

Lesson 8.05:

Solving Exponential Equations



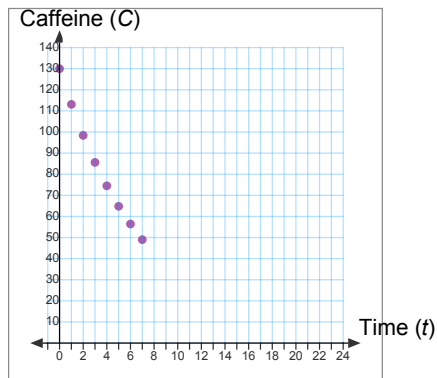
Learning Goals:

I can construct algebraic models based on real-world applications involving exponential growth and decay.

I can use these models to answer important questions

Caffeine is present in most coffees, teas, chocolates and several other food and beverage products. Research shows that this chemical is eliminated from the human body over time exponentially (mostly). We will verify this using observed data.

This table and graph show the mass of caffeine remaining in an average-sized person, for seven hours, after drinking a cup of coffee that contained 130 mg of caffeine.



t (hours)	C (mg)
0	130
1	113.1
2	98.4
3	85.6
4	74.5
5	64.8
6	56.4
7	49

$$P = P_0 \left(\frac{1}{2}\right)^{\frac{t}{h}}$$

$$98.4 = 130 \left(\frac{1}{2}\right)^{\frac{2}{h}}$$

$$\frac{98.4}{130} = \left(\frac{1}{2}\right)^{\frac{2}{h}}$$

$$\log\left(\frac{98.4}{130}\right) = \frac{2}{h} \log\left(\frac{1}{2}\right)$$

$$\frac{\log\left(\frac{98.4}{130}\right)}{2 \log\left(\frac{1}{2}\right)} = \frac{1}{h}$$

$$\frac{2 \log\left(\frac{1}{2}\right)}{\log\left(\frac{98.4}{130}\right)} = h$$

$$\log\left(\frac{98.4}{130}\right) = h$$

$$5h = h$$