



Writing Exponential Functions

Showcase Lesson



Question of the Day



Would you rather eat a whole raw onion or a whole lemon?

Slide 2 / 9

A. Onion 🧅

B. Lemon 🍋

Select an answer

This was our Question of the Day. The Question of the Day is always a silly "Would you Rather" that gets the students to type in the chat and defend their opinions.



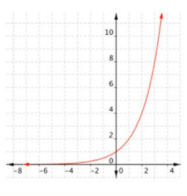
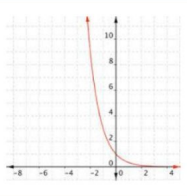
Starting the Lesson

The Beginning



Reviewing Previous Materials

Slide 4 / 9

	Decay Factor of $25(0.8)^x$	35%	.8	$a * b^x$
	the output value when the input of an exponential function is zero	Growth Factor of $25(1.35)^x$	Exponential Decay Function	Asymptote
Decay Rate of $25(0.8)^x$	a line that you approach as you move toward infinity	Exponential Parent Function	Exponential Growth Function	20%
1.35	Growth Rate of $25(1.35)^x$	Initial Value		

The lesson prior to this one had been about graphing exponentials. This is simply a vocabulary review for students to have a refresher on definitions.

Reviewing Previous Materials

Slide 5 / 9

Identifying Parts of Exponential Functions

Given this equation:

$$h(x) = 17(1.34)^{xt}$$

Correctly Identify the following information.

- (a) Growth or decay?
- (b) Initial Value?
- (c) Growth/Decay Factor?
- (d) Growth/Decay Rate?

Along with the review, students identified parts of the exponential function.



Expanding on Previous Material

The Middle



Writing Equations from Word Problem

Slide 6 / 9

Writing Equations from Word Problems

There are 3000 beetles on a farm. The farmer sprays his crops with insecticides to stop the beetles from eating them. The annual rate of decrease for the beetle population is 24.9%.

- (a) Find the decay factor for the beetle population.

This lesson was over writing exponential equations from word problems, so this is an example that we did as a class.

Writing Equations from Word Problem

Slide 7 / 9

Writing Equations from Word Problems

There are 3000 beetles on a farm. The farmer sprays his crops with insecticides to stop the beetles from eating them. The annual rate of decay for the beetle population is 24.9%.

- (a) Find the decay factor for the beetle population. **0.751**
- (b) Suppose the rate of decay continues to be 24.9%. Write a function, $P(t)$, to model the beetle population.

This question is broken into parts so that students really think about what they need to do. This prevents students from feeling overwhelmed when they are presented with wordy problems.

Writing Equations from Word Problem

Slide 8 / 9

Writing Equations from Word Problems

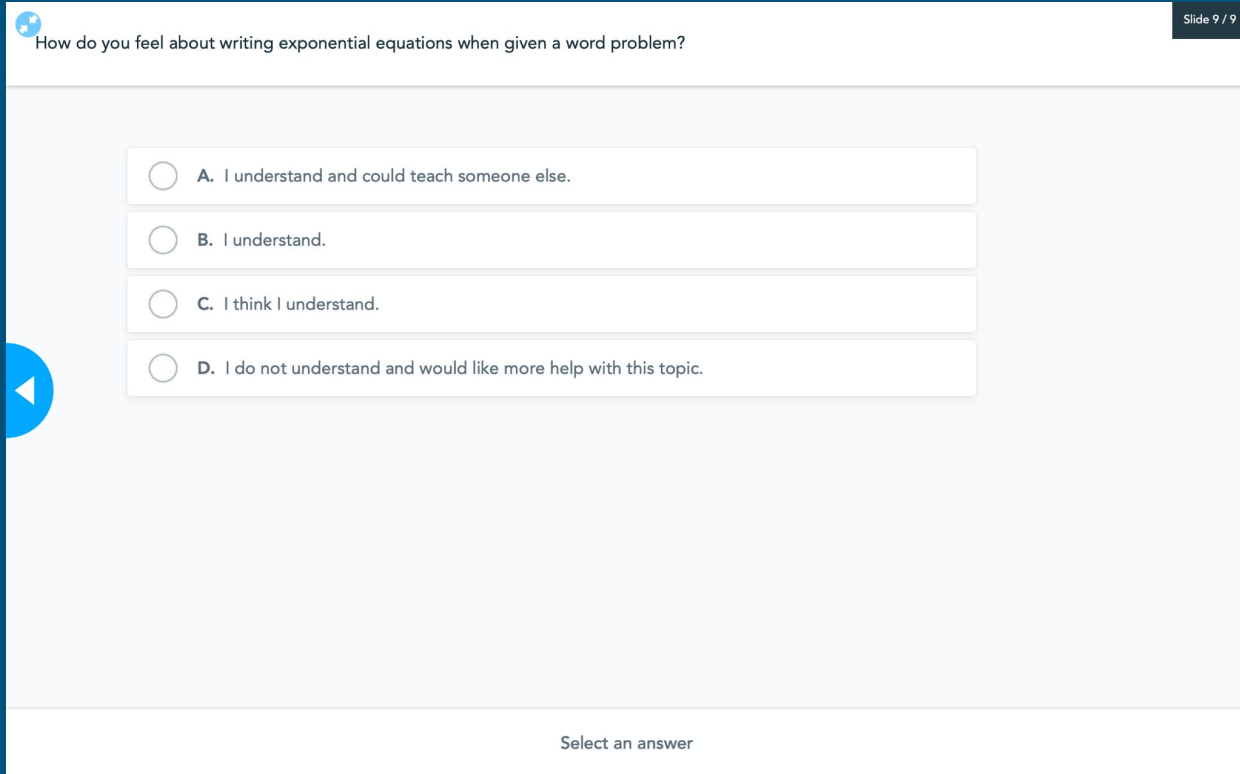
There are 3000 beetles on a farm. The farmer sprays his crops with insecticides to stop the beetles from eating them. The annual rate of decay for the beetle population is 24.9%.

- (a) Find the decay factor for the beetle population. **0.751**
- (b) Suppose the rate of decay continues to be 24.9%. Write a function, $P(t)$, to model the beetle population. **$P(t) = 3000(0.751)^t$**

- (c) Find the beetle population after 4 years. (Hint: $t = 4$)

Throughout this entire activity, students were sharing ideas in the chat, writing their own ideas in their Nearpod, and receiving immediate feedback from myself, as well as their peers.

Gauging Student Understanding



How do you feel about writing exponential equations when given a word problem?

Slide 9 / 9

- A. I understand and could teach someone else.
- B. I understand.
- C. I think I understand.
- D. I do not understand and would like more help with this topic.

Select an answer

The screenshot shows a poll question in a Nearpod interface. The question is "How do you feel about writing exponential equations when given a word problem?". There are four radio button options: A. I understand and could teach someone else., B. I understand., C. I think I understand., and D. I do not understand and would like more help with this topic. The interface includes a "Slide 9 / 9" indicator in the top right and a "Select an answer" prompt at the bottom. A blue navigation arrow is visible on the left side of the screen.

The Nearpod always ends with a poll about how the students are feeling about the topic. I can usually gauge where the students are based on their Nearpod participation. However, it important to see how each student would rate their own understanding.



Putting New Knowledge to the Test

The Ending



Jamboard

Financial Planning Scenarios



Financial Planning Portfolio

Scenario



Your Job

You are a team of financial planners and Mr. and Mrs. Montgomery have asked for your help creating a financial portfolio. They want to invest in a savings account in order to prepare for the cost of their newborn's higher level education. Your job is to compile a portfolio of information to present to the family.

Everyone needs to select the color they wish to write in for this portfolio.

Color	Name
Blue	
Green	
Black	
White	
Yellow	
Red	

Part 1

Mr. and Mrs. Montgomery have presented you with information that they received about savings accounts from two different banks.

Bank of America said that they would let the Montgomery family start a savings account that grows with simple interest (linearly).

Simple Interest Formula: $A = P (1 + rt)$

Wells Fargo said that they would let the Montgomery family start a savings account that grows with compound interest (exponentially).

Compound Interest Formula: $A = P (1 + r)^t$

A = total outcome of initial investment

P= Principal amount (the initial investment)

r = the interest rate

t = time in years

Both banks are offering the couple a chosen interest rate of either 5% ($r = 0.05$) or 7% ($r = 0.07$).

Calculation 1: Let $P = 500$, $r = 0.05$ and $t = 5$. Solve for A using simple interest.

Calculation 2: Let $P = 500$, $r = 0.05$ and $t = 5$. Solve for A using compound interest.

Show your calculations.

Simple Interest

$$A = P (1 + rt)$$

Compound Interest

$$A = P (1 + r)^t$$

Which type of interest produced a higher total outcome, simple interest or compound interest?

Calculation 3: Let $P = 500$, $r = 0.07$ and $t = 5$. Solve for A using simple interest.

Calculation 4: Let $P = 500$, $r = 0.07$ and $t = 5$. Solve for A using compound interest.

Show your calculations.

Simple Interest

$$A = P (1 + rt)$$

Compound Interest

$$A = P (1 + r)^t$$

Which interest rate gives the family a higher total outcome, 5% or 7%?

Which bank and at what interest rate should the couple invest their money if they want to have the highest total outcome for their newborn's college education? Why?

Part 2

Mr. and Mrs. Montgomery have let you know that they want their child to attend Texas A&M at College Station. Texas A&M at College Station tuition per semester is **\$4,266**.

How much does it cost to attend Texas A&M at College Station for 4 years (there are 2 semesters in a year)?

What is the principal amount (P) that the family must invest in order to fully pay for their child's tuition? Assume that the family is saving for 18 years. Use your preferred type of interest and chosen interest rate from *Part 1*.

Hint: Use your answer from the previous slide for your “A” value.

Part 3

Mr. and Mrs. Montgomery have a question for you. They were wondering if it is better to start investing now or if they should wait until their child is older.

Calculation 5: Using your preferred type of interest (compound or simple) and chosen interest rate (r) from **Part 1**, calculate the total outcome (A), if the family were to invest for 8 years. Use the principal amount that you found in **Part 2**.

Calculation 6: Using your preferred type of interest (compound or simple) and chosen interest rate (r) from **Part 1**, calculate the total outcome (A), if the family were to invest for 3 years. Use the principal amount that you found in **Part 2**.

Now that you have calculated the total outcome for 18, 8, and 3 years, when should the family start investing? What does this tell us about how the time of our investment affects our total outcome?

Part 4

Your team now has to use all of the information that you gathered to present to the Montgomerys. Fill in the blanks.

The Montgomerys should invest with _____ because they use _____ interest. They should tell the bank that they choose the interest rate of _____% because it produces the highest total outcome. They should invest for _____ years in order to maximize the total outcome available for their child's tuition. In order for the family to have a high enough total outcome to cover tuition, the family should invest a principal amount of \$_____ into the account.

Use the information from the last slide to create a graph to present to Mr. and Mrs. Montgomery that will show the growth of their initial investment.

Note: You may use Desmos to graph. Take a screenshot of your graph and upload it to this page