

# Test Review Questions...

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7. A service station owner, Uma, has two part-time employees: Pali and Meg.
- Pali is skilled at repairs but has limited experience with customers. Uma pays him \$18 an hour.
  - Meg has experience with customers but can do only simple repairs. Uma pays her \$10 an hour.
  - Uma has a budget of \$470 for their wages.
  - Uma can hire both of these employees for no more than 30 h a week, in total. Both employees are scheduled in whole numbers of hours.
- a) Use a graph to choose two possible combinations of hours for Pali and Meg. Explain your choices.
- b) For each change in the situation below, predict how the graph would change. Explain your prediction, and then graph to check it.
- Uma's budget is \$400 a week.
  - Uma wants Pali to work at least twice as many hours as Meg.

$x \rightarrow$  # of hours Pali works  
 $y \rightarrow$  # of hours Meg works  
 $x \in \mathbb{W} \quad y \in \mathbb{W}$

$$18x + 10y \leq 470$$

$$x + y \leq 30$$

$$18x + 10y = 470$$

x-int:  $\frac{18x}{18} = \frac{470}{18}$

$$x = 26.1$$

$(26.1, 0)$

y-int:  $\frac{10y}{10} = \frac{470}{10}$

$$y = 47$$

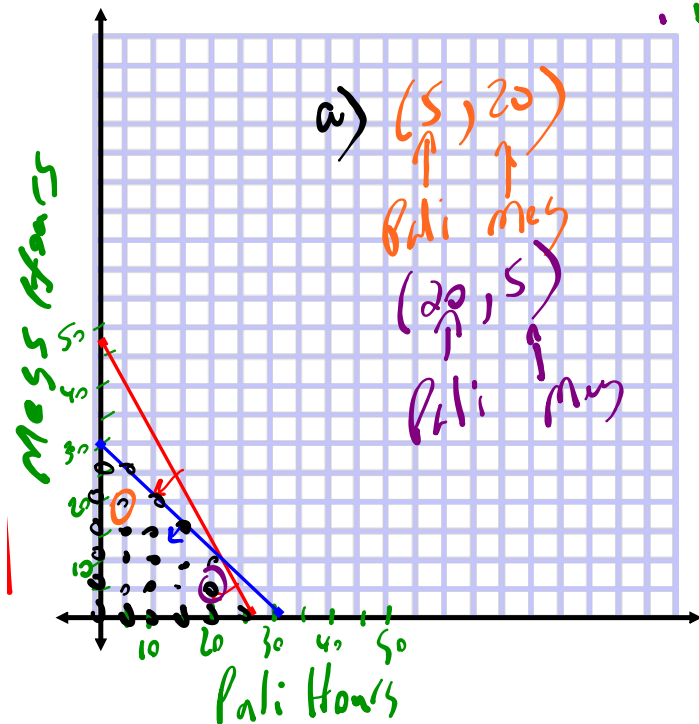
$(0, 47)$

$$x + y = 30$$

x-int  $(30, 0)$

y-int  $(0, 30)$

b) ii)



# 8.1 - The Pythagorean Theorem

## MATH ON THE JOB

Jani Mroshaj is a stone mason in Halifax, NS. Jani learned his trade from his father while growing up in Albania, and then refined his skills while working as a stone mason in Greece and Italy. He immigrated to Canada in 2002, and is now the proud owner of Mr. Masonry, a business in Halifax that builds stone staircases, walls, patios, pathways, and fireplaces.



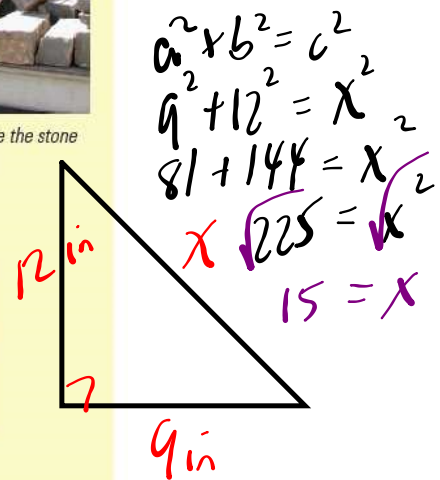
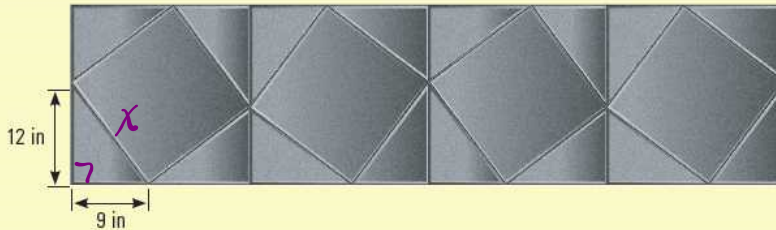
Jani Mroshaj uses a level to make sure the stone he just placed in this wall is straight.

Jani uses math on the job every day. He calculates, estimates, and designs projects for clients, and does bookkeeping. When designing custom work, Jani needs to calculate how much material to order, knowing that this depends both on the dimensions of the stone that is available, and the size of the project he is building.

Jani is working on designing an outdoor patio. His client would like the patio design to feature squares of one kind of stone framing squares of a different kind of stone, with these rotated, as shown in the illustration.

Jani wants the inner squares to be rotated according to the measurements shown in the illustration.

What will be the side lengths of the inner squares?



## SOLUTION

Use the Pythagorean theorem to solve the problem.

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

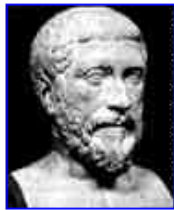
$$12^2 + 9^2 = s^2$$

$$144 + 81 = s^2$$

$$225 = s^2$$

$$\sqrt{225} = s$$

$$15 \text{ in} = s$$



# 's Theorem...

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

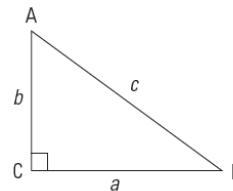
**hypotenuse:** the longest side of a right triangle, opposite the 90° angle

**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

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



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

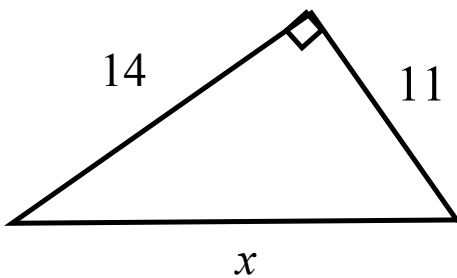
Leg BC, or  $a$ , is adjacent to angle B and opposite angle A

OPTIONS...

#1. Finding the unknown hypotenuse:

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

ex:



$$x^2 = 14^2 + 11^2$$

$$x^2 = 196 + 121$$

$$x^2 = 317$$

$$x = 17.8$$

|                      |             |
|----------------------|-------------|
| $\sqrt{(14^2+11^2)}$ |             |
|                      | 17.80449381 |

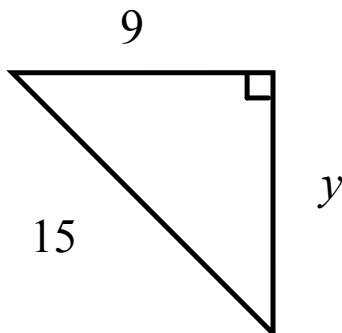
#2. Finding an unknown side

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

3-4-5

9-12-15  $\div 3$

ex:



$$y^2 = 15^2 - 9^2$$

$$y^2 = 225 - 81$$

$$y^2 = 144$$

$$y = 12$$

|                     |     |
|---------------------|-----|
| $\sqrt{(15^2-9^2)}$ | 12  |
| $15^2-9^2$          | 144 |
| $\sqrt{(Ans)}$      | 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.

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

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

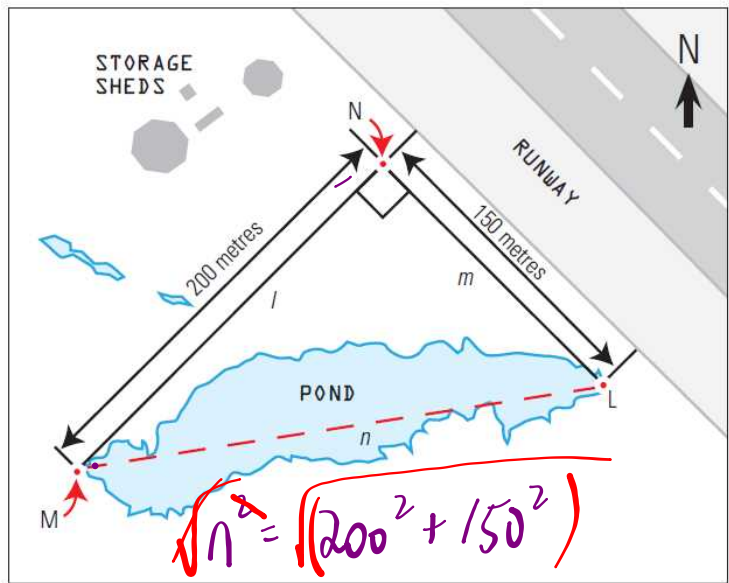
$$n^2 = 40000 + 22500$$

$$n^2 = 62500$$

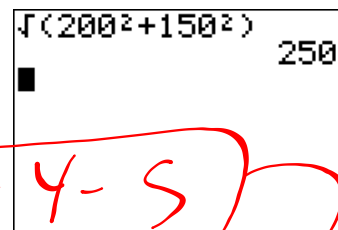
$$n = \sqrt{62500}$$

$$n = 250$$

The pond is 250 m long.



$$\sqrt{n^2} = \sqrt{(200^2 + 150^2)}$$



**3-4-5** x 50

150 - 200 - 250

## 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..."

### Verifying a Pythagorean Triple...

| LS | RS |
|----|----|
|    |    |

| LS | RS |
|----|----|
|    |    |

# HOMEWORK...

 [Worksheet - Pythagorean Theorem.pdf](#)

#5 ace

#6

#8

#10

#11

#12b

**BOTTOM: Justify which triangles are TRIPLES**

## Attachments

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Worksheet - Pythagorean Theorem.pdf