Algebra 1 Unit 10: Exponential Functions Notes

Example 3: The population of a town is decreasing at a rate of 1% per year. In 2000, there were 1300 people. Write an exponential decay function to model this situation. Then find the population in 2008.

Growth or Decay: _____

Starting value (a): _____

Rate (as a decimal): _____

Function: _____

Example 4: The cost of tuition at a college is $12,000 and is increasing at a rate of 6% per year. Find the cost of tuition after 4 years.

Growth or Decay: _____

Starting value (a): _____

Rate (as a decimal): _____

Function: _____

Example 5: The value of a car is $18,000 and is depreciating at a rate of 12% per year. How much will your car be worth after 10 years?

Growth or Decay: _____

Starting value (a): _____

Rate (as a decimal): _____

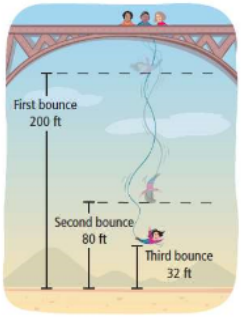
Function: _____

$y = a(1-r)^t$

$y = 18000(1-0.12)^{10}$

$y = \$5013.02$

Example 6: A bungee jumper jumps from a bridge that is 500 feet high. The diagram shows the bungee jumper's height above the ground at the top of each bounce. What is the bungee jumper's height at the top of the 5th bounce?



Growth or Decay: _____

Starting Value: _____

Rate (as a decimal): _____

Function: _____

Algebra 1 Unit 10: Exponential Functions Notes

Summary of Exponential Word Problems

Creating a Growth Function Given a Percentage Rate

The number of chickens in the farm of Sunny House is currently 2,400. The farm grows at an annual rate of 15%. How many chickens will be there in 7 years?

$y = a(1 + r)^t$ $a = 2400$ $r = 15\% = 0.15$ $t = 7$

$y = 2400(1 + 0.15)^7 = 6384$ chickens

Growth: $y = a(1 + r)^t$
Increase
Grow
Appreciate
Gains

Creating a Decay Function Given a Percentage Rate

A limousine cost $75,000 new but depreciates at a rate of 23% per year. What is the value of the limousine after five years?

$a = 75{,}000$ $r = 23\% = 0.23$ $t = 5$

$y = a(1 - r)^t$

$y = 75000(1 - 0.23)^5$

$y = 20{,}300.88$

Decay: $y = a(1 - r)^t$
Decreases
Decays
Depreciates
Loses

Creating an Exponential Function without Being Given a Percentage Rate

A 5th grade class is raising meal worms for an experiment. They start with 10 meal worms. The population triples every hour. How many meal worms does the class have after 12 hours?

$a = 10$ 3x

$y = ab^x$

$y = 10(3)^{12} = 5{,}314{,}410$ worms

Special Key Words
Doubles (b = 2)
Triples (b = 3)
Half (b = ½)
These values replace (1 ± r)

Algebra 1 Unit 10: Exponential Functions Notes

Day 6 – Applications of Exponential Functions – Compound Interest

As you get older, you will come to learn a great deal about investing your money…savings accounts, stock market, mutual funds, bonds, etc. Today, we are going to learn about compound interest, which is a form of saving and earning money by letting it sit in an account over time. **Compound Interest** is interest earned or paid on both the principal and previously earned interest. In middle school, you learned about **simple interest**, which is interest that is only earned on the principal. It's formula is $I = Prt$, where P represents principal, r represents rate, t represents time, and I represents interest.

Compound Interest

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

A = balance after t years
P = Principal (original amount)
r = interest rate (as a decimal)
n = number of times interest is compounded per year
t = time (in years)

n-values
365 - day
12 - months
4 - quart
2 - semi
1 - an.

Example 1: Write a compound interest function that models an investment of $1000 at a rate of 3% compounded quarterly. Then find the balance after 5 years.

P = 1000
r = 3% = 0.03
n = 4
t = 5

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

$$A = 1000\left(1+\frac{.03}{4}\right)^{4(5)} = 1161.18$$

Example 2: Write a compound interest function that models an investment of $18,000 at a rate of 4.5% compounded annually. Then find the balance after 6 years.

P = 18000
r = 4.5% = 0.045
n = 1
t = 5

$$A = 18{,}000\left(1+\frac{.045}{1}\right)^{1.5} =$$

$23,410.68

Example 3: Write a compound interest function that models an investment of $4,000 at a rate of 2.5% compounded monthly. Then find the balance after 10 years.

P = 4000
r = 2.5% = 0.025
n = 12
t = 10

$$A = 4000\left(1+\frac{.025}{12}\right)^{12 \cdot 10}$$