Compound Interest

Goal:

    - to understand how compound interest works

    - to calculate interest with different compounding periods

You are investing $500 in a savings account with 4% interest. How long will it take to double?

$$y = 500(1.04)^x$$

$$\frac{1000}{500} = \frac{500(1.04)^x}{500}$$

$$2 = 1.04^x$$

$$\log_{1.04} 2 = x$$

$$\frac{\log 2}{\log 1.04} = x$$

$$x = 17.7 \text{ years}$$

You are investing $500 in a savings account with 4% interest compounded monthly. How long will it take to double?

$$y = 500\left(1.00\overline{3}\right)^{12x}$$

$$\frac{1000}{500} = \frac{500\left(1.00\overline{3}\right)^{12x}}{500}$$

$$2 = 1.00\overline{3}^{12x}$$

$$\log_{1.00\overline{3}} 2 = 12x$$

$$\frac{\log 2}{\log 1.00\overline{3}} = 12x$$

$$12x = 208.29$$

$$x = 17.35$$

$$\frac{1}{12} \cdot 4\% = 0.\overline{3}\%$$

$$= \frac{4\%}{12} = \frac{0.04}{12}$$

$$= 0.00\overline{3}$$

You are investing $500 in a savings account with 4% interest compounded weekly. How long will it take to double?

$$y = 500 \left(1.000769\right)^{52x}$$

$$1000 = 500 \left(1.000769\right)^{52x}$$

$$2 = 1.000769^{52x}$$

$$\frac{\log 2}{\log 1.000769} = 52x$$

$$\frac{1}{52} \cdot 4\%$$

$$= \frac{4\%}{52} = \frac{1}{13}\%$$

$$= 0.0769\%$$

$$= 0.000769$$

$$x = 17.34 \quad \text{a little faster}$$