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1. A tank in the shape of a rectangular prism is 50 cm tall, 80 cm long, and 30 cm wide. First, some rocks were placed at the bottom of the tank. Then 80 liters of water were poured into the tank. At that point, the tank was  $\frac{3}{4}$  full. What is the total volume of the rocks in cubic meters? Explain.
  
2. (a) A cone-shaped cup has a circular opening at the top of diameter 10 cm. When the cup is filled with 240 ml of liquid, it is  $\frac{4}{5}$  full in terms of volume (so 240 ml is  $\frac{4}{5}$  of the volume of the cup). What is the height of the cup? Explain your reasoning.
  
- (b) A cone-shaped cup has a circular opening at the top of diameter 10 cm. When the cup is filled with 240 ml of liquid, it is filled to  $\frac{4}{5}$  of its height. What is the height of the cup? Explain your reasoning. *Hint:* You must use similar triangles to solve this problem.

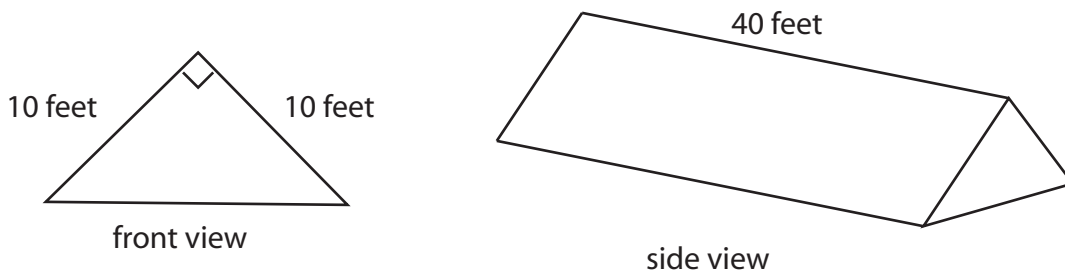


Figure 1: For Problem 3

## 3. A volume problem:

The front and back of a storage shed are shaped like isosceles right triangles with two sides of length 10 feet, as shown on the left in Figure 1. The storage shed is 40 feet long. Determine the volume of the storage shed, explaining your reasoning.

Qing solves the volume problem as follows. First, he uses the Pythagorean theorem to determine that the length of the unknown side of the triangle shown at the left is  $\sqrt{200}$  feet long. Then, Qing uses the Pythagorean theorem again to calculate the height of the triangle  $h$  if the base is the side of length  $\sqrt{200}$ . Qing carries this out as follows:

$$\left(\frac{\sqrt{200}}{2}\right)^2 + h^2 = 10^2$$

$$h^2 = 100 - \frac{200}{4} = 100 - 50 = 50$$

$$h = \sqrt{50}$$

Next, Qing determines that the floor area of the storage shed is

$$40 \cdot \sqrt{200}$$

square feet. Finally, Qing calculates that the volume of the storage shed is given by the floor area of the shed times the height of the triangle:

$$40 \cdot \sqrt{200} \cdot \sqrt{50}$$

- (a) Is Qing's method of calculation correct? Discuss Qing's work. Which parts (if any) are correct, which parts (if any) are incorrect?
- (b) Solve the volume problem in a different way than Qing did, explaining your reasoning.