Name:

Common Core Algebra II

Unit 6

Modeling Exponential Functions

Mr. Schlansky

2026

Lesson 1: I can round by underlining the digit that is in the spot that I am rounding to, drawing a line after it, looking at the number after it, and rounding up if it is 5 or higher.

1) Identify the digit that is in the spot that you are rounding to:
   - a) Thousand: 1234000
   - b) Hundred: 1234500
   - c) Ten: 1234560
   - d) Unit: 1234567
   - e) Tenth:1234.5
   - f) Hundredth: 1234.56
   - g) Thousandth: 1234.567
   - h) Ten-Thousandth: 1234.5678
   - i) Quarter: 1234.75
2) Draw a line after it
   - a) If the *next* digit is 5 or higher, round up.
   - b) If the *next* digit is 4 or lower, keep it as is.

*When rounding up a 9, look at it as one big number and increase it by 1.

Lesson 2: I can create and solve simple exponential functions using $A = P(1 \pm r)^t$.

Basic Exponential Growth/Decay Formula: $A = P(1 \pm r)^t$ where A is the current amount, P is the initial amount, r is the rate as a decimal (divide by 100), and t is time.

Lesson 3: I can find the exponential rate using $A = P(1 \pm r)^t$ and rooting both sides.

To find exponential rate:

1) Substitute values into $A = P(1 \pm r)^t$
2) Isolate the parenthesis
3) Raise both sides to the reciprocal power (or root both sides)
4) Solve for r (divide by -1 if decay)
5) Multiply by 100 to find the percent

Lesson 4: I can find an equivalent exponential form by absorbing the exponent or setting the two expressions equal to each other.

Equivalent Exponential Forms

To get t by itself in the exponent, absorb whatever is in the exponent into the parenthesis. For example:

$A = 100(1.045)^{12t}$ becomes $A = 100(1.045^{12})^t$

$A = 100(1.045)^{\frac{t}{2}}$ becomes $A = 100\left(1.045^{\frac{1}{2}}\right)^t$

If converting to continuous form, set $P(1 \pm r)^t = Pe^{rt}$ and solve. The left hand side is whatever appropriate variation of the formula is involved in the problem.

Lesson 5: I can interpret the meaning of the components of an exponential equation using $A = P(1 \pm r)^t$.

Given an exponential function: What is in front of the parenthesis is the INITIAL amount, what is inside the parenthesis is 1 + the rate or 1 – the rate.

Example: $A = 500(1.2)^t$: 500 is initial amount, rate is .2 or 20% growth (1 + .2)

$A = 500(0.8)^t$: 500 is initial amount, rate is .2 or 20% decay (1 - .2)

Lesson 6: I can convert rates by raising to the $\frac{1}{n}$ power and READING CAREFULLY for what the variable represents.

Phil step 1: Raise what's inside the parenthesis to the $\frac{1}{n}$ power if the timeframe is decreasing. If the timeframe is increasing, raise to the *n* power.

Phil step 2: Read carefully for what the variable represents.

How many times per year do you get the monthly rate? 12y

How many times per month do you get the monthly rate? 1m

How many times per year do you get the yearly rate? 1y

How many times per month do you get the yearly rate? $\frac{m}{12}$

Lesson 7: I can calculate compound interest using $A = P\left(1 \pm \frac{r}{n}\right)^{nt}$ and $A = Pe^{rt}$.

COMPOUNDING Interest: $A = P\left(1 \pm \frac{r}{n}\right)^{nt}$, where A is the current amount, P is the initial amount, r is the rate as a decimal (divide by 100), n is the number of times compounded (yearly =1, semiannually = 2, quarterly = 4, monthly = 12, weekly = 52, daily = 365) and t is time.

COMPOUNDING CONTINUOUSLY: $A = Pe^{rt}$

Lesson 8: I can calculate irregular time (half life) using $A = P(1 \pm r)^{\frac{t}{h}}$.

Half Life

$A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$ where h is the amount of time for the half life

Double Time:

$A = P(2)^{\frac{t}{h}}$ where h is the amount of time it takes to double

Irregular Time:

$A = P(1 \pm r)^{\frac{t}{h}}$ where h is the amount of time it takes for the rate to be applied.

For example, if the rate increases by 15% every 5 years, r = .15 and h = 5.

Lesson 9: I can find A by choosing the appropriate exponential model and substituting in.

$A = P(1 \pm r)^t$	Nothing Below!
$A = P\left(1 + \frac{r}{n}\right)^{nt}$	Compounding (Not Continuous)
$A = Pe^{rt}$	Compounding Continuously
$A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$	Half Life
$A = P(1 \pm r)^{\frac{t}{h}}$	Irregular Time

A = after amount

P = principal (initial/starting) amount

r = rate (as a decimal)

n = number of times compounded per year

t = time (that is passing)

h = half life or time it takes for the percent to be applied

	n
Annually	1
Quarterly	4
Monthly	12
Weekly	52
Daily	365

Lesson 10: I can find t in exponential equations by choosing the appropriate exponential model and solving the exponential equation by taking the log of both sides.

Same notes as Lesson 8!

When solving for t, solve the exponential equation:

1) Isolate the base (divide)
2) Take the log of both sides
3) Bring the exponent to the front
4) Divide to isolate the variable (multiply by the LCD if fraction in exponent)

Lesson 11: I can set up exponential models using inequalities by knowing my formulas and vocabulary for inequalities.

Same notes as Lesson 9.

Maximum/at most: $\leq$

Minimum/at least: $\geq$

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Rounding

Round 104.9437 to the nearest:

1. Unit: 2. Tenth: 3. Hundredth: 4. Thousandth:

Round 28.3518 to the nearest:

5. Degree: 6. Tenth: 7. Hundredth: 8. Thousandth:

Round 54.8561 to the nearest:

9. Meter: 10. Tenth: 11. Hundredth: 12. Thousandth:

13. Round 59.61 to the nearest inch

14. Round 124.95 to the nearest tenth

15. Round 91.8995 to the nearest hundredth

16. Round 2.1999 to the nearest thousandth

Round the following numbers to the nearest unit

17. 12.92   18. 102.4   19. 47.251   20. 49.75

Round the following numbers to the nearest tenth

21. 15.718   22. 105.519   23. 89.253   24. 235.983

Round the following numbers to the nearest hundredth

25. 29.6901   26. 328.297   27. 181.406   28. 2.4951

Round the following numbers to the nearest thousandth

29. 209.6749   30. 0.57813   31. 111.1142   32. 3.1499

Round 218632.432 to the nearest:

33. Thousand 34. Hundred 35. Ten 36. Quarter

Round 8917521.79 to the nearest:

37. Ten-Thousand 38. Thousand 39. Hundred 40. Quarter

Round 19278132.598271 to the nearest:

41. Hundred-Thousand42. Thousand 43. Ten 44. Quarter

Round 918361277.9214 to the nearest:

41. Million 42. Ten-Thousand 43. Hundred 44. Quarter

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Creating and Solving Simple Exponential Functions

1. Cassandra bought an antique dresser for $500. If the value of her dresser increases 6% annually, what will be the value of Cassandra's dresser at the end of 3 years to the *nearest dollar*?

2. A certain car depreciates at a rate of 15% each year. If the car was initially worth $8125, what is the value of the car, rounded to the nearest cent, 11 years later?

3. Cameron invests $1,227 in stocks and her money increases by 9% each year. What will be the value of her investment 18 years later?

4. Kathy plans to purchase a car that depreciates (loses value) at a rate of 14% per year. The initial cost of the car is $21,000. What is the value of the car after 3 years rounded to the nearest cent?

5. Marissa deposits $2000 into a bank account with pays an annual interest rate of 4.6%. How much money, to the nearest cent, will she have in the account after 8 years?

6. A bank is advertising that new customers can open a savings account with a 3.75% interest rate compounded annually. Robert invests $5,000 in an account at this rate. If he makes no additional deposits or withdrawals on his account, find the amount of money he will have, to the *nearest cent*, after three years.

7. The value of a truck bought new for $28,000 decreases 9.5% each year. Write an exponential function to represent this function and predict the value of the truck to the nearest cent after 10 years.

8. A car worth $20,000 depreciates at a rate of 8.75% each year. Find the value of the car after 11 years to the nearest cent?

9. Jeff deposits $8750 into a bank account with pays an annual interest rate of 1.5%. How much money, to the nearest cent, will he have in the account after 12 years?

10. A car worth $41,235 depreciates at a rate of 11.5% each year. Find the value of the car after 7 years to the nearest cent?

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Finding Exponential Rate

1. A bank account opened up 3 years ago with an initial balance of $12000 now has a balance of $12824. Find the annual growth rate, to the *nearest tenth of a percent*.

2. Jack bought a new car in 2010 for $16100. In 2018, the car is now worth $6125. What is the annual rate of decrease to the *nearest percent*?

3. A collectible toy was bought 15 years ago for $5 and is now worth $42. Find the annual growth rate to the *nearest tenth of a percent*.

4. A colony of 120 timberwolves increased to 245 over a 6 year span. Assuming exponential growth, what was the annual growth rate to the *nearest percent*?

5. The principal value of a loan is $424,100. If there is $110,000 remaining on the loan after 19 years, what was the annual rate of decrease to the *nearest tenth of a percent*?

6. An endangered species has dropped from 937 animals to 375 animals over the past 8 years. What is the annual rate of decrease rounded to the *nearest percent*?

7. A house purchased 5 years ago for $100,000 was just sold for $135,000. Assuming exponential growth, approximate the annual growth rate, to the *nearest percent*.

8. Over the past 4 years, the value of a stock increased from $1200 to $2300. What is the *monthly* growth rate, rounded to the *nearest tenth of a percent*?

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Equivalent Exponents Forms

Express each of the following functions with an exponent of *t*. Round values to the nearest thousandth.

1. $A = 12,000(1.025)^{12t}$

2. $A = 25,000(1.125)^{1.32t}$

3. $A = 37,000(.986)^{10t}$

4. $A = 17,000(.889)^{9.4t}$

5. $A = 9,175(1.885)^{\frac{1}{2}t}$

6. $A = 9,325(1.762)^{\frac{2}{5}t}$

7. $A = 11,185(.764)^{\frac{t}{12}}$

8. $A = 125,000(.785)^{\frac{t}{4}}$

9. lridium-192 is an isotope of iridium and has a half-life of 73.83 days. If a laboratory experiment begins with 100 grams of Iridium-192, the number of grams, *A*, of Iridium-192 present after *t* days would be $A = 100\left(\frac{1}{2}\right)^{\frac{t}{73.83}}$. Which equation approximates the amount of Iridium-192 present after *t* days?

1) $A = 100\left(\frac{73.83}{2}\right)^{t}$

2) $A = 100\left(\frac{1}{147.66}\right)^{t}$

3) $A = 100(0.990656)^{t}$

4) $A = 100(0.116381)^{t}$

10. The population, $p(t)$, of a small county in Western New York has grown according to the formula $p(t) = 6000(1.392)^{1.2t}$ after t years. When re-written in the form $p(t) = 6000e^{rt}$, what is the value of r rounded to the nearest thousandth?

11. The value of an investment account, $v(t)$, can be modeled by the formula $v(t) = 10000(.875)^{1.04t}$ after t years. When written in its equivalent form, $v(t) = 10000e^{rt}$, what would be the value of r rounded to the nearest tenth of a percent? Interpret the meaning of this value in the context of the problem.

12. The half-life of iodine-131 is 8 days. The percent of the isotope left in the body d days after being introduced is $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$. When this equation is written in terms of the number e, the base of the natural logarithm, it is equivalent to $I = 100e^{kd}$. What is the approximate value of the constant, k?

1) -0.087
2) 0.087
3) -11.542
4) 11.542

13. According to a pricing website, Indroid phones lose 58% of their cash value over 1.5 years. Which expression can be used to estimate the value of a $300 Indroid phone in 1.5 years?

1) $300e^{-0.87}$
2) $300e^{-0.63}$
3) $300e^{-0.58}$
4) $300e^{-0.42}$

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Interpreting Exponential Functions

1. The function $A = 3,600(1.025)^t$ represents the value of a bank account after *t* years. Which of the following statements is *false*?
1) The initial investment of the bank account was $3,600.
2) The annual interest rate of the bank account is 2.5%.
3) The value of the account after 5 years is $4073.07.
4) It will take 12 years for the value of the account to double.

2. The function $v(t) = 10,000(1.112)^t$ represents the value of a stock investment after *t* years. Which of the following statements is *false*?
1) The stock is increasing by 11.2% each year.
2) The value of the stock after 3 years is $13,750.37
3) The value of the stock increased by $1245.44 between year 1 and year 2.
4) The initial stock investment was $11,120.

3. The function $v(t) = 40,000(0.887)^t$ represents the value of a 2020 Subaru Ascent after *t* years. Which of the following statements is *false*?
1) The initial value of the car was $40,000.
2) The value of the car is decreasing by 11.3% each year.
3) The car is worth $15,324.18 after 5 years.
4) The decreased $3,556.20 from years 2 to 3.

4. A certain pain reliever is taken in 220 mg dosages and has a half-life of 12 hours. The function $A = 220\left(\frac{1}{2}\right)^{\frac{t}{12}}$ can be used to model this situation, where A is the amount of pain reliever in milligrams remaining in the body after t hours. According to this function, which statement is true?

1) Every hour, the amount of pain reliever remaining is cut in half.
2) In 12 hours, there is no pain reliever remaining in the body.
3) In 24 hours, there is no pain reliever remaining in the body.
4) In 12 hours, 110 mg of pain reliever is remaining.

5. An equation to represent the value of a car after t months of ownership is $v = 32,000(0.81)^{\frac{t}{12}}$. Which statement is *not* correct?

1) The car lost approximately 19% of its value each month.
2) The car maintained approximately 98% of its value each month.
3) The value of the car when it was purchased was $32,000.
4) The value of the car 1 year after it was purchased was $25,920.

6. The value of an investment account, $v(t)$, can be modeled by the equation $v(t) = 500(1.15)^{3.2t}$ after t years. Which of the following statements must be true?

1) The account is increasing approximately 15% each year.
2) The account is increasing approximately 56% each year
3) There will be $1216.80 in the account after two years
4) It will take 3.68 years for the account to double

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Converting Rates

Round all coefficients to 6 decimal places

1. Gerard took out a $72000 loan for college that has a 12.7% interest rate. An equation to represent this situation is given as $A(t) = 72000(1.127)^t$.

Write an equation to find the monthly growth rate after *t* years.

Write an equation to find the monthly growth rate after *m* months.

Write an equation to find the weekly growth rate after *t* years.

Write an equation to find the weekly growth rate after *w* weeks.

2. The population of a small neighborhood in Brooklyn, NY is 452,000 and is growing by a rate of 11.6% each year. An equation to represent this situation is given as $A(t) = 452000(1.116)^t$.

Write an equation to find the monthly growth rate after *t* years.

Write an equation to find the monthly growth rate after *m* months.

Write an equation to find the weekly growth rate after *t* years.

Write an equation to find the weekly growth rate after *w* weeks.

3. Stephanie found that the number of white-winged cross bills in an area can be represented by the formula $C = 550(1.08)^t$, where *t* represents the number of years since 2010. Which equation correctly represents the number of white-winged cross bills in terms of the monthly rate of population growth?

1) $C = 550(1.00643)^t$
2) $C = 550(1.00643)^{12t}$
3) $C = 550(1.08)^{12t}$
4) $C = 550(1.00643)^{\frac{t}{12}}$

4. The value of a stock after t years can be modeled by the function $V = 2500(1.14)^t$ after *t* years. Which function would represent the weekly rate of increase after *w* weeks?

1) $V = 2500(1.14)^w$
2) $V = 2500(1.14)^{52w}$
3) $V = 2500(1.0025)^w$
4) $V = 2500(1.0025)^{52w}$

5. The value of a home after t years can be modeled by the function $A = 525000(1.36)^t$ after *t* years. Which function would represent the monthly rate of increase after *m* months?

2) $A = 525000(1.36)^m$
2) $A = 525000(1.36)^{12m}$
3) $A = 525000(1.026)^m$
4) $A = 525000(1.026)^{12m}$

6. A study of the annual population of the red-winged blackbird in Ft. Mill, South Carolina, shows the population, $B(t)$, can be represented by the function $B(t) = 750(1.16)^t$, where the *t* represents the number of years since the study began. In terms of the monthly rate of growth, the population of red-winged blackbirds can be best approximated by the function

1) $B(t) = 750(1.012)^t$
2) $B(t) = 750(1.16)^{12t}$
3) $B(t) = 750(1.012)^{12t}$
4) $B(t) = 750(1.16)^{\frac{t}{12}}$

7. Mia has a student loan that is in deferment, meaning that she does not need to make payments right now. The balance of her loan account during her deferment can be represented by the function $f(x) = 35,000(1.0325)^x$, where *x* is the number of years since the deferment began. If the bank decides to calculate her balance showing a monthly growth rate, an approximately equivalent function would be

1) $f(x) = 35,000(1.0027)^{12x}$
2) $f(x) = 35,000(1.0027)^{\frac{x}{12}}$
3) $f(x) = 35,000(1.0325)^{12x}$
4) $f(x) = 35,000(1.0325)^{\frac{x}{12}}$

8. The value of Kiara's stock can be modeled by $A = 2500(1.016)^m$ where *m* represents the number of months her stock has been invested. Which equation would represent the yearly growth rate of her stock after *y* years?

1) $A = 2500(1.0013)^y$
2) $A = 2500(1.2098)^y$
3) $A = 2500(1.0013)^{\frac{y}{12}}$
4) $A = 2500(1.2098)^{\frac{y}{12}}$

9. The value of Kiara's stock can be modeled by $A = 2500(1.016)^m$ where *m* represents the number of months her stock has been invested. Which equation would represent the yearly growth rate of her stock after *m* months?

1) $A = 2500(1.0013)^m$
2) $A = 2500(1.2098)^m$
3) $A = 2500(1.2098)^{12m}$
4) $A = 2500(1.2098)^{\frac{m}{12}}$

10. Nvidia stock has been increasing by 1.7% each day according to the formula $v(t) = 1000(1.017)^t$ where *t* represents days. Which of the following equations can be used to find the weekly growth rate after *w* weeks?

1) $v(w) = 1000(1.0024)^w$
2) $v(w) = 1000(1.1252)^w$
3) $v(w) = 1000(1.0024)^{\frac{w}{7}}$
4) $v(w) = 1000(1.1252)^{7w}$

11. Rose's bank account has been increasing according to the equation $A = 7500(1.0098)^w$ where *w* represents weeks. Which of the following equations can be used to find the yearly growth rate after *w* weeks?

1) $A = 7500(1.0002)^{52w}$
2) $A = 7500(1.0002)^{\frac{w}{52}}$
3) $A = 7500(1.6605)^{\frac{w}{52}}$
4) $A = 7500(1.6605)^w$

12. The population of Schlansky, Utah is increasing according to the formula $p(t) = 10421(1.23)^t$ after *t* years. Which expression can represent the weekly growth rate, after *w* weeks?

1) $10421(1.23)^{52w}$
2) $10421(1.004)^{52w}$
3) $10421(1.23)^w$
4) $10421(1.004)^w$

13. To prepare for lacrosse tryouts, Kole is increasing the amount of time he spends at the gym. This week he is spending 150 minutes there and he plans to increase this amount by 2% each week. The amount of time, in minutes, that he plans to spend at the gym *t* weeks from now is given by the function $A(t) = 150(1.02)^t$. In terms of a daily growth rate, the amount of time Kole is planning to spend at the gym can best be modeled by the function

1) $A(t) = 150(1.14869)^{\frac{t}{7}}$
2) $A(t) = 150(1.14869)^{7t}$
3) $A(t) = 150(1.00283)^{\frac{t}{7}}$
4) $A(t) = 150(1.00283)^{7t}$

14. Cameron's YouTube video currently has 1200 views and can be modeled by the expression $1200(1.102)^d$ where d represents days. Which expression represents the weekly rate after t weeks.

1) $1200(1.9737)^t$
2) $1200(1.9737)^{\frac{t}{7}}$
3) $1200(1.0140)^t$
4) $1200(1.0140)^{\frac{t}{7}}$

15. The number of people who have read an article grows exponentially throughout the day and can be modeled by the function $N(t) = 2(1.0098)^t$, where t represents the number of minutes since the article has been posted. Which equation best represents the number of people who have read the article in terms of the growth rate per second?

1) $N(t) = 2(1.000163)^{\frac{t}{60}}$
2) $N(t) = 2(1.000163)^{60t}$
3) $N(t) = 2(1.79524)^{\frac{t}{60}}$
4) $N(t) = 2(1.79524)^{60t}$

16. A student studying public policy created a model for the population of Detroit, where the population decreased 25% over a decade. He used the model $P = 714(0.75)^d$, where P is the population, in thousands, d decades after 2010. Another student, Suzanne, wants to use a model that would predict the population after y years. Suzanne's model is best represented by

1) $P = 714(0.6500)^y$
2) $P = 714(0.8500)^y$
3) $P = 714(0.9716)^y$
4) $P = 714(0.9750)^y$

17. The black bear population for a certain area of the Adirondacks can be modeled by the equation $B = 5835.943(1.026)^t$, where t is measured in years since 2010. Kieran would like to rewrite this model in terms of a 5-year growth rate. Kieran's model is best represented by

1) $B = 5835.943(1.005147)^{\frac{t}{5}}$
2) $B = 5835.943(1.005147)^{5t}$
3) $B = 5835.943(1.136938)^{\frac{t}{5}}$
4) $B = 5835.943(1.136938)^{5t}$

18. According to the USGS, an agency within the Department of Interior of the United States, the frog population in the U.S. is decreasing at the rate of 3.79% per year. A student created a model, $P = 12,150(0.962)^t$, to estimate the population in a pond after t years. The student then created a model that would predict the population after d decades. This model is best represented by

1) $P = 12,150(0.461)^d$
2) $P = 12,150(0.679)^d$
3) $P = 12,150(0.996)^d$
4) $P = 12,150(0.998)^d$

19. Last year, the total revenue for Home Style, a national restaurant chain, increased according the expression $(1.0525)^t$ where t represents the number of years. If this trend were to continue, which expression could the company's chief financial officer use to approximate their monthly percent increase in revenue? [Let m represent months.]

1) $(1.0525)^m$
2) $(1.0525)^{\frac{12}{m}}$
3) $(1.00427)^m$
4) $(1.00427)^{\frac{m}{12}}$

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Compound Interest

1. A bank account is opened with $3000 and interest is compounded monthly at an interest rate of 4.2%. How much money is in the account after 8 years?

2. If a bank account is opened with $4000 and is compounded at a rate of 5.2% continuously, how much money will be in the account after 3 years?

3. Sal has a savings account. He opened the account 6 years ago by putting in $3000. If the interest is compounded daily at a rate of 5.6%, how much money is in the account now?

4. How much money is in a bank account opened 7.5 years ago with $3125.67 that is compounded weekly with an interest rate of 5.26%?

5. Moe opened a bank account with $3100 4 years ago at an interest rate of 6.1% that is compounded continuously. How much money is in Moe's bank account now?

6. Max opens a bank account with $2100. If interest is compounded quarterly at an interest rate of 7%, how much interest will Max have earned after 3 years?

7. Dan opened a savings account with $3300. If 4 years has passed, and interest is compounded monthly at a rate of 4.6%, how much *interest* has Dan made?

8. Tyler invests $7,000 in an account with 6.38% interest rate compounded continuously. Alyssa invests $7,000 in an account with a 6.46% interest rate compounded weekly. After 4 years, who will have more money in their account and by how much?

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Irregular Time (Half Life)

1. The half-life of mendelevium-258 is 51.5 days. To the *nearest hundredth of a gram*, how much of a 4000 gram mendelevium-258 sample will remain after 12 days?

2. The amount of ants in a colony doubles every 8 days. If there are initially 275 ants, how many ants, to the nearest ant, will be in the colony after 30 days?

3. Phil is trying to get himself back into shape and wants to ease his way back into distance running. He will start by running 2 miles each day but every four days, he will increase his distance by 60%. How many miles will Phil be running after 10 days rounded to the *nearest tenth of a mile*?

4. Jay borrowed $50,000 from Aaron and they came to an agreement regarding how the interest will be paid. Every 5 days, the loan will accumulate 2% interest. If Jay repays the loan after 21 days, how much money will he have to repay Aaron rounded to the *nearest cent*?

5. The half life of an element is 27 hours. If there were initially 4.2 kg of the substance, how much will remain after 2 days? Round your answer to the *nearest hundredth* of a kg.

6. Jabba went to the movies on Friday night and bought a large popcorn. Every 20 minutes, Jabba eats 40% of the remaining amount of popcorn in his bucket. If there were 967 pieces of popcorn initially in Jabba's bucket, how many pieces of popcorn, to the *nearest piece of popcorn*, will be left an hour and a half into the movie?

7. The amount of views of a YouTube video triples every 5 days. If it currently has 1120 views, how many full views will the video have two weeks from now?

8. A payday loan company makes loans between \$100 and \$1000 available to customers. Every 14 days, customers are charged 30% interest with compounding. In 2013, Remi took out a \$300 payday loan. Which expression can be used to calculate the amount she would owe, in dollars, after one year if she did not make payments?

1) $300(.30)^{\frac{14}{365}}$ 2) $300(1.30)^{\frac{14}{365}}$ 3) $300(.30)^{\frac{365}{14}}$ 4) $300(1.30)^{\frac{365}{14}}$

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Mr. Schlansky Algebra II

Modeling Exponential Functions Practice

$A = P(1 \pm r)^t$	Nothing Below!
$A = P\left(1+\frac{r}{n}\right)^{nt}$	Compounding (Not Continuous)
$A = Pe^{rt}$	Compounding Continuously
$A = P\left(\frac{1}{2}\right)^{\frac{t}{h}}$	Half Life
$A = P(1 \pm r)^{\frac{t}{h}}$	Irregular Time

A = after amount

P = principal (initial/starting) amount

r = rate (as a decimal)

n = number of times compounded per year

t = time (that is passing)

h = half life or time it takes for the percent to be applied

	n
Annually	1
Quarterly	4
Monthly	12
Weekly	52
Daily	365

1. Jackie deposits \$26,000 into a savings account with interest compounded monthly at a rate of 4.6% each year. Write an equation for $A(t)$, the value of her account after t years. Use your equation to determine how much money will be in her account after 4 years?

2. The population of Schlansky, Arizona increases by 18% every 3.2 years. If the population is currently 2750, write an equation for $p(t)$, the population after t years. Using your equation, what will be the population, to the *nearest person*, 12 years from now?

3. A bank account is opened with \$2700 and interest is compounded continuously at a rate of 3.76% per year. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, what will be the balance of the account after 8.1 years?

4. A certain car depreciates at a rate of 14% each year. If the car was initially worth $22,500, write an equation for $v(t)$, the value of the account after t years. Using your equation, what is the value of the car, rounded to the *nearest cent*, 12 years later?

5. The half life of an element is 73 minutes. If there were initially 7.4 kg of the substance, write an equation for $a(t)$, the amount of the substance remaining after t minutes. Using your equation, to the *nearest hundredth of a kg*, how much will remain after 110 minutes?

6. Skylar bought an antique mirror for $800. If the value of her mirror increases 6% annually, write an equation for $v(t)$, the value of her mirror after t years. Using your equation, determine the value of Skylar's mirror at the end of 4 years to the *nearest dollar*?

7. A bank account is opened with $1500 and interest is compounded quarterly at an interest rate of 3.1%. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, how much money will be in the account after 7 years?

8. The amount of insects in a colony doubles every 6 days. If there are initially 50 insects, write an equation for $P(t)$, the amount of insects in the colony after t days. Using your equation, how many insects, to the *nearest insect*, will be in the colony after 11 days?

9. A bank account is opened with $9200 and is compounded at a rate of 4.7% continuously. Write an equation for $A(t)$, the amount of money in the account after t years. Using your equation, how much money will be in the account after 5 years?

10. The half-life of an element Schlanskium is 4.1 days. If there is a 9000 gram sample, write an equation for $p(t)$, the amount of Schlanskium remaining after t days. To the *nearest hundredth of a gram*, how much Schlanskium will remain after 7 days?

11. Emma opens a bank account with an initial balance of $90,210. If interest is compounded quarterly at 4.25% each year, write an equation for $b(t)$, the balance of the account after t years. Using your equation, how much money will be in the account after 14 years?

12. Sophia is beginning to lift weights to get buff for the summer. She starts by working out 30 minutes and every five days, she will increase the time of her workouts by 25%. Write an equation to represent $d(t)$, the duration of her workout after t days. Using your equation, how many minutes will Sophia be working out after 30 days rounded to the *nearest tenth of a minute*?

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Exponential Modeling Finding t

1. Megan opens a savings account with $5,000 in it. If interest is compounded weekly at a rate of 7.8%, write an equation for $b(t)$, the balance of her account after t years. Using your equation, how long will it take, to the *nearest tenth of a year*, for Megan's money to reach $8,000?

2. One of the medical uses of Iodine–131 (I–131), a radioactive isotope of iodine, is to enhance x-ray images. The half-life of I–131 is approximately 8.02 days. A patient is injected with 20 milligrams of I–131. Create an equation for $a(t)$, the amount of Iodine-131 remaining after t days. Determine, to the *nearest day*, the amount of time needed before the amount of I–131 in the patient's body is approximately 7 milligrams.

3. Tyler opens a bank account with $5,450 with an annual interest rate of 5.3% compounded continuously. Write an equation for $b(t)$, the balance of Tyler's account after t years. Using your equation, to the *nearest hundredth of a year*, how long will it take for Tyler's account to triple?

4. Jessica deposits $2000 into a bank account where 4% interest is given every 2.4 years. Write an equation for $v(t)$, the value of Jessica's account after t years. Using your equation, to the *nearest tenth of a year*, how long will it take for Jessica's investment to reach $5000?

5. Manny opens a savings account with $6,400.00 with a 5.2% interest rate that is compounded quarterly. Write an equation for $b(t)$, the balance of the account after t years. Using your equation, to the nearest *tenth of a year,* how long will it take for Manny's balance to double?

6. Christopher is preparing for the Nassau County Spelling Bee. Currently, Christopher knows 1200 words and will learn 20% more words every 4 days. Write an equation, $A(t)$, to represent how many words Christopher will be able to spell after t days. After how many days, to the *nearest day,* will Christopher be able to spell 5000 words?

7. If a bank account was opened with $3000 and interest is compounded continuously at 5.2%. Write an equation for $v(t)$, the value of the account after t years. To the *nearest hundredth of a year*, how long will it take for the value of the account to reach $4000?

8. Danielle bought a basketball card for $2125 its value is increasing by 4.1% each year. Create an equation for $v(t)$, the value of the basketball card after t years. Using your equation, how long, to the *nearest year*, will it take for the value of the basketball card to reach $10000?

9. Miguel opened a bank account with $1000 and interest is compounded monthly at a rate of 8.1%. Write an equation to represent $b(t)$, the balance of Miguel's account after t years. Using your equation, how much time, to the *nearest year*, will it take for Miguel's money to triple?

10. Melanie bought a car for \$52,000 and the car depreciates at a rate of 10% each year. Write an equation to represent the value of the car, $v(t)$, after t years. Using your equation, to the *nearest tenth of a year*, how long will it take until the value of her car reaches \$22,000?

11. Jennifer initially invested \$4800 in a bank account compounded continuously at a rate of 5.8%. Write an equation for $C(t)$, the value of her account after t years. After how much time, to the *nearest tenth of a year*, will it take for Jennifer's money to double?

12. The half-life of carbon-15 is 2.449 seconds. If Jackie has 17500 grams of carbon-15, write an equation for $j(t)$, the amount of grams of carbon-15 remaining after t seconds. After how much time will there be 500 grams of carbon-15 remaining? Round your answer to the *nearest tenth of a second*.

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Modeling Exponential Functions with Inequalities

1. Tage deposits \$2500 into an account that earns 2.7% interest compounded continuously. Which inequality can be used to determine how long it will take for his account to have at least \$4000?
1) $2500(1.027)^t \leq 4000$
2) $2500(1.027)^t \geq 4000$
3) $2500e^{.027t} \leq 4000$
4) $2500e^{.027t} \geq 4000$

2. Lamar has 2000 ants in an ant colony and the population is doubling every 4 days. His tank can hold a maximum amount of 325000 ants. Which inequality can be used to determine how many days, *d*, can pass before he will need to buy a bigger tank?
1) $2000(2)^{\frac{d}{4}} \leq 325000$
2) $2000(2)^{\frac{d}{4}} \geq 325000$
3) $2000(4)^{\frac{d}{2}} \leq 325000$
4) $2000(4)^{\frac{d}{2}} \geq 325000$

3. Caleb bought a car for \$19,100 and its value is decreasing by 12% each year. He wants to sell his car while its value is greater than \$5000. Which inequality can be used to find the maximum number of years, *t*, he can keep his car while its value is greater than \$5000?
1) $19100(.12)^t \geq 5000$
2) $19100(.12)^t \leq 5000$
3) $19100(.88)^t \geq 5000$
4) $19100(.88)^t \leq 5000$

4. A sample of 2000 grams of Fluorine-18 has a half life of 109.734 minutes. Which inequality can be used to represent how many minutes, *m*, can pass for there to be a minimum of 67 grams remaining?
1) $2000(\frac{1}{2})^{\frac{t}{109.734}} \geq 67$
2) $2000(\frac{1}{2})^{\frac{t}{109.734}} \leq 67$
3) $2000(2)^{\frac{t}{109.734}} \geq 67$
4) $2000(2)^{\frac{t}{109.734}} \leq 67$