☺ 1.2 ~ Modeling Growth and Decay ☺

Objectives:

1. Discover applications involving geometric sequences
2. Use geometric sequences to model growth and decay situations

Example 1: TV Central is going out of business in 8 weeks. Each week until it closes, the company plans to reduce the prices from the previous week by 15%. A television is currently priced at $899.

a. Write a recursive formula.

$u_0 = \$899$

$u_n = .85\,u_{n-1}$ where $n \geq 1$

b. Find the price of the television after 8 weeks if it remains unsold.

$899 $\boxed{\text{Enter}}$ × .85 $\boxed{\text{ENTER}}$ ... $\boxed{\$244.97}$

Decay: Amounts <u>decrease</u> by a constant ratio or percent.

Common Ratio is represented by <u>$(1-p)$</u> where *p* equals percent change. (as a decimal)

Growth: Amounts <u>increase</u> by a constant ratio.

Common Ratio is represented by <u>$(1+p)$</u> where *p* equals percent change. (as a decimal)

Example 2: An automobile depreciates, or loses value, as it gets older. Suppose that a particular automobile loses one-fifth of its value each year.

a. Write a recursive formula. $u_n = (1-\frac{1}{5})u_{n-1} = \frac{4}{5}u_{n-1} = .8\,u_{n-1}$ where $n \geq 1$

b. Find the value of the car when it is 6 years old, if it costs $23,999 when it is new.

$u_0 = 23,999$ $\boxed{\$6,291.19}$

Example 3: Susie sells seashells. Business is booming so she decides to increase her prices by 2% each month. Write a recursive routine to represent how much a $1.50 seashell will cost after *n* months.

$u_0 = \$1.50$

$u_n = 1.02\,u_{n-1}$ $n \geq 1$

Principal: Initial balance.

Simple Interest: A percentage paid on the principal.

Compounded Interest: Interest charged or received based on the sum of the principal and the accrued interest.

Example 4: Gloria deposits $2,000 into a bank account that pays 7% interest compounded annually. This means that the bank pays her 7% of her account balance as interest at the end of each year. She leaves the original amount and the interest accumulated in her account without making any withdrawals.

a. Write a recursive routine to represent the amount of money Gloria has in the bank after n years.

$u_0 = \$2{,}000$

$u_n = 1.07\,u_{n-1} \quad n \geq 1$

b. When will Gloria's principal double in value?

$\{0, 2000\}$ $\boxed{\text{ENTER}}$

$\{\text{ANS}(1)+1, \text{ANS}(2) \times 1.07\}$

$\{10, 3934.30\}$

$\{11, 4209.70\}$

$\boxed{\text{11 YEARS}}$

Example 5: Sandy deposits $500 into a savings account that gives her 3.5% interest compounded annually. If she makes no additional deposits or withdrawals, how much money will Sandy have in her account after 4 years?

500 $\boxed{\text{ENTER}}$ $\times\, 1.035$ $\boxed{\text{E}}$ $\boxed{\text{E}}$ $\boxed{\text{E}}$ $\boxed{\text{E}}$ $= \boxed{\$573.76}$

Exit Question:

If a quantity is increased by 35%, what common ratio would you use?

$1 + .35 = \boxed{1.35}$

If a quantify is decreased by 83%, what common ratio would you use?

$1 - .83 = \boxed{.17}$