Name Period Date

Notes 3-5
Growth, Decay, and Compound Interest **Unit 3**

Warm up

1. Hayden bought 6 tickets to a football game online. The online service fee is 5%. Let x be the cost of one ticket. Write an expression to represent the total cost of the tickets.

$6x(1+.05) = 6x(1.05)$

2. Traci buys 4 movies at Great Buy. The movies were all the same price and she received a 20% discount. Let x be the cost of one movie. Write an expression to represent the total cost of the movies.

$4x(.8)$ $100-20=80=1-.2=.8$

Notes:

Exponential Growth: $y = b \cdot a^x$

When you have a % increase(r) $a = 1 + r$

A college's tuition has risen 5% each year since 2000.

a. If the tuition in 2000 was $10,850, write an equation for the amount of the tuition t years after 2000.

$y = 10{,}850(1.05)^t$

b. Predict the cost of tuition for this college in 2015.

$10850(1.05)^{15} = \$22556.30$

Exponential Decay: $y = b \cdot a^x$

When you have a % decrease(r) then $a = 1 - r$

A fully inflated child's raft for a pool is losing 6.6% of its air every day. The raft originally contained 4500 cubic inches of air.

a. Write an equation to represent the loss of air.

$y = 4500(1-.066)^x = 4500(.934)^x$

b. Estimate the amount of air in the raft after 7 days.

Growth or Decay

Which of the following models the fastest exponential growth? Which models the fastest decay?

a. $1.2(0.85)^x$ decay ↓15%
b. $0.85(1.2)^x$ growth ↑20%
c. $1.15(0.86)^x$ ↓14%
d. $0.86(1.15)^x$ ↑15%

tested when $x=2$

Notes 3-5
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Compound Interest: $y = b\left(1+\frac{r}{n}\right)^{t \cdot n}$

b = initial value / principle
r = percent change
n = # of times it compounds
t = variable (time in year)

Yearly: n= 1
Semiannually: n= 2
Quarterly: n= 4
Monthly: n= 12
Weekly: n= 52

A. Samuel plans on investing $350 in an account. Each account will earn 7% interest, but will compound a different number of times per year.

Account A: compounds yearly
Account B: compounds quarterly (this means it compounds 4 times a year)
Account C: compounds monthly
Account D: compounds weekly

Predict which account will earn Samuel the most money after 8 years. Why do you think that account will give him the most money?

Use the compound interest equation to find out how much money Samuel will make in 8 years for each account.

A	B	C	D
$601.40	$y = 350\left(1+\frac{.07}{4}\right)^{8 \cdot 4}$ = $609.80	$611.7	$625

Which account will give Samuel the most money after 8 years?

D

B. Janet is planning on taking out a loan to buy a new car. She decides to go with a loan that will take 25 years to pay off, but she can't decide which interest rate to get on her loan. Country bank is offering and interest rate of 3% compounded monthly. World credit union is offering an interest rate of 4.5% compounded monthly.
Write an equation to find how much Janet would be paying on the loan plus interest after 25 years with each company.

Which company should Janet get the loan from and why?

Write an equation that allow Janet to calculate how much she is will pay for a loan of $25,000 plus interest for the company you chose above after paying for x years.

Practice: Write an equation that represents each situation.

a. A stock is declined at a rate of 75% of its value every week. The stock started at $225.

$y = 225(1-.75)^x = 225(.25)^x$

b. An investment of $1000 earns 3.7% interest and is compounded semi-annually.

$y = 1000\left(1+\frac{.037}{2}\right)^{2x}$

c. The population of a big city is increasing at a rate of 2.5% per year. The city's current population is 67000.

$y = 67000(1+.025)^x$

d. Assuming the population in part c is from 2007, what will the city's population be in 2017?

85765 people

Extension: David and his sister Shanna each deposited the same amount of money into investments. David's investment earned 5% per year, eventually doubling his original investment, at which time he withdrew all his money (principal and interest) from the investment. Unfortunately, Shanna's investment lost 5% per year and she withdrew what was left when her original investment was cut in half.
Without calculating, who withdrew their money first? Explain your reasoning

Now, calculate who took out their money first and show and explain your reasoning. Is the answer different from what you expected? If so, reconsider your reasoning above.