

Unit 3: Powers & Exponents

3.4 Problem Solving With Exponents

Ex. Write an expression involving exponents to solve each problem:

1. What is the numerical difference between the surface area and the volume of a cube with sides of length 4 cm?

$$SA = 6s^2$$

$$V = s^3$$



$$\begin{aligned} & 6(4)^2 - (4)^3 \\ &= 6(16) - 64 \\ &= 96 - 64 \leftarrow 96 \text{ cm}^2 - 64 \text{ cm}^3 \\ &= \boxed{32} \end{aligned}$$

2. An initial population of 10 bacteria quadruples every hour. How many bacteria are present after:
- a) 2 hours b) 4 hours c) n hours d) 11 hours

$$\begin{aligned} &= 10 \times 4 \times 4 \\ &\quad \swarrow \quad \searrow \\ &\quad 1\text{hr} \quad 2\text{hr} \\ &= 10(4)^2 \\ &\quad \uparrow \\ &\text{coefficient} \end{aligned}$$

$$\begin{aligned} &= 10(16) \\ &= \boxed{160 \text{ bacteria}} \end{aligned}$$

$$\begin{aligned} &= 10 \times 4 \times 4 \times 4 \times 4 \\ &\quad \swarrow \quad \swarrow \quad \swarrow \quad \swarrow \\ &\quad 1\text{hr} \quad 2\text{hr} \quad 3\text{hr} \quad 4\text{hr} \\ &= 10(4)^4 \end{aligned}$$

$$\begin{aligned} &= 10(256) \\ &= \boxed{2560 \text{ bacteria}} \end{aligned}$$

$$\boxed{= 10(4)^n}$$

$$= 10(4)^{11}$$

$$= 10(4,194,304)$$

$$= \boxed{41,943,040 \text{ bacteria}}$$