

# MAC1105 Week 12 Discussion

## Module 12: Modeling

(1) A population of bacteria quintuples every 4 hours. If the initial population is 150 bacteria, how many bacteria will be in the population after 20 minutes? After 17 hours?

**Answer:** 172 bacteria; 140,189 bacteria

(2) A population of wolves doubles every 12 years. If the population of wolves now is 480, how many wolves were there 24 years ago? How many wolves will there be in 6 years?

**Answer:** 120 wolves; 679 wolves

(3) The half life of element Floridium is 1234 minutes. If the initial amount is 4321 grams, how many grams would remain after 2 days? After 2 weeks?

**Answer:** 857.1 grams, 0.0522 grams

(4) A company that sells avocado toast pays \$12,000 per month in rent, \$7,000 per month in labor costs, and \$6,000 per year in insurance costs. If it costs them \$0.35 to make each piece of toast and they sell it for \$6.95, how many pieces of avocado toast would they need to sell in one year to break even?

**Answer:** 35,455 pieces of avocado toast

(5) A chemist wants 3L of a 15% acid solution, but only has solutions of 10% and 25%. How much of each does she need to mix to obtain the desired solution?

**Answer:** 2L of the 25%, 1L of the 10%

(6a) A king agrees to pay a neighboring kingdom in rice. He will pay 1 grain of rice on the first day, 2 on the second day, 4 on the third day, 8 on the fourth day, and so on. How many grains will he give the kingdom on day 20? After the 20th day, how many grains of rice will he have given the kingdom?

**Answer:** 524,288 grains; 1,048,575 grains

(6b) **Tough question:** Construct a model for the total amount of rice  $R$  given to the neighboring kingdom after  $t$  days have passed.

**Answer:**  $R(t) = 2^t - 1$