

## Content and Language Objective:

Students will write explicit equations for geometric sequences and set-up and solve situations involving exponential functions.

### Warm - Up

Write about the characteristics of an arithmetic sequence and a geometric sequence and discuss how they are similar and different.

#### ARITHMETIC

add or subtract to complete  
sequence  $u_0 = 5$   $u_n = u_{n-1} + 5$

common difference

linear

show a  
rate of  
change

#### GEOMETRIC

Common ratio

multiplication by a whole  
or fraction

exponential

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### **Vocabulary:**

#### **Exponential Function:**

**A continuous function with a variable in the exponent.**

**This functions is used to model growth and decay.**

$$y = ab^x$$

**a = start value (y-intercept)**

**b = rate of change (growth rate)**

**x = time**



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**Given the sequence below, write a recursive routine and an explicit formula for the sequence and find the next 3 terms.**

420, 105, 26.25, 6.5625, 1.640625, .41015625

growth factor  $\frac{105}{420} = \frac{1}{4} = .25$

$$u_0 = 420$$

$$u_n = .25 u_{n-1}$$

$$y = 420(.25)^x$$

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Another way to understand exponential functions, the easiest thing to do is to work through a word problem that models a geometric sequence.

Most automobiles depreciate as they get older. Suppose an automobile that originally costs \$14,000 depreciates by one-fifth of its value every year.

a. What is the value of this automobile after two and a half years?

$$\begin{aligned} y &= 14000(.20)^x \\ y &= 14000(.80)^x \\ y &= 14000(1-.20)^x \end{aligned}$$

$$\begin{aligned} y &= 14000(.80)^{2.5} \\ y &= 8014.07 \end{aligned}$$

b. When is the automobile worth half of its initial value?

$$\frac{7000}{14000} = \frac{14000(.8)^x}{14000}$$

$$.5 = .8^x$$

$$\begin{aligned} .8^3 &= .512 \\ .8^{3.1} &= .50070 \\ .8^{3.2} &= .4896 \end{aligned}$$

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**Classwork**

**Pages 240 - 241**

**# 1, 2, 4, 5, 6, 8, 10**

**HOMEWORK**

**Worksheet 5.1 due Wednesday January 10th**

