

Lesson 10.1: Population Density

$$\textit{Density} = \frac{\textit{mass}}{\textit{Volume}}$$

$$\textit{Population Density} = \frac{\textit{Population}}{\textit{Area or Volume}}$$

Gahanna, Ohio has a population of 34,051 and an area of 12.4 square miles. What is the population density of Gahanna?

Gahanna

Population: 34,051

Area: 12.4 mi²

$$D = \frac{34,051}{12.4} = 2,746 \text{ people/mi}^2$$

Springville, Utah has a population of 31,205 and an area of 14.44 square miles. How many fewer people live on a square mile of land in Springville than in Gahanna?

Gahanna: 2,746 people/mi²

Springville: $D = \frac{31205}{14.44} = 2,161$ people/mi²

$$2746 - 2161 = 585 \text{ people/mi}^2$$

Formulas to Remember:

- Cylinder: $V = \pi r^2 h$
 - Note: h is the height and r is the radius



- Rectangular Prism (Box): $V = LWH$



- Cube: $V = S^3$



A cylindrical container is 12 inches tall with a diameter of 4 inches. One cubic inch of the container can hold 2 marbles. How many marbles can fit in the jar?



$$V = \pi r^2 h$$

$$V = \pi (2)^2 \cdot 12 \approx 150.79 \text{ in}^3$$

$$\frac{2 \text{ marbles}}{1 \text{ in}^3}$$

$$D = \frac{P}{V} \rightarrow (150.79) 2 = \frac{P}{150.79} (150.79)$$

$$P = 301 \text{ marbles}$$

A florist recommends that you should grow 8 tulips per square foot and 2 lilies per square foot. If you want to grow 50 tulips and 50 lilies, how many more square feet of garden space do you need for the lilies than for the tulips?

$$D = \frac{P}{A}$$

Tulips

Density: 8

Pop: 50

$$8 = \frac{50}{A}$$

$$A = \frac{50}{8} = 6.25 \text{ ft}^2$$

Lilies

Density: 2

Population: 50

$$2 = \frac{50}{A}$$

$$A = \frac{50}{2} = 25 \text{ ft}^2$$

$$25 - 6.25 = \boxed{18.75 \text{ ft}^2}$$

A 5 ft. by 2 ft. by 1.5 ft. aquarium holds 20 fish. Based on the population density of this aquarium, how many fish can an aquarium in the shape of a cube with 2 feet edges hold?

Aquarium 1

$$V = 5(2)(1.5) = 15 \text{ ft}^3$$

$$\text{Pop} = 20 \text{ fish}$$

$$D = \frac{20}{15}$$

Aquarium 2

$$V = 2(2)(2) = 8 \text{ ft}^3$$

$$\text{Population} = x \text{ fish}$$

$$D = \frac{x}{8}$$

Density is the same

$$8 \cdot \frac{20}{15} = \frac{x}{8}$$

$$x = 8\left(\frac{20}{15}\right) \approx \boxed{10 \text{ fish}}$$