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APPLYING THE PYTHAGOREAN THEOREM N-GEN MATH[®] 8

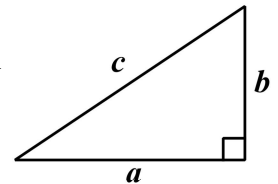


The **Pythagorean Theorem** is one of the single most used ideas in all of math because of how often right (or 90°) angles arise in real world situations. In the next few lessons we will begin to examine many of its uses. Recall what the theorem states:

THE PYTHAGOREAN THEOREM

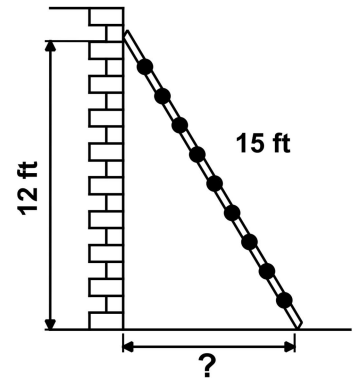
If the lengths of the legs of a right triangle are given by a and b and the length of its hypotenuse is given by c then the following equation is always true:

$$a^2 + b^2 = c^2 \text{ or } (\text{leg } 1)^2 + (\text{leg } 2)^2 = (\text{hypotenuse})^2$$



Exercise #1: A 15-foot-long ladder leans against a building such that it reaches a height of 12 feet. Assuming the building is vertical and the ground horizontal, we want to find out how far from the base of the building the bottom of the ladder lies.

- Draw a right angle on the picture based on the information given.
- Are we missing the hypotenuse or a leg of the right triangle?
- Find the missing side (your answer will be a rational number).



There are many real world applications where a right angle is assumed to exist, such as the one above. Another good example are the four **cardinal directions** of north, south, east, and west.

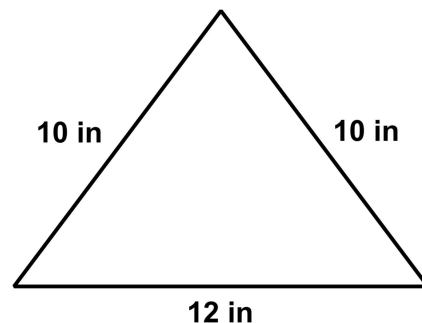
Exercise #2: A car starts by driving north for 5 miles and then drives east for another 12 miles before stopping. Draw a diagram of this scenario and determine the straight line distance from the car's starting point to its ending point.



Many times, the Pythagorean Theorem will come up in ways that require us to create the right triangle from previous knowledge.

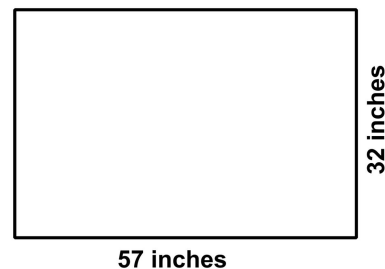
Exercise #3: An **isosceles triangle** (two sides equal) is shown below with legs that each have a length of 10 inches and a base with a length of 12 inches. We want to find the **area** of this triangle.

- (a) Draw a line from the vertex perpendicular to the base and draw in the right angle. Label this line segment h .
- (b) Draw a right triangle below that represents half of this isosceles triangle. Label its known dimensions and h .

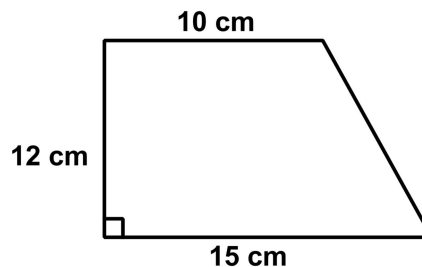


- (c) Find the value of h using the Pythagorean Theorem.
- (d) Find the area of the original isosceles triangle.

Exercise #4: The size of a large screen television is given by the length of the diagonal of the rectangular screen. Samantha wants to know the size of her screen, so she measures its length and width as shown. What size television did Samantha purchase? Round to the nearest inch.



Exercise #5: A right trapezoid is shown below with side lengths labeled. Determine the missing side length.



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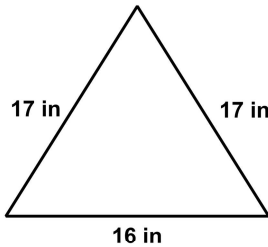


APPLYING THE PYTHAGOREAN THEOREM N-GEN MATH[®] 8 HOMEWORK

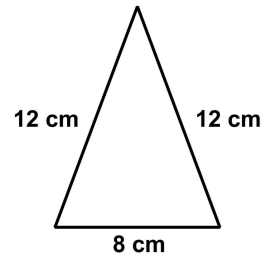
FLUENCY

1. For each of the following isosceles triangles, draw a perpendicular segment from its vertex to its base. Label it h and find its value. If its value is irrational, round to the nearest tenth.

(a)

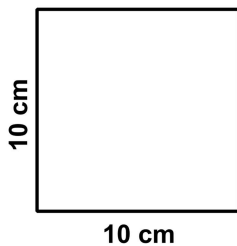


(b)



2. For each of the following, draw a diagonal into the picture and then find its length. If its length is irrational, round to the nearest tenth.

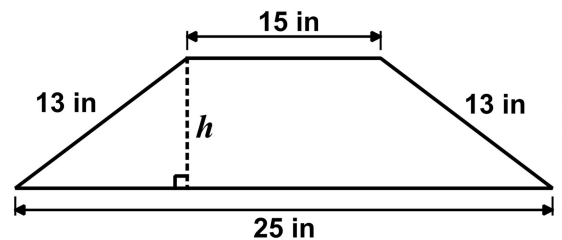
(a)



(b)

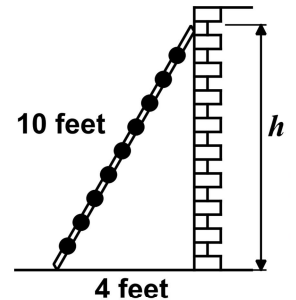


3. A trapezoid has two non-parallel sides the same length, 13 inches. Its two parallel sides have lengths of 25 inches and 15 inches. Determine the height, h , of this trapezoid.

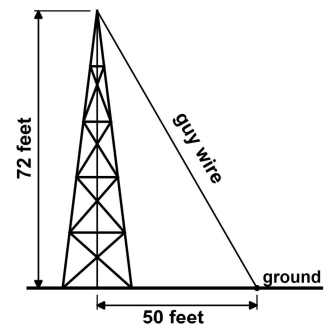


USING YOUR MATH

4. A 10-foot long ladder leans against a vertical wall such that its base is 4 feet from the bottom of the wall. Determine, to the nearest tenth of a foot, how high, h , the ladder reaches up the wall.

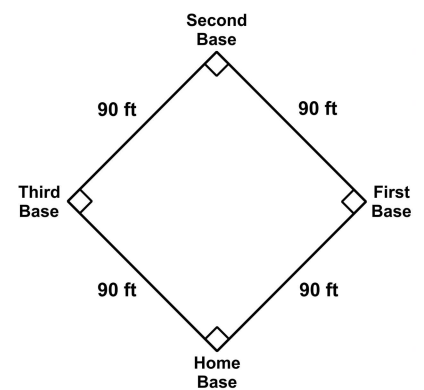


5. A guy wire is attached to the top of a radio tower to help support it. The tower is 72 feet tall and the wire is attached to the ground 50 feet from the midline of the tower. Find the length of the guy wire to the nearest foot.



6. The infield of a professional baseball field is a square whose side lengths are all exactly 90 feet long as shown below.

Determine, to the nearest foot, the distance from second base to home base.



7. Laura is following a map that tells her to walk 25 feet due south from her starting point and then turn right and walk 16 feet due west where she stops. How far, to the nearest foot, is Laura from her starting point? Draw a diagram to justify your work.

