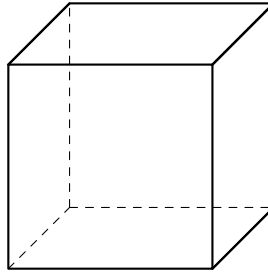


Question 9

The side of a cube is measured to be 5 cm with a possible error of 0.1 cm.

- (a) Use differentials to estimate the maximum error in computing the volume of the cube.
- (b) Estimate the relative and percentage error in the volume.



$$s = 5 \text{ cm}$$

Question 9 - Solution

We are given:

$$s = 5 \text{ cm}, \quad ds = 0.1 \text{ cm}$$

The volume of a cube is:

$$V = s^3$$

Differentiate using differentials:

$$dV = \frac{d}{ds}(s^3) ds = 3s^2 ds$$

Substitute values:

$$dV = 3(5)^2(0.1) = 3 \cdot 25 \cdot 0.1 = \boxed{7.5 \text{ cm}^3}$$

(a) **Maximum error in volume:**

$$\boxed{7.5 \text{ cm}^3}$$

(b) **Relative and percentage error:**

$$V = 5^3 = 125 \text{ cm}^3$$

$$\text{Relative error} = \frac{dV}{V} = \frac{7.5}{125} = 0.06$$

$$\text{Percentage error} = 0.06 \times 100 = \boxed{6\%}$$

Final Answers:

- Maximum error in volume: $\boxed{7.5 \text{ cm}^3}$
- Relative error: $\boxed{0.06}$
- Percentage error: $\boxed{6\%}$