

# Exponential Functions

Goal:

- to model exponential functions with a rule



A rabbit population quadruples every year. If there are 20 rabbits today, how many will there be in 8 years?

$$y = 20(4)^8 = 1\,310\,720$$

Radioactive material decays over time. Half-life is a term which describes how long it takes a radioactive material to decay to half its mass.

Plutonium-238 has a half-life of 80 years. How much plutonium-238 will remain after 200 years if it begins with 5 kg?

$$5(0.5)^{\cancel{80}} =$$

$$5(0.5)^{\cancel{200}}$$

$$5(0.5)^{2.5} = 0.88 \text{ kg}$$

Number of "half-lives":

$$\frac{200}{80} = 2.5$$

An investment fund promotes an annual rate of return of 15%. If you invest \$5 000, how much should you expect to have after ten years?

$$\cancel{5000(0.15)} = 750 \quad \text{too long}$$

$$\cancel{5750(0.15)} =$$

$$y = 5000(1.15)^{10} = 20\,227.79$$

$$\begin{aligned} &\hookrightarrow 100\% + 15\% \\ &= 115\% \\ &= 1.15 \end{aligned}$$

You just bought a brand new Lambo (car) for 200 000. This car loses 10% of its value each year. How much will it be worth after 5 years?

$$200\ 000 (\cancel{0.10})^5 = 2$$

$$200\ 000 (0.9)^5 = 118\ 098$$

$$\hookrightarrow 100\% - 10\%$$

$$= 90\%$$

$$= 0.9$$

What does the rule of an exponential function look like?

p.82  
#10-12

$$y = ac^x \quad \text{or} \quad y = ac^{\underline{bx}}$$

a : initial value

c : multiplier (base)

x : usually time

b : multiplier rate