

Length, Area, and Volume

NAME _____

1. Cube A has an edge length of 2 centimeters, and cube B has an edge length of 4 centimeters. Calculate the area of one face, the total surface area, and the volume of each cube. Determine the ratios of edge length, area of one face, surface area, and volume for the two cubes. Explain how the ratios are related.

Edge Length – 1:2
Surface Area – 1:4

Area of a Face – 1:4
Volume – 1:8

The ratio of the areas is the square of the edge length ratio. The volume ratio is the cube of the edge length ratio.

2. Cube C has an edge length of 1.8 meters, and cube D has an edge length of 5.4 meters. Calculate the area of one face, the total surface area, and the volume of each cube. Determine the ratios of edge length, area of one face, surface area, and volume for the two cubes. Explain how the ratios are related.

Edge Length – 1:3
Surface Area – 1:9

Area of a Face – 1:9
Volume – 1:27

The relationships between the ratios are the same as in Question 1.

3. The edge length of cube E is 3 inches. The area of one face of cube E is one-half the area of cube F. What is the edge length of cube F? Explain your solution.

The area of cube E is $3^2 = 9 \text{ in.}^2$. The area of cube F is $9 \times 2 = 18 \text{ in.}^2$, so the edge length of cube F is $\sqrt{18} \approx 4.24 \text{ in.}$

4. The dimensions of a rectangular prism are $13 \text{ cm} \times 8 \text{ cm} \times 5 \text{ cm}$. Increase each dimension by 50%. How is the volume of the new prism related to the volume of the original prism? Explain your solution.

$V_1 = 13 \times 8 \times 5 = 520$, and $V_2 = (13 \times 1.5) \times (8 \times 1.5) \times (5 \times 1.5) = 1755$, so the ratio is $1755 \div 520 = 3.375$.

5. Choose a radius for a sphere, and calculate its volume. Then, create a second by doubling the radius. Calculate the volume of the second sphere. Compare the volumes of these two spheres. Does the comparison match your expectation of the ratios?

The ratio of the radii is 1:2, so the ratio of the volumes is $(1:2)^3$, or 1:8.