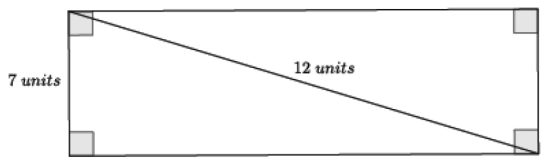
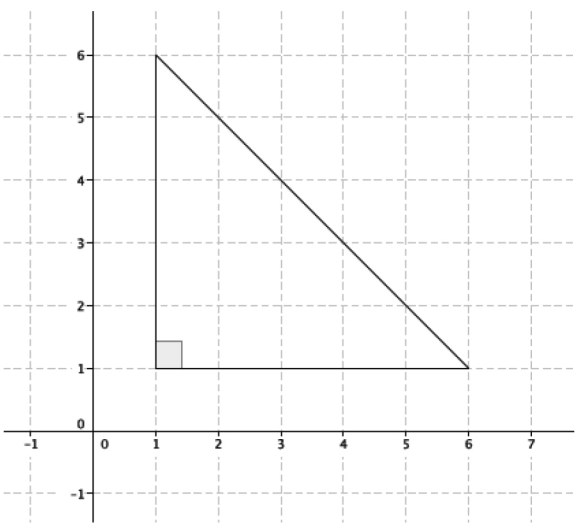
Name _____ Date _____

Applications of the Pythagorean Theorem

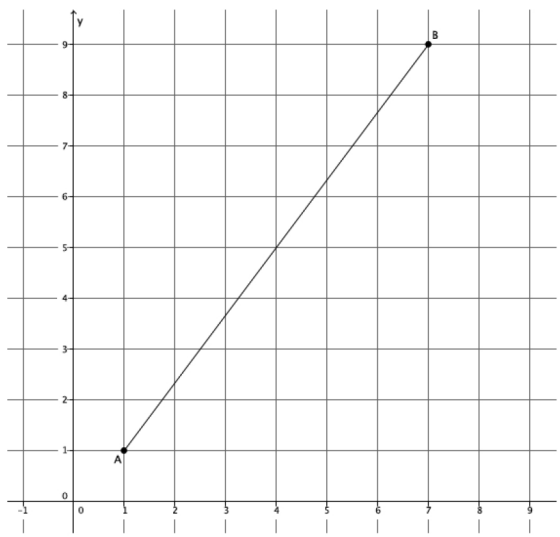
1. Find the length of the missing side of the rectangle shown below, if possible.



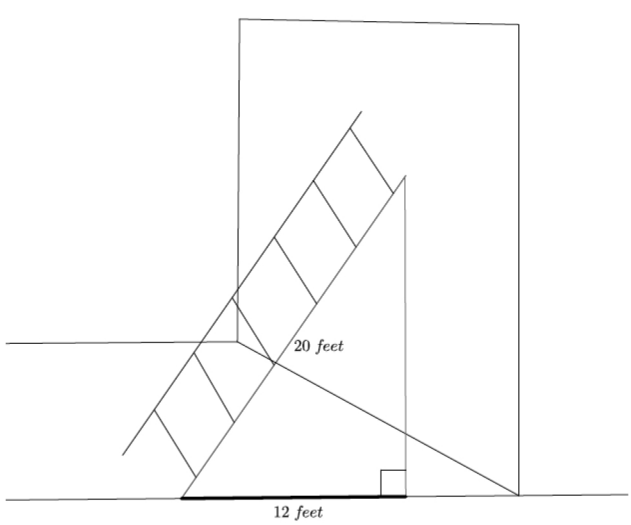
2. Find the length of all three sides of the right triangle shown below, if possible.



1. Find the length of the segment AB shown below, if possible.



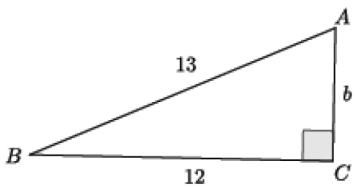
2. A 20-foot ladder is placed 12 feet from the wall, as shown. How high up the wall will the ladder reach?



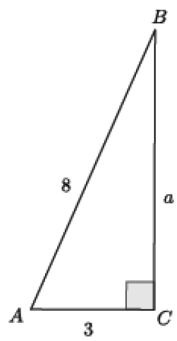
3. A rectangle has dimensions 6 in. by 12 in. What is the length of the diagonal of the rectangle?

Use the Pythagorean theorem to find the missing side lengths for the triangles shown in Problems 4–8.

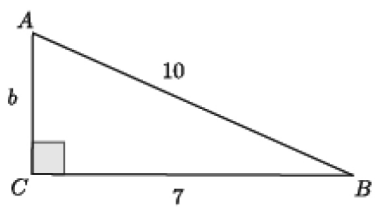
4. Determine the length of the missing side, if possible.



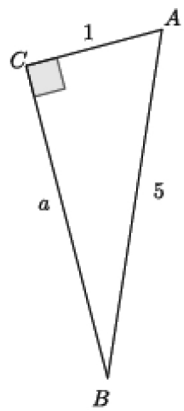
5. Determine the length of the missing side, if possible.



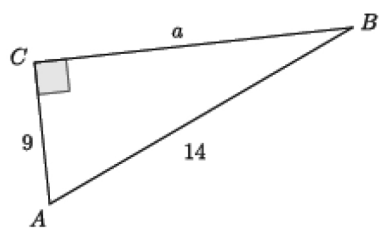
6. Determine the length of the missing side, if possible.



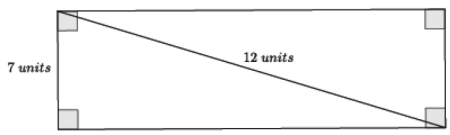
7. Determine the length of the missing side, if possible.



8. Determine the length of the missing side, if possible.



1. Find the length of the missing side of the rectangle shown below, if possible.

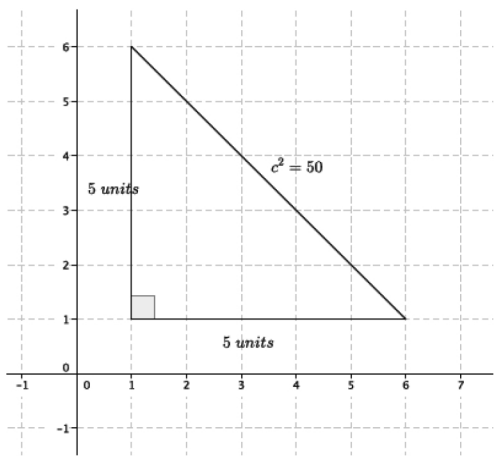


Let a represent the length of the unknown leg. Then,

$$\begin{aligned} a^2 + 7^2 &= 12^2 \\ a^2 + 7^2 - 7^2 &= 12^2 - 7^2 \\ a^2 &= 12^2 - 7^2 \\ a^2 &= 144 - 49 \\ a^2 &= 95. \end{aligned}$$

The precise length of the side cannot be found, but $a^2 = 95$ units.

2. Find the length of all three sides of the right triangle shown below, if possible.



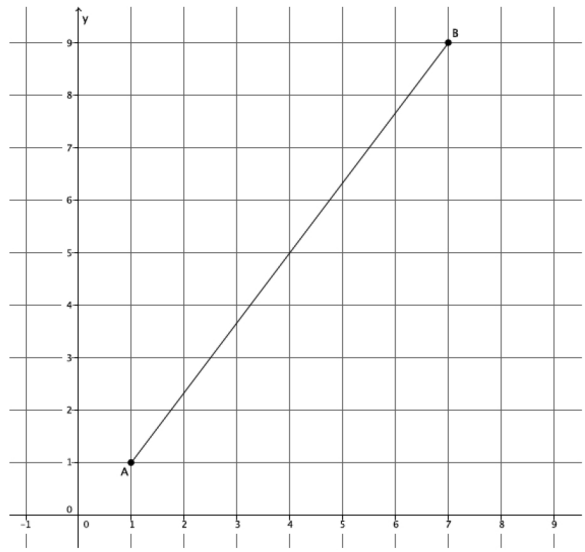
The two legs are each 5 units in length. The hypotenuse is

$$\begin{aligned} 5^2 + 5^2 &= c^2 \\ 25 + 25 &= c^2 \\ 50 &= c^2. \end{aligned}$$

The precise length of the hypotenuse cannot be found, but $c^2 = 50$ units.

Students practice using the Pythagorean theorem to find missing lengths in right triangles.

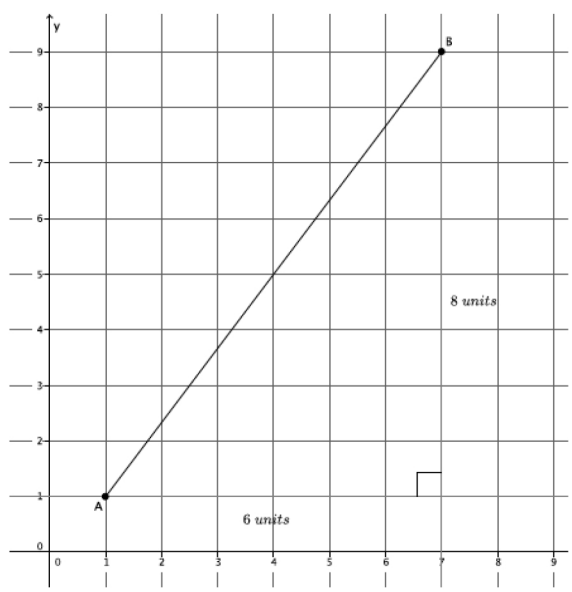
1. Find the length of the segment AB shown below, if possible.



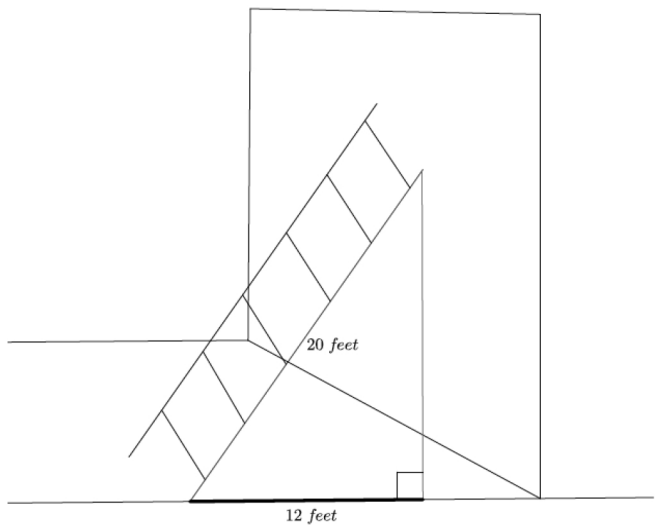
If we let the length of AB be represented by c, then by the Pythagorean theorem

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

The length of the segment AB is 10 units.



2. **A 20-foot ladder is placed 12 feet from the wall, as shown. How high up the wall will the ladder reach?**



Let a represent the height up the wall that the ladder will reach. Then,

$$\begin{aligned} a^2 + 12^2 &= 20^2 \\ a^2 + 12^2 - 12^2 &= 20^2 - 12^2 \\ a^2 &= 20^2 - 12^2 \\ a^2 &= 400 - 144 \\ a^2 &= 256 \\ a &= 16. \end{aligned}$$

The ladder will reach 16 feet up the wall.

3. **A rectangle has dimensions 6 in. by 12 in. What is the length of the diagonal of the rectangle?**

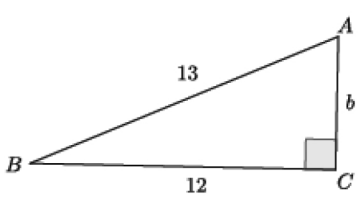
If we let c represent the length of the diagonal, then

$$\begin{aligned} 6^2 + 12^2 &= c^2 \\ 36 + 144 &= c^2 \\ 180 &= c^2. \end{aligned}$$

A precise answer cannot be determined for the length of the diagonal, so we say that ($c^2 = 180$) in.

Use the Pythagorean theorem to find the missing side lengths for the triangles shown in Problems 4–8.

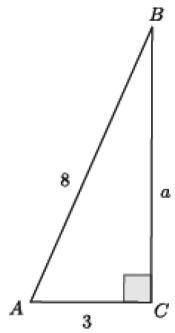
4. **Determine the length of the missing side, if possible.**



$$\begin{aligned} 12^2 + b^2 &= 13^2 \\ 12^2 - 12^2 + b^2 &= 13^2 - 12^2 \\ b^2 &= 13^2 - 12^2 \\ b^2 &= 169 - 144 \\ b^2 &= 25 \\ b &= 5 \end{aligned}$$

The length of the missing side is 5 units.

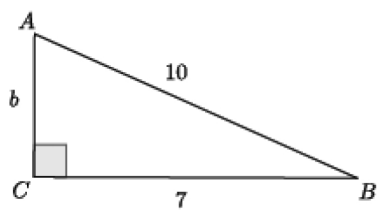
5. Determine the length of the missing side, if possible.



$$a^2 + 3^2 = 8^2$$
$$a^2 + 3^2 - 3^2 = 8^2 - 3^2$$
$$a^2 = 8^2 - 3^2$$
$$a^2 = 64 - 9$$
$$a^2 = 55$$

We cannot get a precise answer, but $a^2 = 55$.

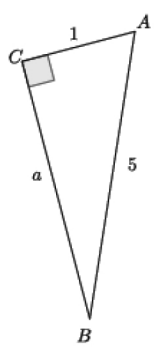
6. Determine the length of the missing side, if possible.



$$7^2 + b^2 = 10^2$$
$$7^2 - 7^2 + b^2 = 10^2 - 7^2$$
$$b^2 = 10^2 - 7^2$$
$$b^2 = 100 - 49$$
$$b^2 = 51$$

We cannot get a precise answer, but $b^2 = 51$.

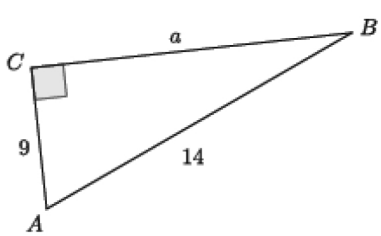
7. Determine the length of the missing side, if possible.



$$a^2 + 1^2 = 5^2$$
$$a^2 + 1^2 - 1^2 = 5^2 - 1^2$$
$$a^2 = 5^2 - 1^2$$
$$a^2 = 25 - 1$$
$$a^2 = 24$$

We cannot get a precise answer, but $a^2 = 24$.

8. Determine the length of the missing side, if possible.



$$a^2 + 9^2 = 14^2$$
$$a^2 + 9^2 - 9^2 = 14^2 - 9^2$$
$$a^2 = 14^2 - 9^2$$
$$a^2 = 196 - 81$$
$$a^2 = 115$$

We cannot get a precise answer, but $a^2 = 115$.