

# Logarithms in Practice

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
  - Are civil and are aware of your impact on others.
  - Assume and engage with the strongest argument while assuming best intent.
1. How many years will it take \$5,500 to amount to \$8,000 if it is invested at an annual rate of 9% compounded monthly?

2. How many years will it take \$5,500 to amount to \$8,000 if it is invested at an annual rate of 9% compounded continuously?

3. *Exponential Growth Model*(§3.1): A population that experiences exponential growth increases according to the model  $Pe^{rt}$  where  $P$  is the initial population,  $r$  is the relative rate of growth, and  $t$  is time.

Zombies! The population of zombies is 2 on Wednesday and 5 a day later.

- (a) If the population continues to grow exponentially, how many zombies will there be in a week?

- (b) How long until the population of UW Tacoma is gone?  
(note: UW Tacoma has about 5000 students)

4. *Radioactive Decay Model:* If  $P$  is the initial mass of a radioactive substance with a half life  $h$ , then the mass remaining  $A$ , at time  $t$  is modeled by:

$$A = Pe^{-rt}$$

where  $r = \frac{\ln 2}{h}$ .

A skeleton of a cat was found in a well and has a ratio of carbon 14 to carbon 12 that is 61% of the corresponding ratio for living things. (Carbon 14 is only made by living things, carbon 14 begins to decay to carbon 12 upon death. The half-life of carbon 14 is 5730 years.) About how long ago did the cat die?

5. *Newton's Law of Cooling:* If  $D$  is the initial temperature difference between an object and its surroundings, and if its surroundings have a temperature  $T$ , then the temperature of the object  $A$  and time  $t$  is modeled by:

$$A = T + De^{-kt}$$

where  $k$  is a positive constant that depends on the type of object.

Initially coffee has a temperature of 200°F in a room that is 70°. After ten minutes the temperature is 150°. What will the temperature of the coffee be after an additional ten minutes passes?