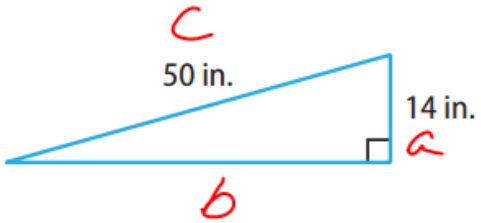
$5^2+12^2=c^2$

$25+144=c^2$

$\sqrt{169}=\sqrt{c^2}$

$\sqrt{169}=c$

$13\text{ cm}=c$



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

$14^2+b^2=50^2$

$196+b^2=2500$

$-196 \quad -196$

$\sqrt{b^2}=\sqrt{2304}$

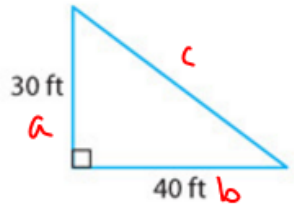
$b=\sqrt{2304}$

$b=48\text{ in.}$

YOUR TURN

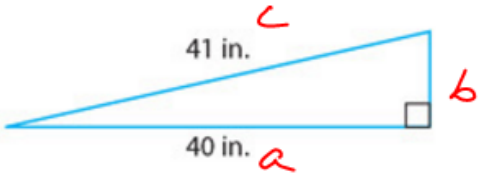
Find the length of the missing side.

4.



50 ft

5.



9 in

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

$30^2+40^2=c^2$

$900+1600=c^2$

$\sqrt{2500}=\sqrt{c^2}$

$\sqrt{2500}=c$

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

$40^2+b^2=41^2$

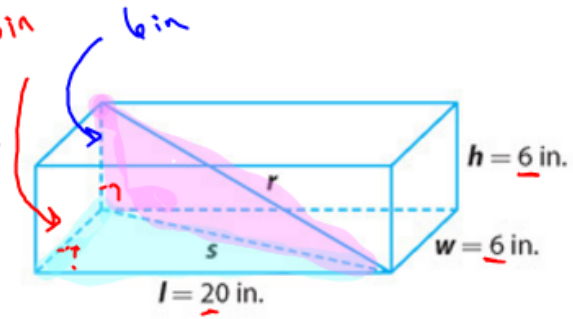
$1600+b^2=1681$

$-1600 \quad -1600$

$\sqrt{b^2}=\sqrt{81}$

$b=\sqrt{81}$

A box used for shipping narrow copper tubes measures 6 inches by 6 inches by 20 inches. What is the length of the longest tube that will fit in the box, given that the length of the tube must be a whole number of inches?



$l^2 + w^2 = s^2$

$20^2 + 6^2 = s^2$

$400 + 36 = s^2$

$\sqrt{436} = \sqrt{s^2}$

$\sqrt{436} = s$

$20.8 \approx s$

$h^2 + s^2 = r^2$

$6^2 + 436 = r^2$

$36 + 436 = r^2$

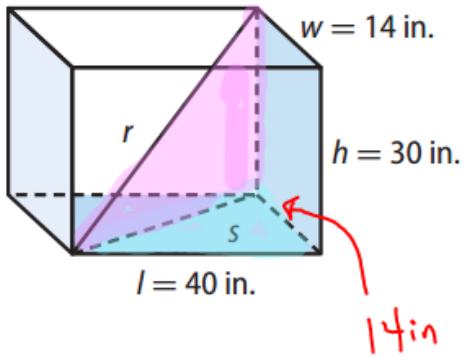
$\sqrt{472} = \sqrt{r^2}$

$\sqrt{472} = r$

$21.7 \approx r$

21 inches

A bee is in a box shaped as a rectangular prism. The box measures 30 inches by 14 inches by 40 inches. The bee flies from one corner of the box to the corner that is the farthest away. To the nearest inch, how far does the bee fly?



$l^2 + w^2 = s^2$

$40^2 + 14^2 = s^2$

$1600 + 196 = s^2$

$\sqrt{1796} = \sqrt{s^2}$

$\sqrt{1796} = s$

$42.4 \approx s$

$h^2 + s^2 = r^2$

$30^2 + 1796 = r^2$

$900 + 1796 = r^2$

$\sqrt{2696} = \sqrt{r^2}$

$51.9 \approx r$

52 inches

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

$4^2 + 14^2 = s^2$

$16 + 196 = s^2$

$212 = s^2$

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

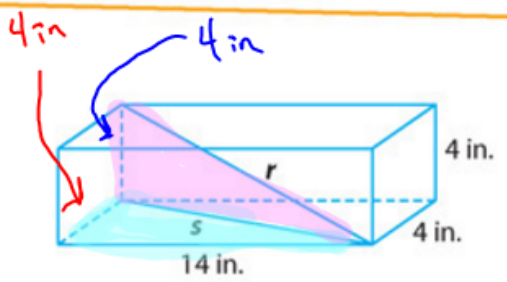
$4^2 + 212 = c^2$

$16 + 212 = c^2$

$\sqrt{228} = \sqrt{c^2}$

YOUR TURN

6. Tina ordered a replacement part for her desk. It was shipped in a box that measures 4 in. by 4 in. by 14 in. What is the greatest length in whole inches that the part could have been?



15 inches

$\sqrt{228} = c$

$15.1 \approx c$

HW

p378 (1-2)

p379 (4-11)

Worksheet