

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?



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

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

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

$$= 10(16)$$

$$= \boxed{160 \text{ bacteria}}$$

$$\begin{aligned}
 & 10 \times \underbrace{4 \times 4 \times 4 \times 4}_{\downarrow 4} \\
 & = 10(4)^4
 \end{aligned}$$

$$= 10(256)$$

$$= \boxed{2560 \text{ bacteria}}$$

$$= 10(4)^n$$

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

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

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