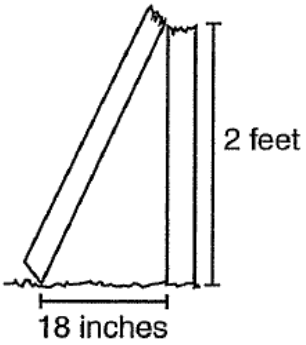
Pythagorean Theorem

The Pythagorean Theorem is often used in word problems. One strategy for solving these is to draw a picture. Then, figure out which pieces you have and which piece you are solving for.

Example:

The post in the picture at the right was broken in a recent storm. The power company needs to know how tall the original post was in order to bring a new one. How tall was the post before it was broken?



In the picture, I notice the two given pieces are in different units. I need to first correct that. 2 feet is equal to 24 inches and since the other measurement is in inches, I will use that. So, I have leg lengths of 24 inches (2 feet) and 18 inches. I can plug these numbers into the Pythagorean Theorem to find the length of the hypotenuse.

$$a^2+b^2=c^2$$
$$24^2+18^2=c^2$$
$$576+324=c^2$$
$$900=c^2$$

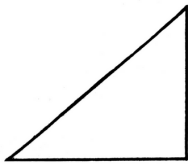
Now remember, c^2 represents the area of the square on the side, so we have to take the square root to get the length of c. The square root of 900 is 30, so the broken piece in the picture is 30 inches. We aren't done quite yet! They asked for us to find the length of the original pole. So, I need to add the length of the broken piece to the length of the piece still standing. The pole must have been 30+24=54 inches.

The Converse of the Pythagorean Theorem

The Pythagorean Theorem says that for all right triangles, $a^2+b^2=c^2$. We can turn that around to say that IF $a^2+b^2=c^2$, you must have a right triangle. If you are given three lengths, you can test them to see if they form a right triangle.

Can 6in, 8in, and 10in form a right triangle? First determine which length is the hypotenuse. Remember, it is the longest side. Then, plug in and see if your equation balances.

$$a^2+b^2=c^2$$
$$6^2+8^2=10^2$$
$$36+64=100$$
$$100=100$$



Since the equation balances, this must be a right triangle.

Can 3cm, 4cm, and 9cm form a right triangle? First determine which length is the hypotenuse. Remember, it is the longest side. Then, plug in and see if your equation balances.

$$a^2+b^2=c^2$$
$$3^2+4^2=9^2$$
$$9+16=81$$
$$25=81$$

Since the equation does not balance, this can't be a right triangle.