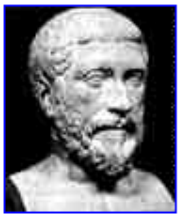


's Theorem...

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

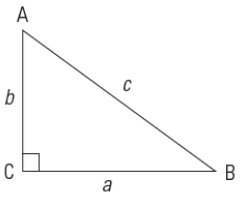
Euclid (born circa 300 BCE) is called the Father of Modern Geometry. In his famous book *The Elements*, he generalized the Pythagorean theorem by stating that if one erects similar figures on the sides of a right triangle, then the sum of the areas of the two smaller figures will equal the area of the larger figure.

right triangle: a triangle with one right angle

hypotenuse: the longest side of a right triangle, opposite the 90° angle

leg: in a right triangle, the two sides that intersect to form a right angle

Pythagorean theorem: in a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse



Leg AC, or *b*, is adjacent to angle A and opposite angle B

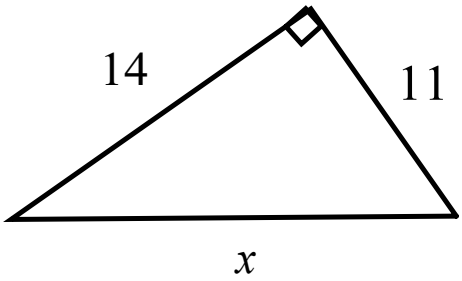
Leg BC, or *a*, is adjacent to angle B and opposite angle A

OPTIONS...

#1. Finding the unknown hypotenuse: (the long side)

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

ex:

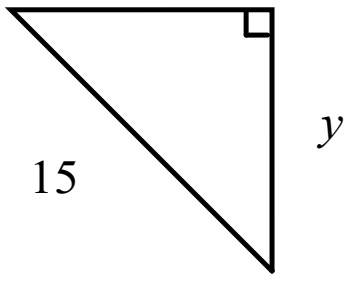


$x^2 = 14^2 + 11^2$
$= 196 + 121$
$= 317$
$x = \sqrt{317}$
≈ 17.8

#2. Finding an unknown side (a short side)

$$a^2 = c^2 - b^2$$

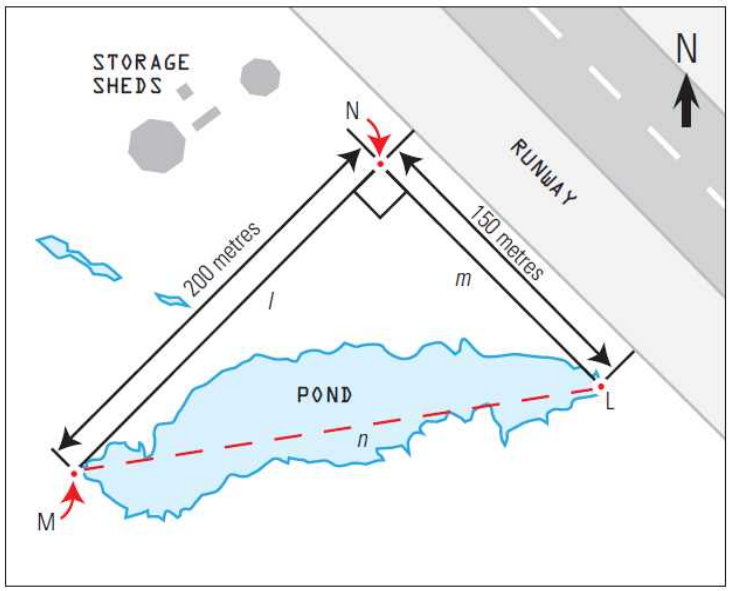
ex:



$y^2 = 15^2 - 9^2$
$= 225 - 81$
$= 144$
$y = \sqrt{144}$
$= 12$

ACTIVITY 8.1
INDIRECT MEASUREMENT

Cam is a surveyor working in Prince Edward Island. He needs to estimate the length of a small pond beside the Summerside Airport. He decides to use a right triangle, as shown in the diagram, as an indirect method of measurement.



1. Why might a surveyor use an indirect method of measurement in the example above?
2. What is the length of the pond?

SOLUTION

1. The surveyor can measure directly on dry land, but he cannot necessarily walk across the pond to measure it.
2. Students will recognize the right triangle and should write the Pythagorean theorem as follows.

$n^2 = l^2 + m^2$

$n^2 = 200^2 + 150^2$

$n^2 = 40\,000 + 22\,500$

$n^2 = 62\,500$

$n = \sqrt{62\,500}$

$n = 250$

The pond is 250 m long.

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

$n^2 = 200^2 + 150^2$

$= 40000 + 22500$

$= 62500$

$n = \sqrt{62500}$

$= 250\text{m}$

Remember... Common Pythagorean Triples

1) 3 - 4 - 5
2) 5 - 12 - 13
3) 8 - 15 - 17
4) 7 - 24 - 25

"Multiple any of these by a constant and you will have another triple..."

$3^2 + 4^2 = 5^2$
$9 + 16 = 25$

$5^2 + 12^2 = 13^2$
$25 + 144 = 169$

Is 10.5 - 14 - 17.5 a pythagorean triple?

LS	RS
$10.5^2 + 14^2$	17.5^2
$110.25 + 196$	306.25
306.25	

Yes it is a pythagorean triple.