

# Instructional Unit Title: Reproducing Bacterial Rabbits

Mathematics  
High School – Integrated Math 2

The teacher may provide a variety of different representations of equivalent exponential equations so that students can graph functions and explain why equations are equivalent using both symbolical and graphical representations (ex.:  $y = 5$  and  $y = \left(5^{\frac{1}{3}}\right)^3$ )

Teacher may provide examples of rational and irrational numbers and their sums and products so that students can classify sums or products as rational or irrational.

Teacher may provide examples of savings account/car loan interest rates so that students can analyze options between saving versus financing a major purchase.

The teacher may provide students with scenarios where interest on a savings account is compounded more and more often (yearly, monthly, daily, hourly, even minute, every second, etc.) so that students can explore the limit of compounding at a particular interest

**PERFORMANCE ASSESSMENT:** You would like to purchase a vehicle. Your parents might be willing to co-sign for a loan but you need to present to them a plan that is well-researched about the type of vehicle you want to purchase, the cost of financing (loan) including sales tax on the purchase price, depreciation of the vehicle, and additional monthly and yearly expenses such as registration, fuel, repairs, and insurance. Specifically, you will need to research possible loans and use the equation below to determine monthly payments:

$$A = P \frac{r(1+r)^n}{(1+r)^n - 1}$$

where  $A$  is the payment Amount per month,  $P$  is the initial principal (loan amount),  $r$  is interest rate per month (note this is rate per month not year),  $n$  is the total number of payments or months. Create an equation to determine the value of your vehicle each month after it was purchased using the average depreciations below:

Age of Vehicle in Years	Average Yearly Depreciation
0 to 4	15%
5 to 9	4%
10 and older	1%

Visually display the relationship between your depreciated value and your accumulated monthly loan payments and explain the meaning of this relationship in relation to your decision to buy the vehicle. Determine the total estimated cost of owning your vehicle over the life of the loan including the additional expenses of registration, insurance, fuel, maintenance and repair and calculate how many hours you would need to work a month to pay for your vehicle. Finally, compare this plan to waiting a year during which you save the cost of the car each month in a 2% saving account and was used for down payment on the car.

Teacher may provide examples of models of exponential growth and decay so that students can recognize different forms of exponential models.

Teacher may provide examples of graphs and equations of families of functions (exponential, square root, cube root, and piecewise-defined including step and absolute value) so that students can compare average rate of change between two non-linear functions on the same interval.