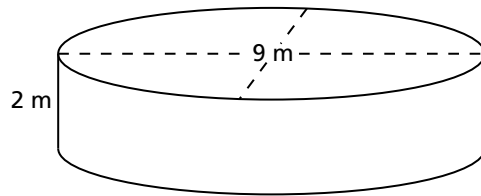
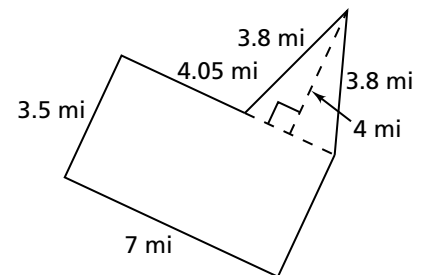


## Solving Density and Design Problems

- Chicago, Illinois, has an area of 227.13 square miles and a population of 2,896,016. What is the population density of Chicago?
- Paris, France, has 2,193,031 people living on 105.4 square kilometers of land. The city of San Francisco, California, has 812,826 people living on 121.47 square kilometers of land. How many fewer people live on a square kilometer of land in San Francisco than in Paris?
- The cylindrical shark tank below can accommodate up to 2 sharks whose maximum length will not exceed 5 feet.



- What is the population density of the shark tank (round to the nearest thousandth of a shark per cubic meter)?
  - A public aquarium wants to build a tank large enough for 5 sharks. Based on the population density you found in part (a), what will the volume of the tank need to be to hold the sharks?
- The population of a nearby town is 16,840. The dimensions of the town are shown on the right.
    - What is the area of the town?
    - What is the population density?

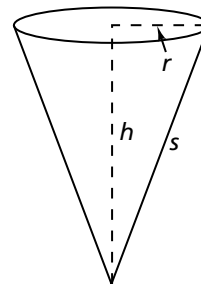


- A sports fan is designing a foam cushion to use on stadium bleachers. The foam is 10 cm thick, and can be cut to any length and width to form a rectangular prism. He wants to make a fabric covering for a piece that has a volume of  $5000 \text{ cm}^3$ . To the nearest tenth of a centimeter, what dimensions should he choose to use the least amount of fabric covering?

## Solving Density and Design Problems

6. You are building a kite in the shape of a cylinder. The kite will have a volume of 64 cubic feet. You want to choose the dimensions so that you use the minimum amount of fabric to wrap the kite frame. To the nearest tenth of a foot, what dimensions should you choose for the kite frame?

7. A family and consumer sciences class is baking waffle cones. Each cone will have a volume of  $36\pi$  cubic centimeters when it is full to the rim with ice cream. The class needs to choose the dimensions so that the cone's surface area is minimized to reduce the cost of ingredients needed. What dimensions should the class choose for the cones? *Hint:* Use the fact that  $s = \sqrt{h^2 + r^2}$ .



8. **Reasoning** The table shows the population and density of several counties in the United States.

County	Population	Density (pop/km <sup>2</sup> )
Suffolk County, Massachusetts	685,502	4551.51
Dallas County, Texas	2,368,139	973.99
Cook County, Illinois	5,194,675	2195.21
Orange County, California	3,010,232	1392.14

- What is the approximate land area of Suffolk County, Massachusetts?
- What is the approximate land area of Dallas County, Texas?
- What is the approximate land area of Cook County, Illinois?
- What is the approximate land area of Orange County, California?
- Based on the information in the table, along with your answers from Parts a–d, what stands out as being different about Suffolk County?