Math I Mrs. Orr Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Unit 6: Exponential Functions

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| --- | --- | --- | --- | --- |
| **Day** | **DATE** | **Topic** | **Independent Practice** | **Grade** |
| 1 | 2/24 | Sequences: Arithmetic (Linear) vs. Geometric (Exponential) | Day 1 Practice |  |
| 2 | 2/26 | Sequences: Equations to Tables to Graphs | Day 2 Practice |  |
| 3 | 3/1 | Building and Interpreting Exponential Functions**QUIZ**  | None |  |
| 4 | 3/3 | Exponential Growth | Day 3 Practice |  |
| 5 | 3/7 | Exponential Decay | Day 4 Practice |  |
| 6 | 3/9 | Review | Review Sheet |  |
| 7 | 3/11 | **TEST** | *Turn in this packet for a CW grade!* |



Need tutoring or to make up an assignment?

Stay after school on Tuesdays and Thursdays from

2:30—3:30 pm!

Need some online help? **Go to SAS Curriculum Pathways** (login: BroughtonStudent) Use the Quick Launch numbers **5061 – 5064** (to access these, type in the top right of the homepage where it says QL # )

Notes and Assignments are on Mrs. Orr’s website:

[calculatORR.weebly.com](http://www.profiomillermath.weebly.com)

Or check out videos and online practice at:

bhsccmath.weebly.com

**Unit 6 Standards**

**Skill 16: I CAN compare linear to exponential functions**

**F-LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions

1. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

**F-LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, ~~quadratically, or (more generally) as a polynomial function.~~

**Skill 17: I CAN build exponential functions**

**F-LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

**F-BF.2** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. ★

**Skill 18: I CAN interpret exponential functions**

**Interpret expressions for functions in terms of the situation they model.**

**F-LE.5** Interpret the parameters in a linear or exponential function in terms of a context.

**F-IF.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

***Note:*** *At this level, the focus is linear and exponential functions.*

**F-IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship.

**DAY 1 PRACTICE (Skill 16)**

|  |
| --- |
| **Determine if the sequence is geometric, arithmetic or neither. If it is geometric or arithmetic, find the common ratio or common difference.** |
| **A1.** -2, -4, -8, -16, . . . | **A2.** 7, 4, 1, -1, . . . |
| **B1.** -1, 6, -36, 216, … | **B2.** 4, 26, 48, 70, . . . |
| **C1.** 375, 75, 15, 3, 1/3, . . . | **C2.** -125, -107, -89, -71, . . . |
| **Answer the questions following each scenario.** |
| **A3.** You visit the Grand Canyon and drop a penny off the edge of a cliff.  The penny will fall is 16 feet the first second, 48 feet the next second, 80 feet the third second, and so on.  Is the sequence arithmetic or geometric? \_\_\_\_\_\_\_\_\_\_What is the common difference? \_\_\_\_\_\_\_\_\_\_What is the initial term? \_\_\_\_\_\_\_\_\_\_Write a NOW-NEXT Rule: Next = Now \_\_\_\_\_\_\_\_\_\_ ; start at \_\_\_\_\_\_How far will the penny fall in six seconds? | **B3.**  The hot tub in your hotel suite is set at 75º F. The hotel tells you that they will increase the temperature by 10% each hour to make it more comfortable.Is the scenario arithmetic or geometric? \_\_\_\_\_\_\_\_\_\_What is the common ratio? \_\_\_\_\_\_\_\_\_\_What is the initial term? \_\_\_\_\_\_\_\_\_\_Write a NOW-NEXT Rule. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What will the temperature of the hot tub be after three hours? |
| **C3.**  The sum of the interior angles of a triangle is 180º, of a quadrilateral is 360º and of a pentagon is 540º.  Is this sequence arithmetic or geometric? How can you tell?Write a NOW-NEXT rule: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Assuming this pattern continues, find the sum of the interior angles of a dodecagon (12 sides). \_\_\_\_\_\_\_\_\_\_\_ | **C4**. After knee surgery, your trainer tells you to return to your jogging program slowly.  He suggests jogging for 12 minutes each day for the first week.  Each week thereafter, he suggests that you increase that time by 6 minutes per day.  Is this sequence arithmetic or geometric? How can you tell?Write a NOW-NEXT rule: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_How many weeks will it be before you are up to jogging 60 minutes per day? \_\_\_\_\_\_\_\_\_\_ |

**DAY 2 PRACTICE (Skill 16 & 17)**

 **Killer Plants**

**1.** Ghost Lake is a popular site for fishermen, campers, and boaters. In recent years, a certain water plant has been growing on the late at an alarming rate. The surface area of Ghost Lake is 25,000,000 square feet. At present, 1,000 square feet are covered by the plant. The Department of Natural Resources estimates that the area is growing by a scale factor of 1.5 every month.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of Months** | 0 | 1 | 2 | 3 | 4 |
| **Area Covered in Square Feet** | 1,000 |  |  |  |  |

**A.**  Complete the table below.

Use the data to graph the situation. Be sure to label your axes and title your graph.

Write a NOW-NEXT rule representing the situation.

 Is this function linear or exponential?

**B**. Write an explicit equation using y = . Explain what the variables in your equation represent.

**C.** How much of the lake’s surface will be covered with the water plant by the end of one year?

After how many months will the plant completely cover the surface of the lake?

**2.** Loon Lake has a “killer plant” problem similar to Ghost Lake. Using the table below, answer the following questions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of Years** | 1 | 2 | 3 | 4 | 5 |
| **Area Covered in Square Feet** | 5,000 | 10,000 | 20,000 | 40,000 | 80,000 |

**A.** What is the initial area covered? (this is when the number of years is zero) \_\_\_\_\_\_\_\_\_\_

What is the growth factor for the area covered? \_\_\_\_\_\_\_\_

 Write a recursive (NOW-NEXT) equation to model the scenario described in the table.

 Is this function linear or exponential?

**B.** Write an explicit equation (slope intercept form) to model the scenario described. Make sure to define your variables.

Use your explicit equation to determine how much of the lake’s surface will be covered with the plant at the end of 7 years?

**C.** The surface area of the lake is approximately 200,000 square feet. How long will it take before the lake is completely covered?

Pretend a new student in class has no idea how to read the information in the table above. Using complete sentences, explain what the numbers in the table are saying about the situation at Loon Lake.

Adapted from Growing, Growing, Growing Exponential Relationships, Connected Mathematics 2, Pearson, 2009.

**DAY 3 PRACTICE (Skill 17 & 18)**

|  |  |
| --- | --- |
| Time | Value |
| 0 | 130 |
| 1 | 139.1 |
| 2 |  |
| 3 |  |
| 4 |  |

**1.**  Omar bought a set of baseball cars for $130 and predicted the growth in value over time.

**A:** Complete the table.

What is the initial value? \_\_\_\_\_\_\_\_

What is the growth rate? \_\_\_\_\_\_\_\_

What is the growth factor? \_\_\_\_\_\_\_\_

**B:**  Write the explicit equation that describes the scenario. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If the value continues to increase at this rate, how much would the collection be worth after 7 years?

**C.** What is the difference between the value at the end of year one and the starting value?

 What is the difference between the value at the end of year 7 and the end of year 6?

 If the growth rate is the same, why are these values so different?

**2**. Carlos, Latanya, and Mila work in a biology laboratory. Each of them is responsible for a population of mice. The growth factor for Carlos’s population of mice is 8/7. The growth factor for Latanya’s population of mice is 3. The growth factor for Mila’s population of mice is 125%.

**A.** Whose mice are reproducing fastest? \_\_\_\_\_\_\_\_\_\_\_\_\_ Whose mice are reproducing slowest? \_\_\_\_\_\_\_\_\_\_\_\_\_

**B.** If they each start with 20 mice, how many do they each have at the end of two growth periods?

**C**. After how many growth periods will Mila have *about* 76 mice?

**Use the Compound Interest Formula (A = P(1 + r/n)nt) for the problems below.**

**A.** If interest is compounded annually, find the compound amount of $1000 invested for 5 years at 9.5% interest.

**B.**  If interest is compounded monthly, find the compound amount of $1200 invested for four and a half years at 12%.

**C.** One hundred dollars is deposited in a bank which compounds interest quarterly yields $115 at the end of a year. What is the annual rate of interest?

**DAY 4 PRACTICE (Skill 17 & 18)**

**1.** Suppose a new golf ball drops downward from a height of 27 feet onto a paved parking lot and keeps bouncing up and down, again and again. Rebound height of the ball should be 2/3 of its drop height.

**A.** Fill in the table of the rebound heights.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bounce # | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Rebound Height(in ft) | 27 |  |  |  |  |  |  |  |  |  |  |

Write a NOW-NEXT rule for the scenario, and ***describe in words*** what it means.

Write an explicit equation to describe the scenario above? Make sure to define your variables.

**B.** After 15 bounces, what will the height of the ball be?

**C.** If the ball had a starting height of 12 feet, what would the new equation be?

Using this new equation, determine the approximate number of bounces it would take for the height to be 1 foot.

**2.** A used vehicle is purchased for $8,500. It depreciates in value 8% every year.

**A.** What is the initial value? \_\_\_\_\_\_\_\_

What is the decay rate? \_\_\_\_\_\_\_\_

What is the decay factor? \_\_\_\_\_\_\_\_

Write an equation representing the situation where *t* = time in years, and *v(t)* = value of your vehicle.

**B.** What is the predicted value of the vehicle after it is 10 years old?

**OVER 🡪**

**C.** Assuming the depreciation rate is the same, would a vehicle purchased at $9,500 still be worth exactly $1,000 more than the vehicle purchased at $8,500 after 10 years? Use math to prove your answer.

**3.** A radioactive isotope has a half-life of 18 months.

**A.** What is the decay rate? \_\_\_\_\_\_\_\_

What is the decay factor? \_\_\_\_\_\_\_\_

**B.** Write an equation to model the scenario if the initial sample is 6,500 grams.

How many grams of the isotope are left after 36 months?

**C**  How many grams are left after 6 years and three months?