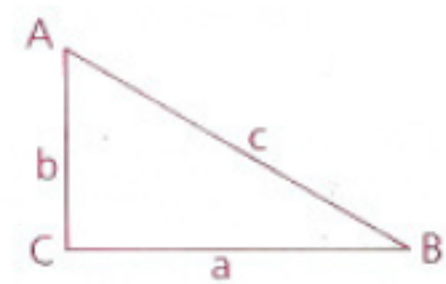
Objective

Students will be able to use the Pythagorean theorem.

If the square of the measure of one side of a triangle equals the sum of the squares of the measures of the other two sides, then the angle opposite the longest side is a right angle.

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



If c is the length of the longest side of a triangle and

- $a^2 + b^2 > c^2$, then the triangle is acute
- $a^2 + b^2 = c^2$, then the triangle is right
- $a^2 + b^2 < c^2$, then the triangle is obtuse

Find the perimeter of the rectangle.

$$x^2 + 5^2 = 13^2$$

$$x^2 + 25 = 169$$

$$x^2 = 144$$

$$x = \pm 12$$ (Reject -12)

Perimeter = 5 + 12 + 5 + 12 = 34

Nadia skipped 3 miles north, 2 miles east, 4 miles north, 13 miles east, and 1 mile north. How far is Nadia from where she started?

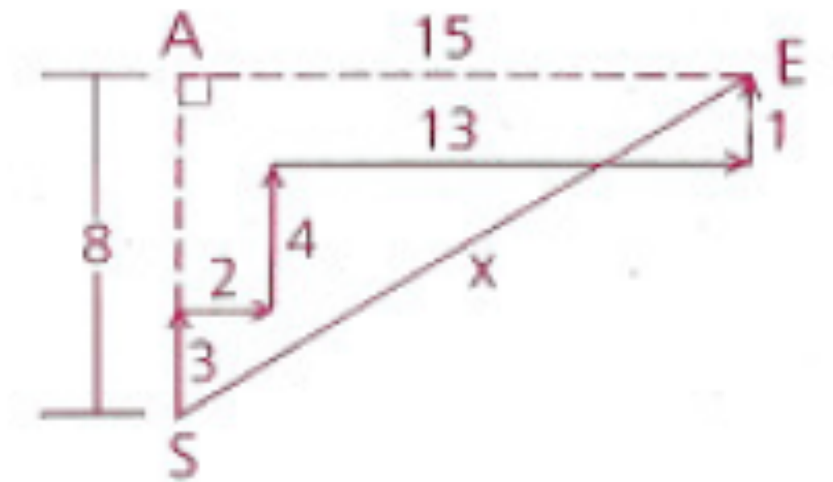
**draw a picture to help

$$8^2 + 15^2 = x^2$$

$$64 + 225 = x^2$$

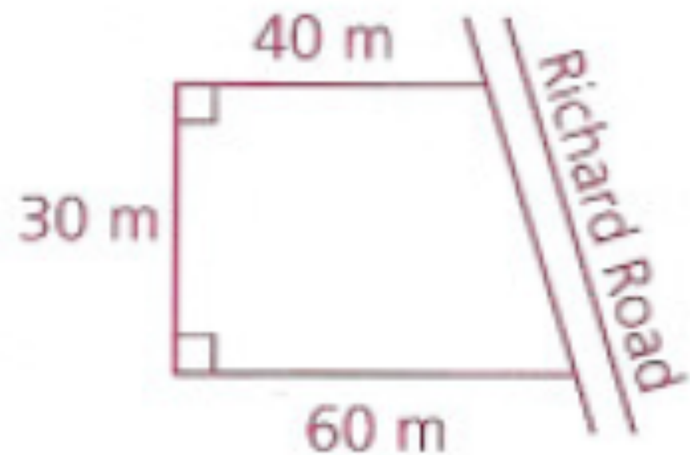
$$289 = x^2$$

$$\pm 17 = x$$ (Reject -17)



She is 17 miles Northeast

George and Diane bought a plot of land along Richard Road with the dimensions shown.



a) Find the area of the plot.

1500 sq. meters

b) Find, to the nearest meter, the length of frontage on Richard Road.

approx. 36 meters

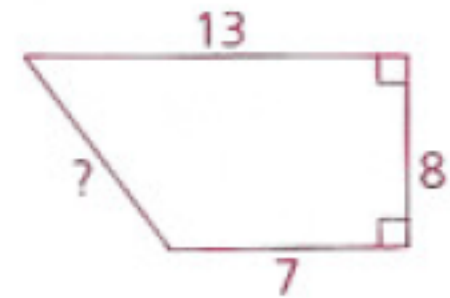
Homework

p.387: 2, 4, 7, 13, 17

2 Find the length of the diagonal of a square with perimeter 12 cm.

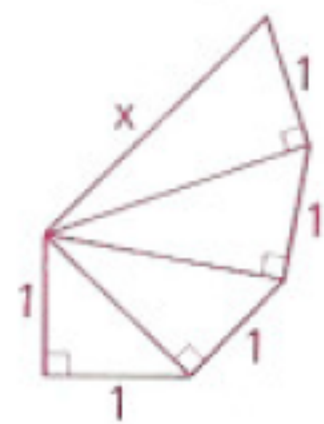
4 Find the perimeter of a rectangle whose diagonal is 17 mm long and whose base is 15 mm long.

7 Find the missing length in the trapezoid.



13 Al Capone walked 2 km north, 6 km west, 4 km north, and 2 km west. If Big Al decides to "go straight," how far must he walk across the fields to his starting point?

17 Solve for x in the partial spiral to the right.



Objective

Students will be able to identify the relationships between the parts of a right triangle when an altitude is drawn to the hypotenuse.

What is an altitude of a triangle?

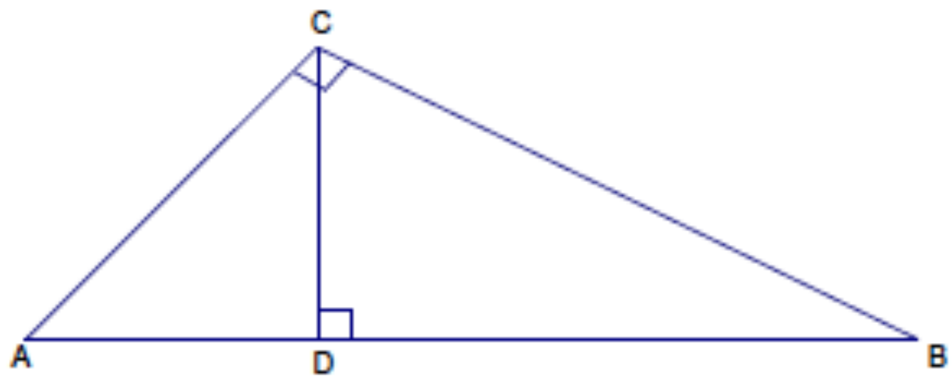
The altitude of a triangle is the perpendicular segment from a vertex to the line containing the side opposite the vertex.

We can use the altitude to help us prove that **right** triangles are similar.

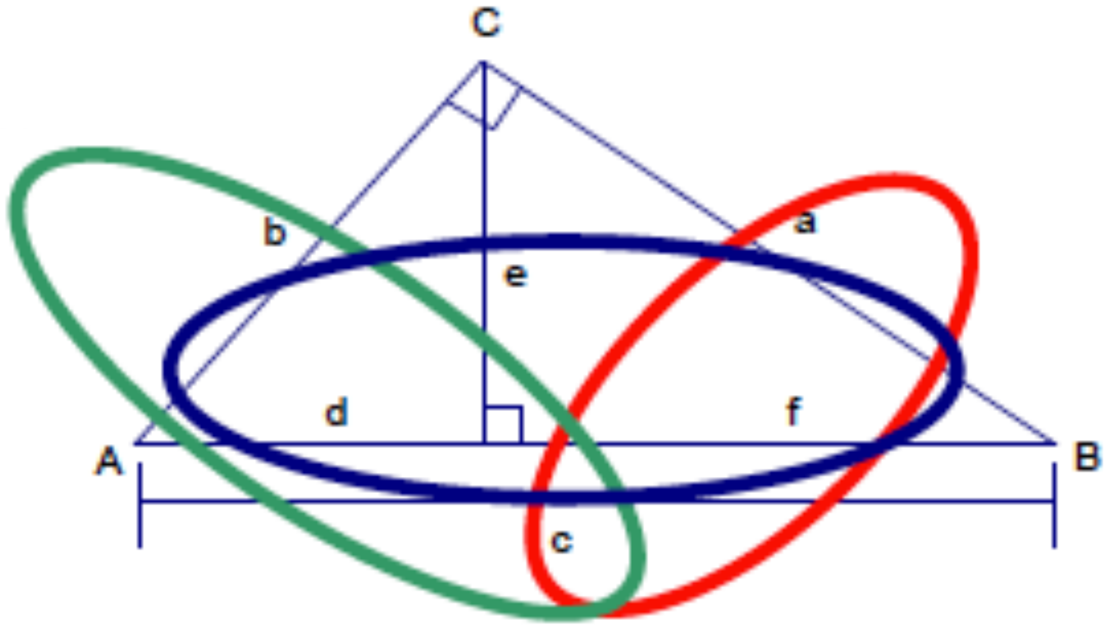
Altitude-on-Hypotenuse Theorem

1) The altitude to the hypotenuse of a right triangle divides the triangle into two triangles that are similar to the original triangle and to each other.

$$\triangle ABC \sim \triangle ACD \sim \triangle CBD$$

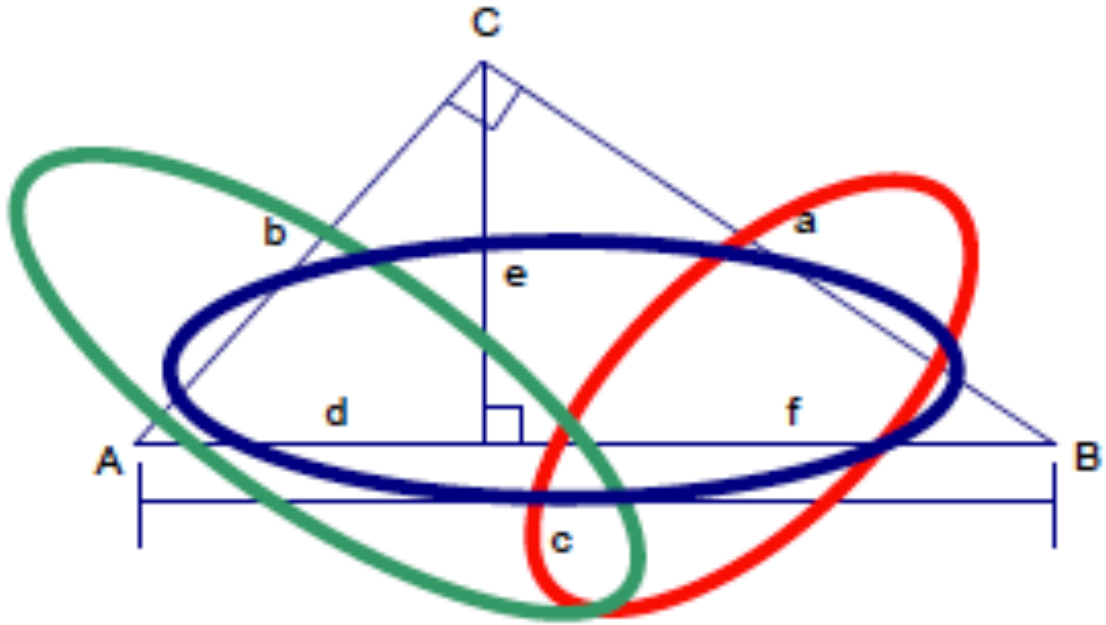


This theorem allows us to set up the following proportions using the geometric mean. Recall that the <u>geometric mean</u> of a and b is the positive number x such that $\frac{a}{x} = \frac{x}{b}$



2) The altitude (to the hypotenuse) is the geometric mean (mean proportional) between the segments of the hypotenuse.

$$\boxed{\frac{d}{e} = \frac{e}{f}}$$



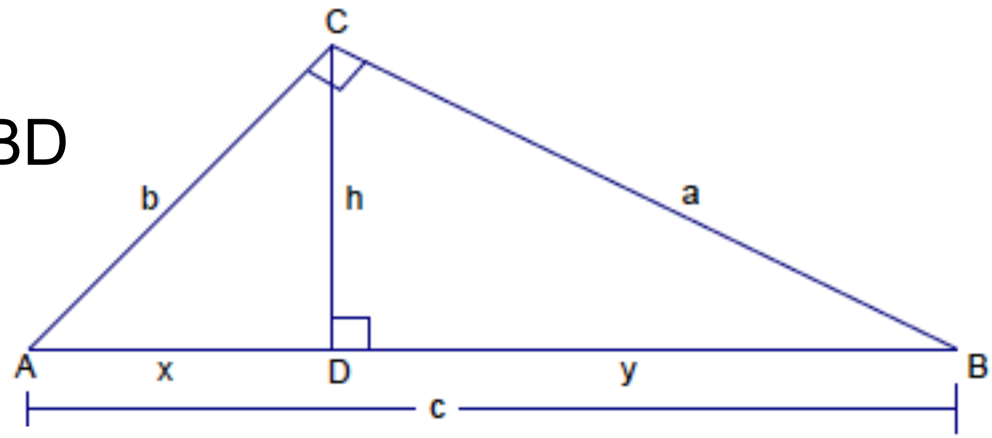
3) Each leg of the given right triangle is the geometric mean (mean proportional) of the adjacent part of the hypotenuse and the entire hypotenuse.

$$\boxed{\frac{d}{b} = \frac{b}{c}}$$

$$\boxed{\frac{f}{a} = \frac{a}{c}}$$

Refer to the figure to complete each proportion. You need to know that all three triangles are similar.

$\triangle ABC \sim \triangle ACD \sim \triangle CBD$



Make sure you explain why!

1) $\dfrac{x}{h} = \dfrac{\quad}{y}$

2) $\dfrac{a}{b} = \dfrac{\quad}{h}$

3) $\dfrac{a}{b} = \dfrac{h}{\quad}$

4) $\dfrac{a}{c} = \dfrac{y}{\quad}$

5) $\dfrac{a}{c} = \dfrac{h}{\quad}$

6) $\dfrac{b}{x} = \dfrac{\quad}{b}$

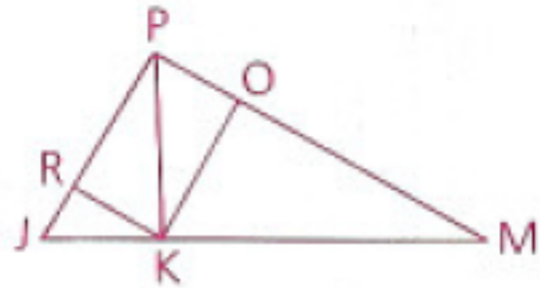
Objective

Students will be able to identify the relationships between the parts of a right triangle when an altitude is drawn to the hypotenuse.

Pythagorean Theorem, Distance Formula, and Altitude-on-Hypotenuse Theorems Quiz on Tuesday

Given: $\overline{PK} \perp \overline{JM}$, $\overline{RK} \perp \overline{JP}$, $\overline{KO} \perp \overline{PM}$

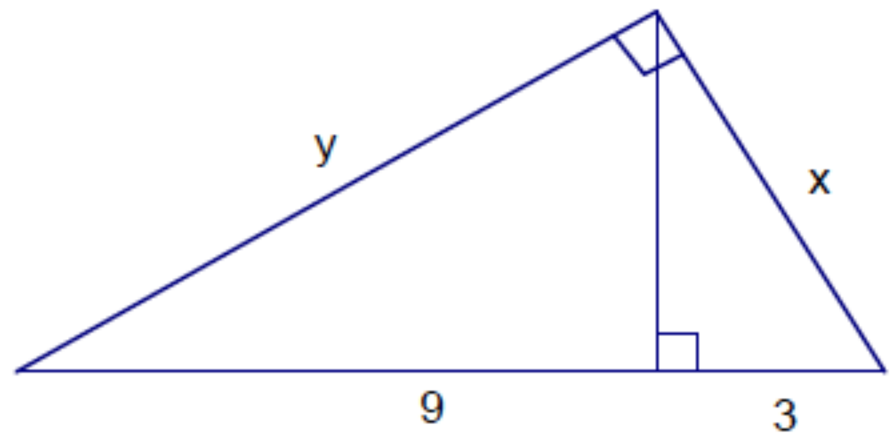
Prove: $(PO)(PM) = (PR)(PJ)$



1 $\overline{PK} \perp \overline{JM}$	1 Given
2 $\angle PKJ$ is a right $\angle$.	2 $\perp$ segments form right $\angle$s.
3 $\angle PKM$ is a right $\angle$.	3 Same as 2
4 $\overline{RK} \perp \overline{JP}$	4 Given
5 $\overline{RK}$ is an altitude.	5 A segment drawn from a vertex of a $\triangle$ $\perp$ to the opposite side is an altitude.
6 $(PK)^2 = (PR)(PJ)$	6 If the altitude is drawn to the hypotenuse of a right $\triangle$, then either leg of the given right $\triangle$ is the mean proportional between the hypotenuse and the segment of the hypotenuse adjacent to that leg.
7 Similarly, $(PK)^2 = (PO)(PM)$	7 Reasons 1–6
8 $(PO)(PM) = (PR)(PJ)$	8 Transitive Property

Find the values of the variables. We can use geometric means.

$$\frac{x}{3} = \frac{12}{x} \qquad \frac{y}{9} = \frac{12}{y}$$



$$x^2 = 36 \qquad y^2 = 108$$

$$x = 6 \qquad y = \sqrt{108}$$

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

Find the values of the variables. We can use geometric means.

$$\frac{x}{3} = \frac{8}{x}$$

$$x^2 = 24$$

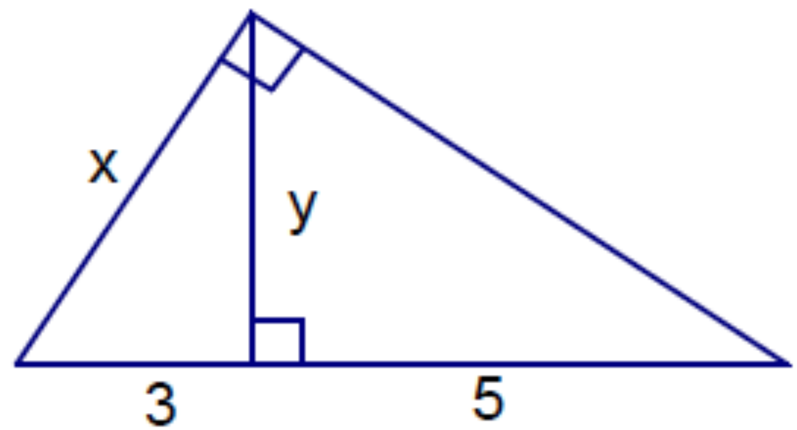
$$x = \sqrt{24}$$

$$x = 2\sqrt{6}$$

$$\frac{y}{3} = \frac{5}{y}$$

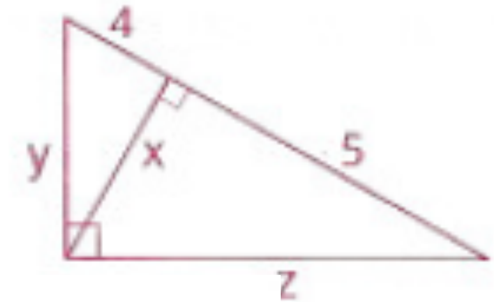
$$y^2 = 15$$

$$y = \sqrt{15}$$

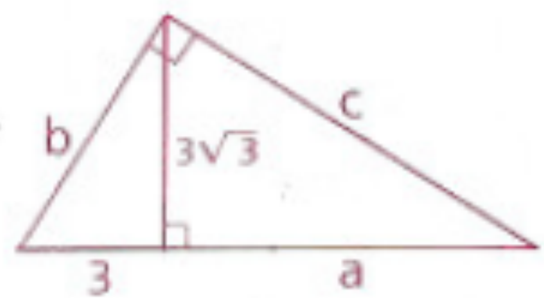


Homework p.379: 2, 5, 6, 14, 17

2 **a** Find 2x. **b** Find $\frac{1}{2}y$. **c** Find z + 8.

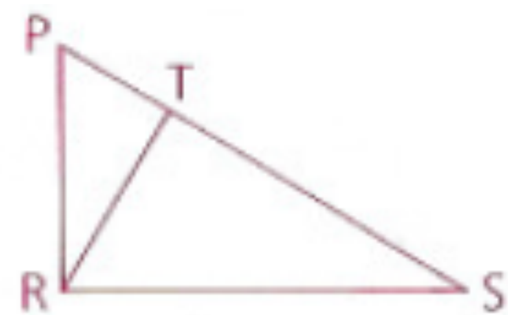


5 **a** Find a.
b Find ab.
c Find $a + b + c$.

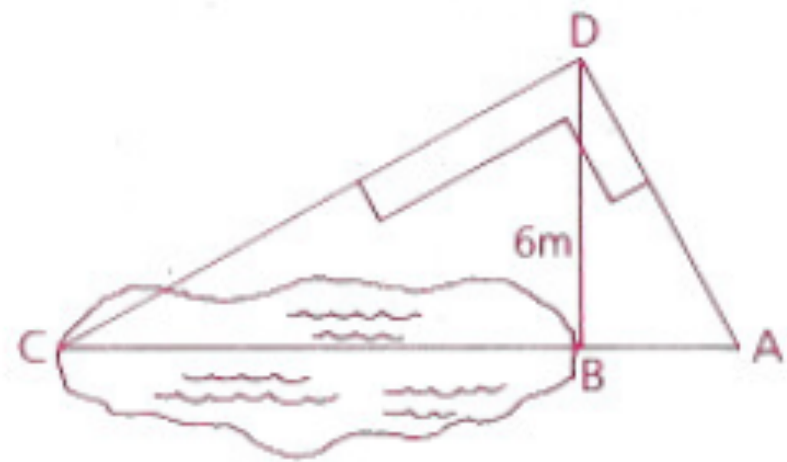


6 Given: $\overline{RT}$ is an altitude. ∠PRS is a right ∠.

Conclusion: $\frac{PR}{RS} = \frac{RT}{ST}$



14 As Slarpy stood at B, the foot of a 6-m pole, he asked Carpy how far it was across the pond from B to C. Carpy got his carpenter's square and climbed the pole. Using his lines of sight, he set up the figure shown. When Slarpy found that AB = 3 m, Carpy knew the answer. What was it?

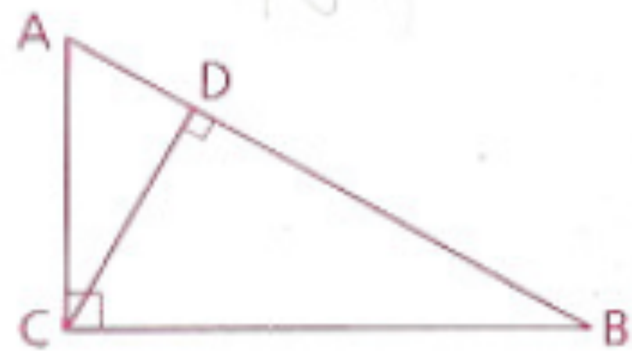


17 **a** If AD = 7 and AB = 11, find CD.

b If CD = 8 and AD = 6, find AB.

c If AB = 12 and AD = 4, find BC.

d If AC = 7 and AB = 12, find BD.



Objective

Students will be able to identify and apply families of right triangles.

Pythagorean Triples

Any three whole numbers that satisfy the equation $a^2 + b^2 = c^2$ form a <u>Pythagorean triple</u>.

What are some Pythagorean triples that you thought of?

(5, 12, 13)

(3, 4, 5)

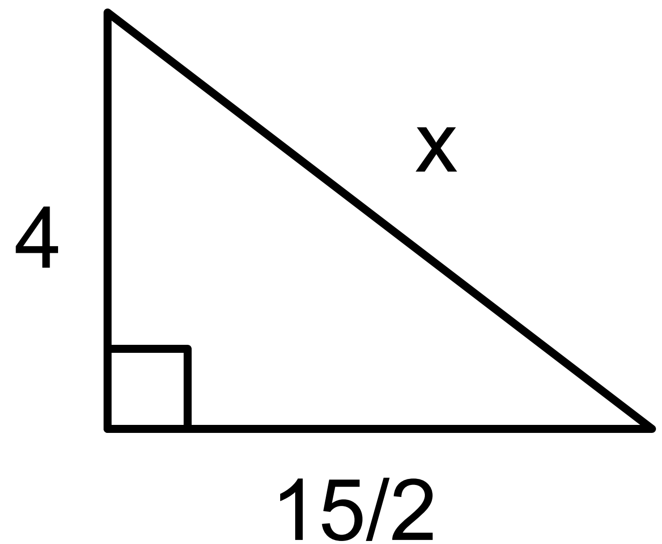
(8, 15, 17)

(7, 24, 25)

These are all families of Pythagorean triples.

The Principle of the Reduced Triangle

Solve for x.



$4^2 + (15/2)^2 = x^2$

$16 + 225/4 = x^2$

$64/4 + 225/4 = x^2$

$289/4 = x^2$

$\pm 17/2 = x$

$17/2 = x$

Is there an alternative to solving for x?

Do you recognize a way to get a Pythagorean triple?

Multiply each side by 2

(8, 15, 17) family

$2x = 17$

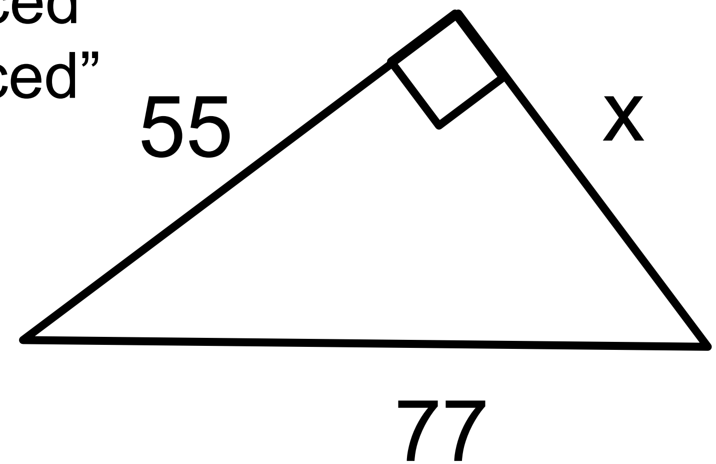
$x = 17/2$

The Principle of the Reduced Triangle

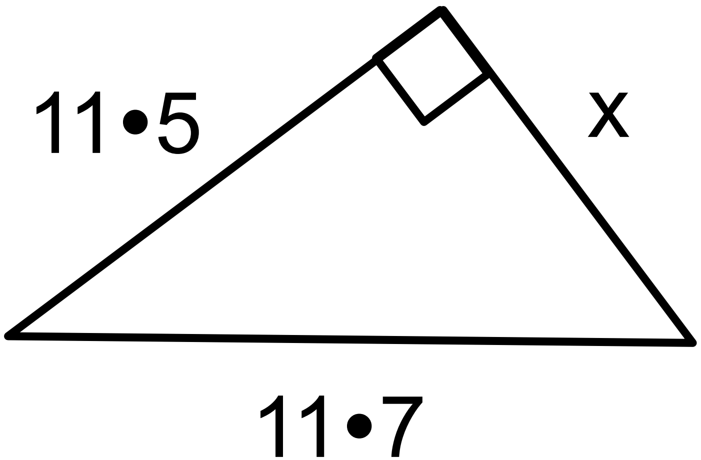
1) Reduce the difficultly of the problem by multiplying or dividing the three lengths by the same number to obtain a similar, but simpler, triangle in the same family.
2) Solve for the missing side of this easier triangle.
3) Convert back to the original problem.

Find the value of x.

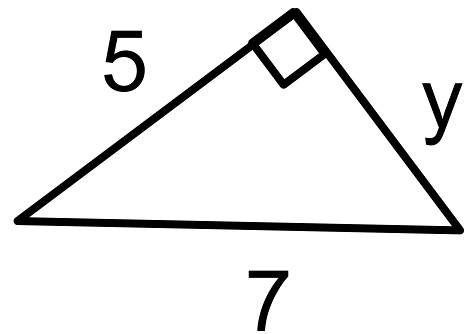
We can use the Principle of the Reduced Triangle even if the sides of the "reduced" triangle are not a Pythagorean triple.



**55 and 77 are multiples of 11



is in the family



$5^2 + y^2 = 7^2$

$25 + y^2 = 49$

$y^2 = 24$

$y = \pm 2\sqrt{6}$

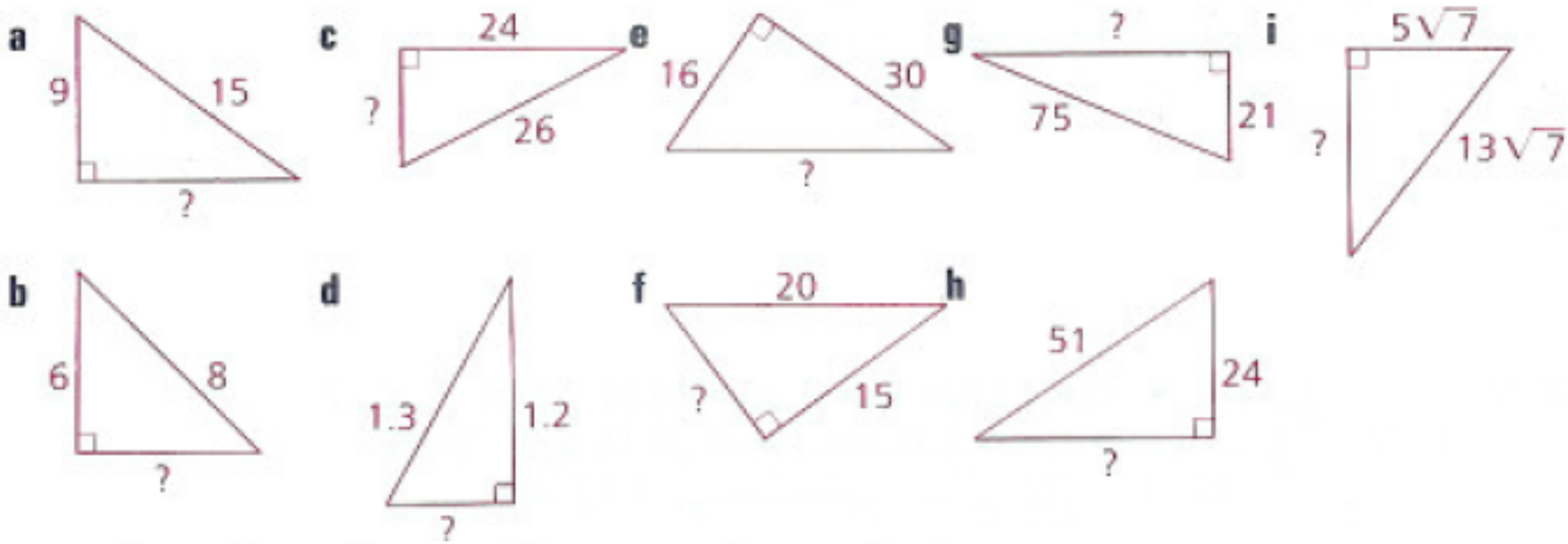
$y = 2\sqrt{6}$

Thus, $x = 11 \cdot 2\sqrt{6} = 22\sqrt{6}$

Homework p. 401: 5, 9, 10, 16

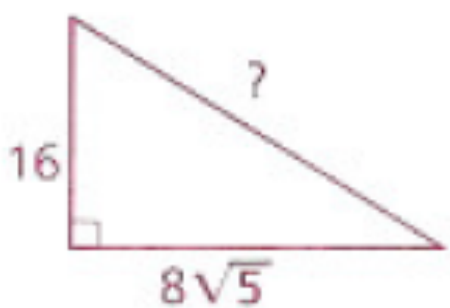
In problems 1–5, find the missing side in each triangle.

5 Mixed

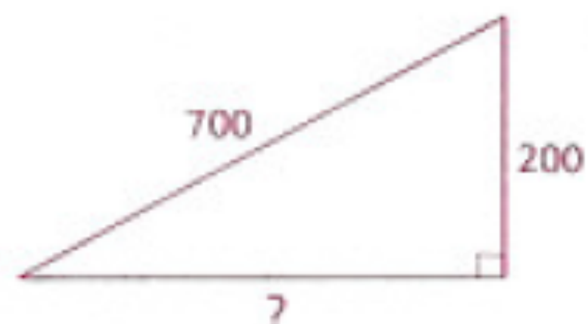


9 Use the reduced-triangle principle to find each missing side.

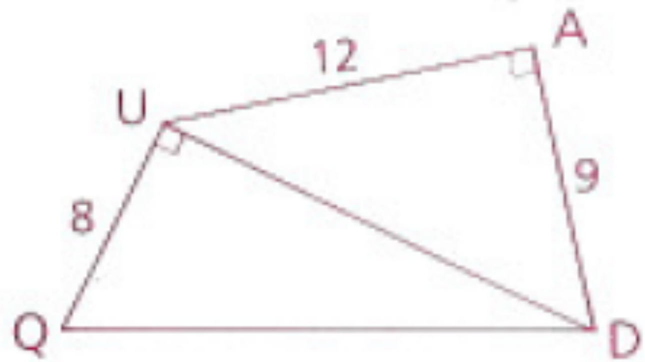
a



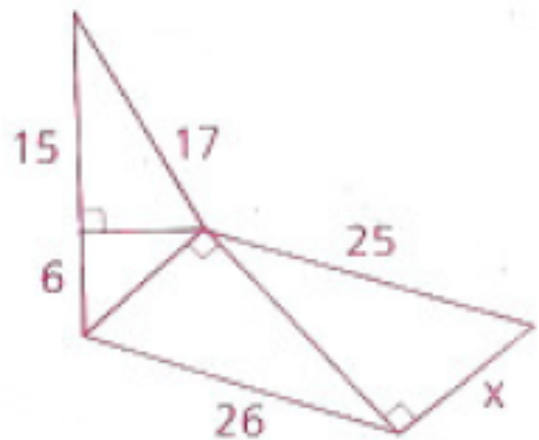
b



10 Find QD.



16 **a** Find x.



b Find x and y.