Topic 6.2 Exponential Models

Essential Question:

How can you develop exponential models to represent and interpret situations?

Explore & Reason

Complete online.

CONCEPT: Compound Interest

When interest is paid monthly, the interest earned after the first month becomes part of the new principal for the second month, and so on. Interest is earned on interest already earned. This is compound interest.

The **compound interest formula** is an exponential model that is used to calculate the value of an investment when interest is compounded.

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

P = the initial principal invested

r = annual interest rate, written as a decimal

n = number of compounding periods per year

A = the value of the account after t years

CONCEPT SUMMARY: Writing Exponential Models

	General Exponential Model	Compound Interest	Continuously Compounded Interest
ALGEBRA	$y = a \cdot b^x$	$A = P\left(1 + \frac{r}{n}\right)^{nt}$	$A = Pe^{rt}$
NUMBERS	A necklace costs \$250 and increases in value by 2% per year. a = initial amount \$250 b = growth factor 1.02 x = number of years $y = 250(1.02)^x$	A principal of \$3,000 is invested at 5% annual interest, compounded monthly, for 4 years. $P = 3{,}000$ $r = 5\%$ n = 12 compounding periods per year $t = 4$ years $A = 3000\left(1 + \frac{0.05}{12}\right)^{(12)(4)}$	A principal of \$3,000 is invested at 5% continuously compounded interest for 4 years. $P = 3{,}000$ $r = 5\%$ $t = 4$ years $A = 3000e^{(0.05)(4)}$

Q: Write models for the balance in an account with \$500 principal and an interest rate of 4.5% compounded both monthly and continuously.

Q: How does the value of n affect the value of A?

Examples & Questions

Examples 1
Q: How does the monthly rate compare to the annual rate?

Examples 2
Q: Why is 0.04 used in the formula for *r* rather than 4?

Examples 3
Q: Are the values of $(1+\frac{1}{n})^n$ exact values?

Examples 4
Q: What part of the *continuously compounded interest formula* represents the concept of continuous?

Examples 5
Q: Why is 7 substituted for *x*?
Q: How can you find the growth factor when the data points have *x*-values than are 2 units apart?

Examples 6
Q: Why can't the soup cool to a temperature below 68˚F?
Q: What does 0.9492 mean in the given context?
Q: Can you use a model that does not involve adding 68 to the exponential function?

Practice and Problem Solving
Complete MathXL for School: Practice and Problem Solving (online)
Complete MathXL for School: Enrichment (online)

Challenge: #26, 27, 30, 33 – key will be posted in Power School Learning.

Lesson Quiz 5.1/Notes