

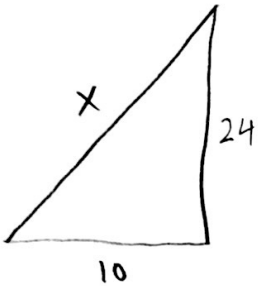
10.3 Applications of the Pythagorean Theorem Notes
Geometry 3313

$a^2 + b^2 =$ Key
Date _____ Period _____

Recall the Pythagorean Theorem: If $\triangle ABC$ is a right triangle with right angle C, then $a^2 + b^2 = c^2$

Recall the Converse: If $\triangle ABC$ is a triangle with $a^2 + b^2 = c^2$, then $\triangle ABC$ is a right triangle with right angle C.

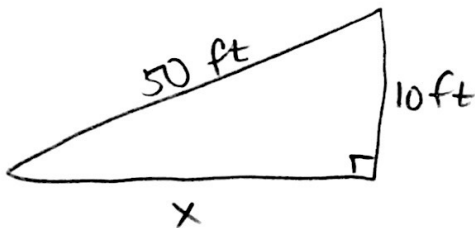
Ex 1] A ladder is leaning against a wall. The bottom of the ladder is 10 feet from the base of the building, and the ladder reaches a point on the wall that is 24 feet high. How long is the ladder? (Sketch a diagram.)



$$\begin{aligned}10^2 + 24^2 &= x^2 \\100 + 576 &= x^2 \\676 &= x^2 \\26 &= x\end{aligned}$$

26 feet

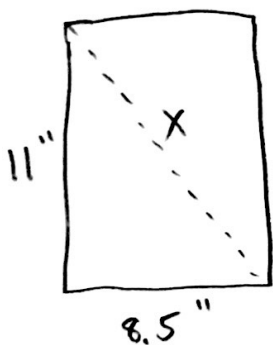
Ex 2] The surface of a ramp is 50 feet long. If the ramp travels a vertical distance of 10 feet, what is the horizontal length of the ramp? (Sketch a diagram.)



$$\begin{aligned}x^2 + 10^2 &= 50^2 \\x^2 + 100 &= 2500 \\x^2 &= 2400\end{aligned}$$

$x \approx 49.0 \text{ ft}$

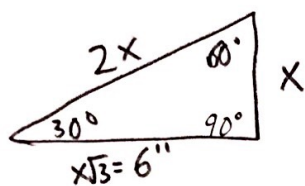
Ex 3] A standard letter-sized piece of paper is 8.5 inches by 11 inches. How long is the diagonal of a sheet this size?



$$\begin{aligned}8.5^2 + 11^2 &= x^2 \\72.25 + 121 &= x^2 \\193.25 &= x^2 \\13.9 &\approx x\end{aligned}$$

13.9 inches

Ex 4] Mr. Wood cuts a triangular wedge out of a piece of pine. The two smaller angles of the triangle measure 30° and 60° . If the side opposite the 60° angle measures exactly 6 inches, what are the exact lengths of the other sides of the wedge?



$$30 + 60 = 90$$

$$180 - 90 = 90$$

$$x\sqrt{3} = 6$$

$$x = \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

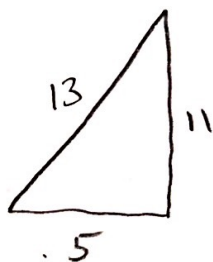
$$x = \frac{6\sqrt{3}}{3}$$

$$x = 2\sqrt{3}$$

$$2x = 4\sqrt{3}$$

The side opposite 30° is $2\sqrt{3}$ in.
The side opposite 90° is $4\sqrt{3}$ in.

Ex 5] A 13 foot ladder is leaning against a wall such that it extends 11 feet up the wall while the bottom of the ladder is 5 feet from the wall. If we assume that the ground is horizontal, can we conclude that the wall is vertical? Explain.



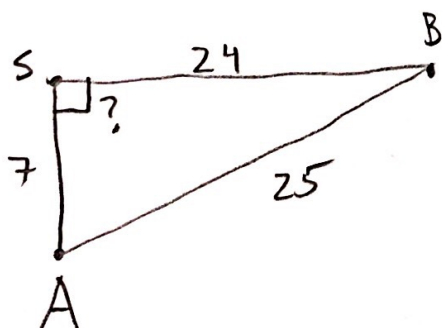
$$5^2 + 11^2 \stackrel{?}{=} 13^2$$

$$25 + 121 \stackrel{?}{=} 169$$

$$146 \neq 169$$

Since $a^2 + b^2 \neq c^2$, we can conclude we do not have a right Δ , so the wall is not vertical.

Ex 6] Smithtown is 7 miles directly north of Allentown. Brownsburg is 25 miles east-northeast of Allentown. If Smithtown and Brownsburg are 24 miles apart, is Brownsburg directly east of Smithtown? Explain.



$$7^2 + 24^2 \stackrel{?}{=} 25^2$$

$$49 + 576 \stackrel{?}{=} 625$$

$$625 = 625$$

Since $a^2 + b^2 = c^2$ ($7^2 + 24^2 = 25^2$)

we can conclude that we DO have a right Δ . Our directions are

perpendicular, so Brownsburg is directly east of Smithtown.