

## Exercise 11

Express the edge length of a cube as a function of the cube's diagonal length  $d$ . Then express the surface area and volume of the cube as a function of the diagonal length.

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### Solution

$$\text{Edge Length } x: \quad d = \sqrt{x^2 + x^2 + x^2} = x\sqrt{3} \quad \rightarrow \quad x = \frac{d}{\sqrt{3}}$$

$$\text{Surface Area:} \quad A = x^2 + x^2 + x^2 + x^2 + x^2 + x^2 = 6x^2 = 6 \left( \frac{d^2}{3} \right) = 2d^2$$

$$\text{Volume:} \quad V = x^3 = \frac{d^3}{\sqrt{27}} = \frac{d^3}{3\sqrt{3}}$$