

Module 16e: Density

Math Practice(s):

- Model with mathematics.
- Look for & make use of structure.

Learning Target(s):

- Apply the formulas for volume to solve problems in real-world context.

Homework:

HW#12: 16e #1-2

(erase to show)

Density (#VOC)The measure of one quantity per unit measure of another.

$$\text{classroom } (30' \times 31') = 930 \text{ ft}^2$$

26 people in classroom

$$\frac{930 \text{ ft}^2}{26 \text{ ppl}} = 35.8 \text{ ft}^2 \text{ each person has about } 36 \text{ ft}^2 \text{ to themselves.}$$

Example 1: Frank is looking to relocate from the busy island of Oahu to a Hawaiian island that has a lower population density. He is currently deciding between Maui and Kaua'i. Maui has a land area of 1884 km^2 and a population of around 145,000 people. Kaua'i has a land area of 552 km^2 and 66,000 people.

- A. What is the population density of Maui (in people per square km)? What is the population density of Kaua'i?

$$\frac{\text{Maui}}{145,000}{1884}$$

$$77 \text{ ppl} / \text{km}^2$$

$$\frac{\text{Kaua'i}}{66,000}{552}$$

$$120 \text{ ppl} / \text{km}^2$$

- B. Frank would prefer to live on the island with the least population density. Based on your answer to the previous question, where should he relocate to?

Frank should relocate to Maui.

- C. Hawai'i Island has a land area of $10,432 \text{ km}^2$. How many people would need to live on Hawai'i Island to have the same population density as Maui?

$$10,432 \cdot \left(\frac{P}{10,432} \right) = (77) 10,432$$

Hawai'i would need 803,264 ppl to have the same pop. density as Maui.

Example 2: Rein has three fish that need to be kept in an aquarium. It is recommended that the fish live in a low-density environment, with no more than 1 fish per 400 in.^3 of water.

Rein is interested in purchasing one of three fish tanks:

- A. A rectangular prism with length of 18 inches, width of 6 inches, and height of 9 inches.
- B. A square pyramid that has a height of 12 inches and a base that has a side length of 15 inches.
- C. A pentagonal pyramid with a height of 13 inches and a base that has an area = 70 inches^2 .

Which fish tank(s) would provide a proper environment for Rein's fish?

To accommodate 3 fish, you need a tank w/
a volume of at least 1200 in^3 of water
 $\rightarrow (400 \cdot 3)$

A) 972 in^3 B) 900 in^3 C) 303 in^3

Rein cannot use any of the tanks. ☹️

Example 3: In 2017, the population of the state of Hawaii was approximately 1,430,000. The eight major islands of Hawaii make up a total of 10,931 square miles. How many people would you expect to find in an arbitrarily chosen square mile?

"what is pop. density"?

$$\begin{array}{r} 1,430,000 \\ \hline 10,931 \\ 130.8 \end{array}$$

you would expect
to find 131 ppl
in a square mile.