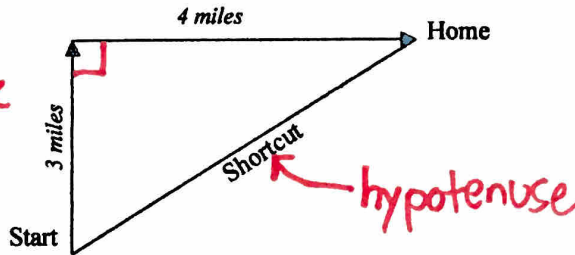


# Is the shortcut actually shorter? Day 1



Right triangle



Reese and her dad are on a very long walk. Her dad says they should go up 3 miles and over 4 miles. Reese says they should take a "shortcut" to get home faster. Is the shortcut actually shorter?

1. What is the total distance of the dad's path? Show your work.

$$3 + 4 = 7 \text{ miles}$$

2. Do you think the shortcut is actually a shorter distance? Make a guess at the shortcut distance.

Yes shorter. 5 or 6 miles.

Let's model the two different paths using pieces of spaghetti. Measure one piece of spaghetti to be exactly 3 inches and another to be exactly 4 inches. Then break a third piece of spaghetti to be the shortcut path.

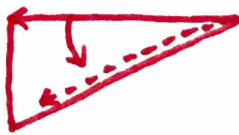
3. Do you think the shortcut piece of spaghetti is longer or shorter than 3 inches? Compare the spaghetti pieces to be sure.

Longer than 3 inches



4. Do you think the shortcut piece of spaghetti is longer or shorter than 4 inches? Compare the spaghetti pieces to be sure.

Longer than 4 inches



5. Measure the actual length of the shortcut piece of spaghetti. How close was your guess from question #1?

5 inches

6. How much shorter is the shortcut than the dad's path?

$$7 \text{ miles} - 5 \text{ miles} = 2 \text{ miles}$$

7. If the dad's path takes 84 minutes, how long would the shortcut take? How much time is saved?

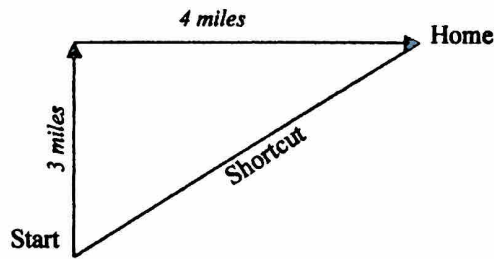
$$\frac{84 \text{ minutes}}{7 \text{ miles}} = 12 \text{ miles per minute}$$

$$5 \times 12 = 60 \text{ minutes}$$

$$84 - 60 = 24 \text{ minutes saved}$$

hypotenuse is the longest side of a triangle

## Is the shortcut actually shorter? Day 2



Reese and her dad are on a very long walk. Her dad says they should go up 3 miles and over 4 miles. Reese says they should take a "shortcut" to get home faster. Today we discover a pattern that will help us find the distance of the shortcut.

1. Use spaghetti pieces to find the distance of the shortcut for a walk on each day.

	<b>A</b> UP	<b>B</b> OVER	<b>C</b> SHORTCUT
Day 1	3	4	5
Day 2	6	8	10
Day 3	5	12	13

Notice:  
 $A + B = C$   
does not work

2. Now take each number in the table above and multiply it by itself.

	<b>A<sup>2</sup></b> UP x UP	+	<b>B<sup>2</sup></b> OVER x OVER	=	<b>C<sup>2</sup></b> SHORTCUT x SHORTCUT
Day 1	9		16		25
Day 2	36		64		100
Day 3	25		144		169

Notice:  
 $A^2 + B^2 = C^2$   
does work

3. What pattern do you notice with the numbers in this table?

For each day, the 1st number + 2nd number = 3rd number

4. Describe the pattern in words.

UP multiplied by itself plus over multiplied by itself gives the shortcut multiplied by itself

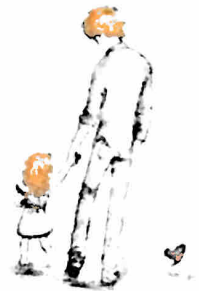
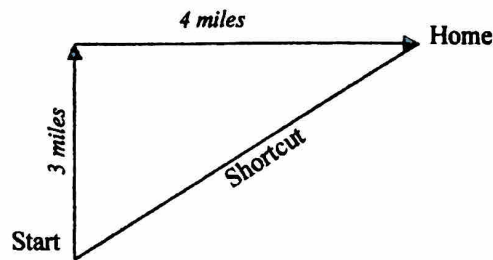
5. Write an equation that goes with the pattern.

$$\text{up} \times \text{up} + \text{over} \times \text{over} = \text{shortcut} \times \text{shortcut}$$

$$A^2 + B^2 = C^2$$

Pythagorean Theorem!

## Is the shortcut actually shorter? Day 3



Reese and her dad are on a very long walk. Her dad says they should go up 3 miles and over 4 miles. Reese says they should take a "shortcut" to get home faster. Today we find unknown distances.

1. What is the pattern we discovered yesterday to relate "UP", "OVER", and "SHORTCUT"?

$$(\text{UP})^2 + (\text{OVER})^2 = (\text{SHORTCUT})^2 \text{ OR } A^2 + B^2 = C^2$$

2. Without using spaghetti pieces, find the unknown distance on each day. Show your work.

	UP	OVER	SHORTCUT
Day 4	9	12	15

Show work:

$$9^2 = 81 \quad 12^2 = 144$$

$$81 + 144 = 225$$

$$\sqrt{225} = 15$$

$$15 \times 15 = 225$$

$$A^2 + B^2 = C^2$$

$$9^2 + 12^2 = C^2$$

$$81 + 144 = C^2$$

$$225 = C^2$$

$$15 = C$$

	UP	OVER	SHORTCUT
Day 5	8	15	17

Show work:

$$8 \times 8 = 64$$

$$15^2 = 225$$

$$17^2 = 289$$

$$289 - 225 = 64$$

$$\sqrt{64} = 8$$

$$A^2 + B^2 = C^2$$

$$A^2 + 15^2 = 17^2$$

$$A^2 + 225 = 289$$

$$A^2 = 64$$

$$A = 8$$

	UP	OVER	SHORTCUT
Day 6	24	7	25

Show work:

$$24^2 = 576$$

$$7 \cdot 7 = 49$$

$$25^2 = 625$$

$$625 - 576 = 49$$

$$\sqrt{49} = 7$$

$$A^2 + B^2 = C^2$$

$$24^2 + B^2 = 25^2$$

$$576 + B^2 = 625$$

$$B^2 = 49$$

$$B = 7$$