

A.M.3: Error 2: Calculate the relative error in measuring square and cubic units, when there is an error in the linear measure

- 1 Ryan estimates the measurement of the volume of a popcorn container to be 282 cubic inches. The actual volume of the popcorn container is 289 cubic inches. What is the relative error of Ryan's measurement to the *nearest thousandth*?
 - 1) 0.024
 - 2) 0.025
 - 3) 0.096
 - 4) 1.025
- 2 To calculate the volume of a small wooden cube, Ezra measured an edge of the cube as 2 cm. The actual length of the edge of Ezra's cube is 2.1 cm. What is the relative error in his volume calculation to the *nearest hundredth*?
 - 1) 0.13
 - 2) 0.14
 - 3) 0.15
 - 4) 0.16
- 3 Using his ruler, Howell measured the sides of a rectangular prism to be 5 cm by 8 cm by 4 cm. The actual measurements are 5.3 cm by 8.2 cm by 4.1 cm. Find Howell's relative error in calculating the volume of the prism, to the *nearest thousandth*.
- 4 Ashley measured the dimensions of a rectangular prism to be 6 cm by 10 cm by 1.5 cm. The actual dimensions are 5.9 cm by 10.3 cm by 1.7 cm. Determine the relative error, to the *nearest thousandth*, in calculating the volume of the prism.
- 5 A storage container in the form of a rectangular prism is measured to be 12 inches by 8 inches by 4 inches. Its actual measurements are 11.75 inches by 7.75 inches by 4 inches. Find the relative error in calculating the volume of the container, to the *nearest thousandth*.
- 6 Alexis calculates the surface area of a gift box as 600 square inches. The actual surface area of the gift box is 592 square inches. Find the relative error of Alexis' calculation expressed as a decimal to the *nearest thousandth*.
- 7 Terry estimated the length of the edge of a cube to be 5 cm. The actual length of the side is 5.2 cm. Find the relative error of the surface area of the cube, to the *nearest thousandth*.
- 8 An oil company distributes oil in a metal can shaped like a cylinder that has an actual radius of 5.1 cm and a height of 15.1 cm. A worker incorrectly measured the radius as 5 cm and the height as 15 cm. Determine the relative error in calculating the surface area, to the *nearest thousandth*.

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Answer Section

1 ANS: 1

$$\left| \frac{289 - 282}{289} \right| \approx 0.024$$

REF: 080828ia

2 ANS: 2

The volume of the cube using Ezra's measurements is $8 (2^3)$. The actual volume is $9.261 (2.1^3)$. The relative error is $\left| \frac{9.261 - 8}{9.261} \right| \approx 0.14$.

REF: 060928ia

3 ANS:

$$0.102. \frac{(5.3 \times 8.2 \times 4.1) - (5 \times 8 \times 4)}{5.3 \times 8.2 \times 4.1} = \frac{178.16 - 160}{178.16} = 0.102$$

REF: 011036ia

4 ANS:

$$\frac{(5.9 \times 10.3 \times 1.7) - (6 \times 10 \times 1.5)}{5.9 \times 10.3 \times 1.7} \approx 0.129$$

REF: 081235ia

5 ANS:

$$\frac{(11.75 \times 7.75 \times 4) - (12 \times 8 \times 4)}{11.75 \times 7.75 \times 4} = \frac{364.25 - 384}{364.25} = 0.054$$

REF: 061435ia

6 ANS:

$$\frac{600 - 592}{592} \approx 0.014$$

REF: 061031ia

7 ANS:

$$\frac{6(5.2)^2 - 6(5)^2}{6(5.2)^2} \approx 0.075$$

REF: 011435ia

8 ANS:

$$0.029. \frac{[2\pi(5.1)^2 + 2\pi(5.1)(15.1)] - [2\pi(5)^2 + 2\pi(5)(15)]}{2\pi(5.1)^2 + 2\pi(5.1)(15.1)} \approx \frac{647.294 - 628.319}{647.294} \approx 0.029$$

REF: 011137ia