

# Warm-up...

Evaluate the following without a calculator...

$$36^{(0.5 + \log_6 \sqrt{2})}$$

## Applications using Logarithms

**Example:**

An investment of \$800 is made in a term deposit that pays 6 %/a compounded semi-annually. How long will it take to triple the value of the investment?

- Set up a pattern for the data

Time(years)	0	$\frac{1}{2}$	1	$1\frac{1}{2}$	
Amount(\$)	800				

- Develop a function that models this data

$$A = 800(1.03)^{2t}$$

$$\frac{t}{(\frac{1}{2})}$$

- Use this function to solve the problem

$$\frac{2400}{800} = \frac{800(1.03)^{2t}}{800}$$

$$3 = 1.03^{2t}$$

$$\log 3 = \log(1.03)^{2t}$$

$$\log 3 = 2t \log 1.03$$

$$t = \frac{\log 3}{2 \log 1.03}$$

$$\underline{t = 18.6 \text{ years}}$$

#2. The grade 12 Biology class has been growing a new bacteria culture. The population was initially 5000 bacteria and doubles every three hours.

- What will be the population after 240 minutes.
- How many hours will it take for the bacteria population to reach 1 million?

hours	0	3
<u>Num</u>	5000	10000

x2

(a)  $N = 5000(2)^{t/3}$   $240 \text{ min} = \underline{4 \text{ hours}}$

$N = 5000(2)^{4/3}$

$N \approx 12599$

(b)  $\frac{1000000}{5000} = \frac{5000(2)^{t/3}}{5000}$

$$200 = 2^{t/3}$$

$$\log(200) = \log(2)^{t/3}$$

$$\log 200 = \frac{t}{3} \log 2$$

$$t = \frac{3 \log 200}{\log 2}$$

$$t = \underline{22.9 \text{ hours}}$$