

2.4 Using Exponents to Solve Problems

Math 9

Using Exponents to Solve Problems

Name: _____

Suppose you were given a choice to receive one million dollars in one month or a penny doubled every day for 30 days. Which one would you choose?

Day 1: \$0.01

Day 2: \$0.02

Day 3: \$0.04 ... $0.01 \times 2 \times 2 = 0.01 \times 2^2$

Day 4: $0.01 \times 2 \times 2 \times 2 = 0.01 \times 2^3$

Day 30: ? $0.01 \times 2^{29} = \$5\,368\,709.12$

Exponential Growth:

A petri dish contains 100 bacteria. Under ideal conditions, the bacteria double in number every hour. How many bacteria will be present after 1 hour? 5 hours? n hours?

After 1 hour $\rightarrow 200$ bacteria (100×2)

After 5 hours $\rightarrow 100 \times 2 \times 2 \times 2 \times 2 \times 2$
 $= 100 \times 2^5$
 $= 3200$ bacteria

After n hours $\rightarrow 100(2)^n$ or 100×2^n

How would the calculations change if the bacteria triple every hour, and there are 50 to begin with?

After 1 hour $\rightarrow 50 \times 3 = 150$

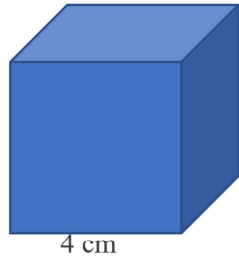
After 5 hours $\rightarrow 50 \times 3^5 = 12150$

After n hours $\rightarrow 50(3)^n$

Working with Formulas:

Write an expression using exponents to solve each problem.

- a) What is the surface area of a cube with an edge length of 4 cm?



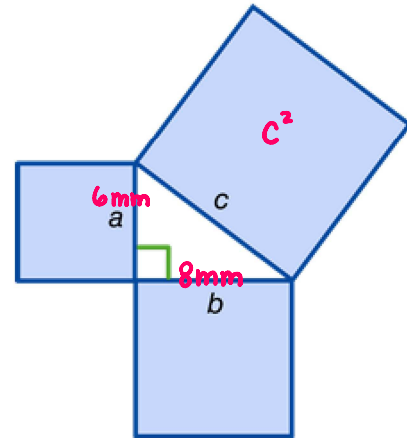
6 squares \rightarrow each area is s^2 ($s =$ side length)

$$\begin{aligned} SA &= 6(s)^2 \\ &= 6(4)^2 \\ &= 6(16) \\ &= 96\text{cm}^2 \end{aligned}$$

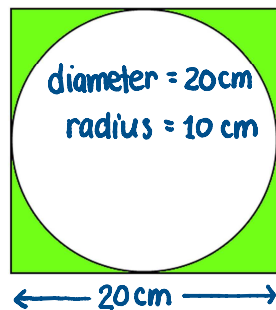
- b) Three squares are attached to a right triangle. Find the area of the square attached to the hypotenuse in the diagram if $a = 6$ mm and $b = 8$ mm.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 6^2 + 8^2 &= c^2 \\ 36 + 64 &= c^2 \\ 100 &= c^2 \end{aligned}$$

The area is 100mm^2 .



- c) A circle is inscribed in a square with a side length of 20 cm. What is the area of the shaded region?



$$\begin{aligned} &\text{area of square} - \text{area of circle} \\ &= s^2 - \pi r^2 \\ &= 20^2 - \pi(10)^2 \\ &= 400 - 100\pi \\ &\approx 85.84\text{cm}^2 \end{aligned}$$

$$\begin{aligned} \#1 \quad SA &= 4 \times \pi \times r \times r \\ &= 4 \times \pi \times r^2 \\ &= 4\pi r^2 \leftarrow \text{exponent} = 2 \end{aligned}$$

coefficient \leftarrow \leftarrow base = r
= 4π variable = r