MAT-222-840 | Name: Solutions

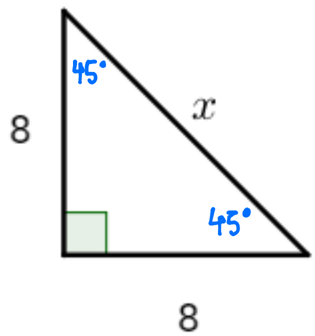
Team Problems for Chapter 9

Spring 2017 | Date: ______________________

Problem #1: Special Right Triangles

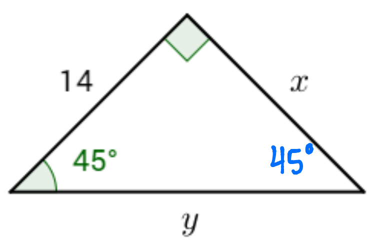
1. Find the value of each variable in the following figures.

a.



$x = 8\sqrt{2}$

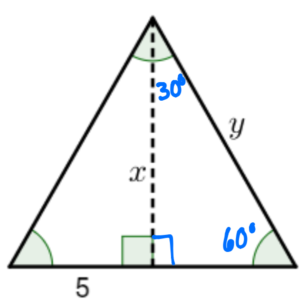
b.



$x = 14$

$y = 14\sqrt{2}$

c.

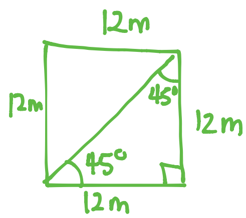


$x = 5\sqrt{3}$

$y = 10$

Problem #2: More Special Right Triangles

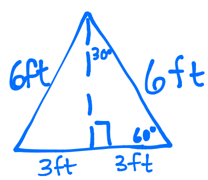
1. The perimeter of a square is 48 meters. Find the length of its diagonal.



$\frac{48}{4} = 12$ m per side

diagonal $= 12\sqrt{2}$ m

2. The perimeter of an equilateral triangle is 18 feet. Find the length of its altitude.

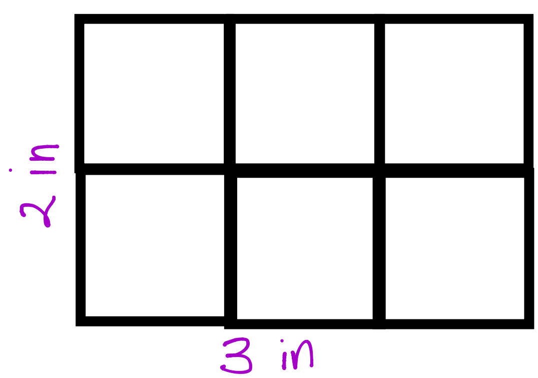


$\frac{18}{3} = 6$ft per side

altitude $= 3\sqrt{3}$ ft

Problem #3: What does "6 square inches" mean?

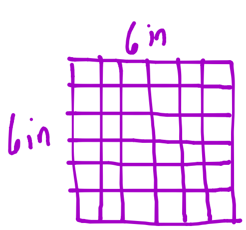
What does it mean to say that a shape has an area of 6 square inches? Give an example of one such shape below by using 1-inch-by-1-inch tiles.



This means that the shape can be covered by 6 1in-by-1in tiles.

Note: You may need to cut the tiles to fit the shape.

If we weren't thinking carefully, we might try to illustrate 6 square inches by drawing a square that is 6 inches wide and 6 inches long. Why is it easy to think that such a square has area 6 square inches, and why is this *not correct?* (Use 1-inch-by-1-inch tiles to explain.)



It is easy for us to interpret "6 square" as representing a square with side length 6. This is not correct because such a square would be covered by 36 1 inch-by-1 inch tiles, as shown.

Problem #4: The Biggest Tree in the World

Listed below are several different trees that could perhaps qualify as the biggest tree in the world. Compare these trees. Why can reasonable people differ about which tree is the biggest?

Tree #1: "General Sherman" is a giant sequoia located in Sequoia National Park in California. According to the National Park Service, General Sherman is 275 feet tall, has a circumference (at its base) of 103 feet, and has a volume of 52,500 cubic feet.

Tree #2: "General Grant" is a giant sequoia located in Sequoia National Park in California. According to the National Park Service, General Grant is 268 feet tall, has a circumference (at its base) of 108 feet, and has a volume of 46,600 cubic feet.

Tree #3: "Mendocino tree" is a redwood tree in Montgomery Redwoods State Reserve near Ukiah, California. It is 368 feet tall and has a diameter of 10.4 feet, which means that its circumference should be about 33 feet.

Tree #4: A Banyan tree in Calcutta, India, has a circumference of 1350 feet (meaning the circumference of the whole tree, not just the trunk) and covers three acres.

Tree #5: A tree in Santa Maria del Tule near Oaxaca, Mexico, is 130 feet tall and is described as requiring 40 people holding hands to encircle it.

Each of these trees has a superlative feature that would qualify it as the biggest in some sense. But does biggest mean tallest? Highest volume? Greatest circumference? Depending on my choice, I might have different answers for "biggest tree".

Problem #5: Conversions: Which are Correct? Which are Not?

Analyze the calculations that follow, which are intended to convert 25 square meters to square feet. Which use legitimate methods and are correct, and which are not? Explain.

A. $25 \text{ m}^2 = 25 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} = 82 \text{ ft}^2$

Incorrect — this method does not account for area (m^2) measurements.

B. $25 \text{ m}^2 = 25 \text{ m}^2 \times \frac{100\times100 \text{ cm}^2}{1 \text{ m}^2} \times \frac{1 \text{ in}^2}{2.54\times2.54 \text{ cm}^2} \times \frac{1 \text{ ft}^2}{12\times12 \text{ in}^2} = 269 \text{ ft}^2$

Correct - conversions account for squared factors.

C. $25 \text{ m} = 25 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} = 82 \text{ ft}$

Therefore, $25 \text{ m}^2 = 82^2 \text{ft}^2 = 6727 \text{ft}^2$.

Incorrect — this measurement assumes the shape is a 25m×25m square.

D. 25 square meters is the area of a square that is 5 meters wide and 5 meters long, so

$$5 \text{ m} = 5 \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} \times \frac{1 \text{ ft}}{12 \text{ in}} = 16.404 \text{ ft}$$

Therefore, $25 \text{ m}^2 = 16.404 \times 16.404 \text{ ft}^2 = 269 \text{ ft}^2$.

Correct — by finding valid dimensions for the shape (5m×5m), we can convert from meters to ft, then square.