Chapter 9 Review

Chapter 9:

- Find a certain term in a geometric sequence (know the geometric sequence formula and what the variables all stand for)
- Know what a common ratio is
- Use the exponential growth and decay formulas to solve story problems (know both formulas and what the variables stand for, as well as what exponential growth and decay are)
- Use the compound interest formula to solve a story problem (know the compound interest formula and what all the variables stand for)
- Know the formula for half-life, what the variables represent, what a half-life is, and how to use the formula to solve a story problem; make sure you know how to find t

Geometric Sequence Formula:

$a_n = a_1 r^{n-1}$

Need to have ALL Formulas & know what the variables stand for!

n = # of term you want to find

a_1 = first term in the sequence

r = common ratio (what you're multiplying by each time)

Geometric Sequences must always be multiplication!

The first term of a geometric sequence is 128, and the common ratio is 0.5. What is the 10th term of the sequence?

$a_1 = 128$

$r = 0.5$

$n = 10$

$a_{10} = 128(0.5)^{10-1}$

$= 128(0.5)^9$

$= 0.25$

Exponential Growth and Decay

An exponential growth function has the form $y = a(1 + r)^t$, where $a > 0$.

y represents the final amount.

a represents the original amount.

r represents the rate of growth expressed as a decimal.

t represents time.

An exponential decay function has the form $y = a(1 - r)^t$, where $a > 0$.

y represents the final amount.

a represents the original amount.

r represents the rate of decay as a decimal.

t represents time.

The original value of a painting is $1400, and the value increases by 9% each year. Write an exponential growth function to model this situation. Then find the value of the painting in 25 years.

$a = 1,400$

$r = 0.09$

$t = 25$

$y = 1400(1+0.09)^{25}$

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.

Compound Interest

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

A represents the balance after t years.

P represents the principal, or original amount.

r represents the annual interest rate expressed as a decimal.

n represents the number of times interest is compounded per year.

t represents time in years.

↳ annually → 1
semi-annually → 2
quarterly → 4
monthly → 12

★ $1000 invested at a rate of 3% compounded quarterly; 5 years

$P = 1{,}000$

$r = 0.03$

$n = 4$

$t = 5$

$A = 1{,}000\left(1 + \frac{0.03}{4}\right)^{(4 \cdot 5)}$

★ $A = 1{,}000(1.0075)^{20}$

$A = \$1{,}161.18$

$18,000 invested at a rate of 4.5% compounded annually; 6 years

Half-Life

$A = P(0.5)^t$

A represents the final amount.

P represents the original amount.

t represents the number of half-lives in a given time period.

Remember to ask yourself "how many half-lives will occur in the given time period?" (divide!) to get t

- Find the amount of fluorine-20 left from a 40-gram sample after 44 seconds.

Bismuth-210 has a half-life of 5 days. Find the amount of bismuth-210 left from a 100-gram sample after ~~5 weeks~~ 35 days.

$A = P(0.5)^t$

$P = 100$

$t = 7$ $(35 \div 5)$

$A = 100(0.5)^7$

$A = 0.78125$ grams

What shapes do each graph make? How can you tell what kind of function you're dealing with from a table or equation?

linear → 1st differences $y=mx+b$

quadratic → 2nd differences $y=ax^2+bx+c$

exponential → multiply by same # $y=ab^x$