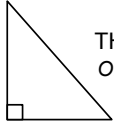


INTRODUCTION - PYTHAGOREAN THEOREM

NAME: _____



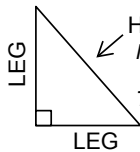
THE **PYTHAGOREAN THEOREM** HAS BEEN USED FOR THOUSANDS OF YEARS TO MEASURE DISTANCE, HELP BUILD THINGS, TELL HOW TALL SOMETHING IS, AND MAKE ACCURATE DRAWINGS. IT IS STILL USED TODAY AND IS A VERY IMPORTANT MATHEMATICAL EQUATION.



THIS IS A RIGHT TRIANGLE. ONE ANGLE EQUALS 90 DEGREES.

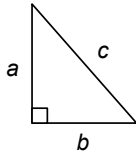
EVEN THOUGH IT HAS BEEN USED FOR THOUSANDS OF YEARS, A GREEK MATHEMATICIAN NAMED **PYTHAGORAS** WAS THE FIRST PERSON TO ACTUALLY PROVE ITS EXISTENCE.

THE PYTHAGOREAN THEOREM SHOWS THE RELATIONSHIP BETWEEN THE LEGS (SHORTER LENGTHS) AND THE HYPOTENUSE (LONGEST SIDE) OF A RIGHT TRIANGLE.



HYPOTENUSE
IT'S ALWAYS OPPOSITE THE RIGHT ANGLE AND THE LONGEST SIDE..

THE THEOREM CAN BE WRITTEN AS AN EQUATION RELATING THE LEGS TO THE HYPOTENUSE. WE CAN USE **a**, **b**, and **c** TO SHOW THE LENGTHS OF EACH SIDE.



PYTHAGOREAN THEOREM

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

THE EQUATION TELLS US THAT IF WE SQUARE THE LEGS AND THEN ADD THEM TOGETHER THEY WILL EQUAL THE SQUARE OF THE HYPOTENUSE.



THIS IS VERY IMPORTANT BECAUSE WE CAN USE THE THEOREM TO FIND A MISSING SIDE OF A RIGHT TRIANGLE. CHECK OUT THE EXAMPLES BELOW.

WHEN YOU SQUARE A NUMBER YOU TIMES IT BY ITSELF.

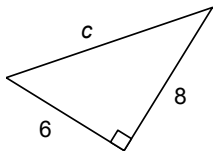
$$4^2 = 4 \times 4 = 16$$

Ex:1

PYTHAGOREAN THEOREM

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

Ex:2



$$10 \times 10 = 100$$

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

$$6^2 + 8^2 = c^2$$

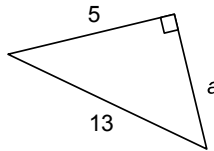
$$(6 \times 6) + (8 \times 8) = c^2$$

$$36 + 64 = c^2$$

$$100 = c^2$$

$$10 = c$$

ASK YOURSELF, "WHAT NUMBER TIMES ITSELF WILL EQUAL 100?"



$$12 \times 12 = 144$$

$$a^2 + b^2 = c^2 \quad \text{or} \quad a^2 = c^2 - b^2$$

$$a^2 + 5^2 = 13^2$$

$$a^2 + (5 \times 5) = (13 \times 13)$$

$$a^2 + 25 = 169$$

$$a^2 + 25 = 169$$

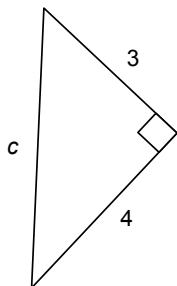
$$a^2 = 144$$

$$a = 12$$

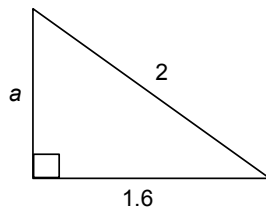
WHAT NUMBER TIMES ITSELF WILL EQUAL 144?

Now your turn. Find the missing side for each right triangle.

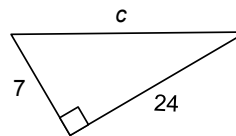
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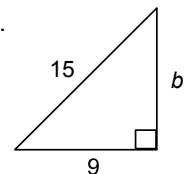
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3.

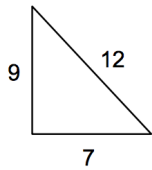


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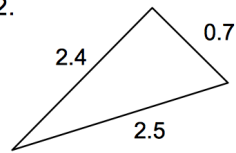


Use the Pythagorean Theorem to show if the triangle is a right triangle.

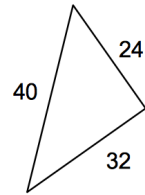
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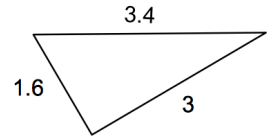
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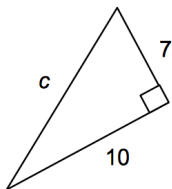


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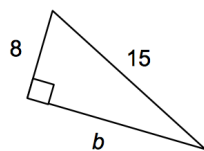


Estimate the answer to the nearest whole number.

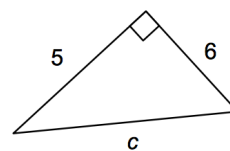
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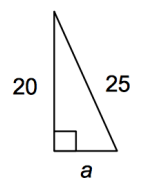
6.



7.



8.

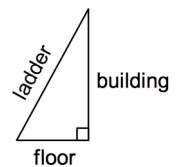


Solve the word problem.

9.



Fire Man Carry needs a ladder to reach the second floor window of an old warehouse. The window is 15 feet straight up, but there is debris and fire all around the building so he will need to place the ladder 8 feet away from the building. How long does the ladder need to be to reach the window?



Verify that the segment lengths form a triangle. Is the triangle acute, right, or obtuse?

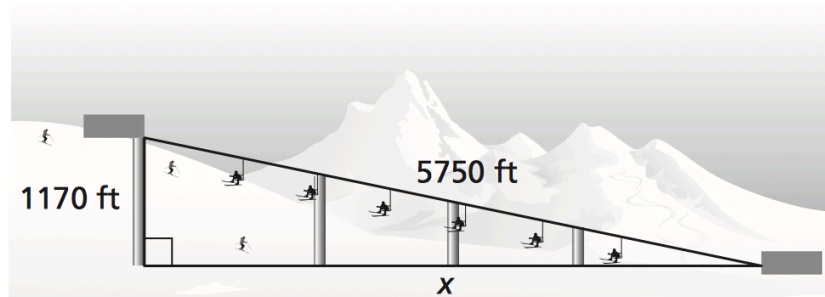
10. 9, 5, 12, and 13

11. 5, 7, and 8

12. 2, 10, and 11

13. 8, 4, and 6

14. A ski lift forms a right triangle, as shown. Use the Pythagorean Theorem to approximate the horizontal distance traveled by a person riding the ski lift. Round your answer to the nearest whole foot.

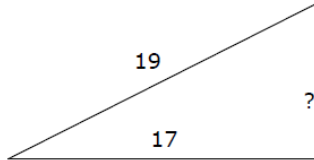


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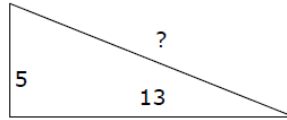
PYTHAGOREAN THEOREM - WORKSHEET

For each triangle find the missing length. Round your answer to the nearest tenth. Then find the area and the perimeter.

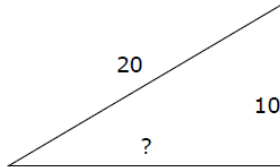
1.



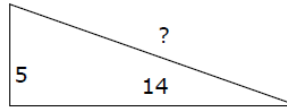
2.



3.



4.



For #5-9 c is the hypotenuse of the right triangle ABC with sides a, b, c

5. $a = 12$; $b = 5$; $c = \underline{\hspace{2cm}}$

6. $a = 8$; $b = \underline{\hspace{2cm}}$; $c = 10$

7. $a = 15$; $b = \underline{\hspace{2cm}}$; $c = 17$

8. $a = \underline{\hspace{2cm}}$; $b = 40$; $c = 50$

9. $a = \underline{\hspace{2cm}}$; $b = 2$; $c = 4$

10. Find a third number so that the three numbers form a right triangle:
- i) 9 , 41

 - ii) 13 , 85
11. Ms. Green tells you that a right triangle has a hypotenuse of 13 and a leg of 5. She asks you to find the other leg of the triangle. What is your answer?
12. Two joggers run 8 miles north and then 5 miles west. What is the shortest distance, to the *nearest tenth* of a mile, they must travel to return to their starting point?
13. Oscar's dog house is shaped like a tent. The slanted sides are both 5 feet long and the bottom of the house is 6 feet across. What is the height of his dog house, in feet, at its tallest point?
14. To get from point A to point B you must avoid walking through a pond. To avoid the pond, you must walk 34 meters south and 41 meters east. To the *nearest meter*, how many meters would be saved if it were possible to walk through the pond?
15. A suitcase measures 24 inches long and the diagonal is 30 inches long. How much material is needed to cover one side of the suitcase?