Algebra 8 GGG Mid Unit Test Review Packet

Name: ANSWER KEY **Period:**_____ **Date:**_____

Know how to:

- Create a table and a graph of an exponential relationship given a description or equation (Inv. 1)
- Write an exponential equation given a graph, table, or two points (Inv. 1 + 2)
- Write expressions in exponential, expanded, and standard form (Inv. 1)
- Write numbers in scientific notation and standard form (Inv. 1)
- Write an exponential equation with a y-intercept other than 1 (Inv. 2)
- Identify whether a table is linear, exponential, or neither based on a table, graph or equation (Inv. 1 + 2)
- Write the equation of a linear or exponential relationship given a table, graph, or equation (Inv. 1 + 2)
- Estimate when an exponential relationship will reach a certain number (Inv. 1 - 3)
- Write an exponential equation with a growth factor that is not a whole number (Inv. 3)
- Write an exponential equation given a growth rate (Inv. 3)
- Convert growth rates into growth factors and growth factors into growth rates (Inv. 3)
- Compare rates of growth in different situations (Inv. 3)

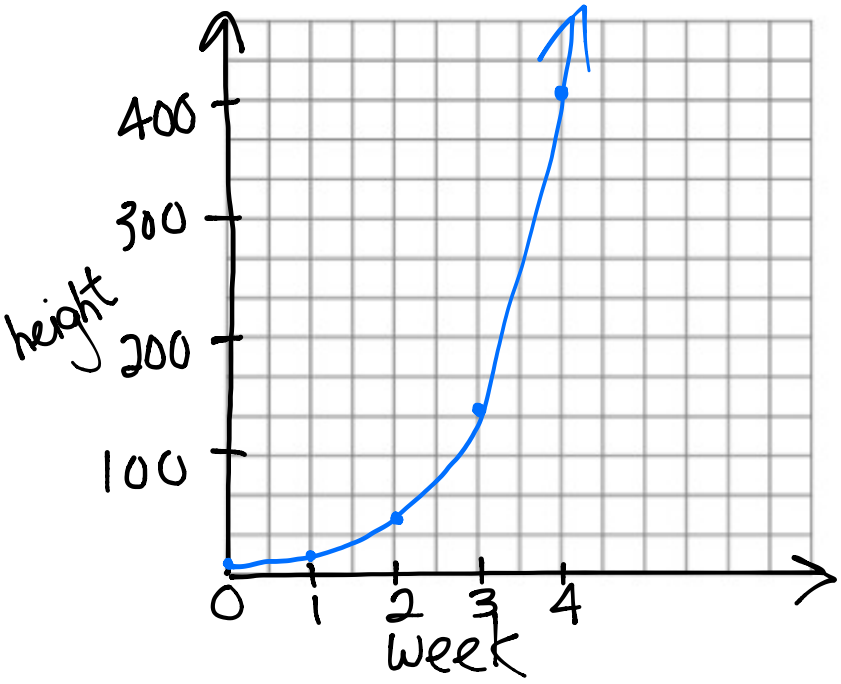
Make sure to show all your work. Read carefully and think critically!

Bamboo can grow rapidly. When it is very young, it can triple in size in a week. You start tracking how quickly a piece of bamboo grows when it is already 5 millimeters tall.

1.) Make a table showing how the bamboo will grow in size over the next four weeks.

week	0	1	2	3	4
height	5	15	45	135	405

2.) Graph your data. Label your axes and connect the dots if it makes sense to.



3.) Write an equation showing how the height of the bamboo changes as the number of weeks increases. **Explain what the variables and numbers in your equation mean in the context of this situation.** There should be 5 parts to your answer.

$h = 5(3)^w$

initial height

# of weeks

current height at any week w

height is tripling each week

4.) How long would it take for the bamboo to reach a height of at least 1500 millimeters?

weeks	4	5	6
height	405	1215	3645

Between 5 + 6 weeks.

5.) How tall would the bamboo be after twelve weeks? Is this a reasonable estimate? Why or why not?

$h = 5(3)^{12}$

$h = 5(531{,}441)$

$h = 2{,}657{,}205$ mm

This is not a reasonable estimate because the bamboo growth will eventually slow down. This bamboo is over 2000 m tall, which is unrealistic.

6.) Your friend also has some bamboo and has been tracking the growth over the last few weeks. Their table is below.

0 1 2

.5 2 8

Weeks	3	4	5	6	7
Height (mm)	32	128	512	2048	8192

Write an equation that models the growth of your friend's bamboo. Whose bamboo is growing at a faster rate?

$GF = \frac{128}{32} = 4$

$h = 0.5(4)^{w}$

Your friend's bamboo because it has a larger growth factor.

Decide whether the relationship is linear, exponential, or neither. If it is linear or exponential, write an equation for the relationship. If it is neither, explain why and be specific.

7.)

x	1	2	3	4	5
y	135	179	223	267	311

+1 +1 +1

+44 +44 +44

$y = 44x + 91$

8.)

x	1	2	3	4
y	16	32	64	256

+1 +1 +1

×2 ×2 ×4

Neither because it is multiplied by 4 at the end instead of 2.

9.)

0	x	1	2	3	4	5
3	y	6	12	24	48	96	192

+1 +1 +1

×2 ×2 ×2

$y = 3(2)^x$

10.)

x	0	1	2	3	4
y	4.5	13.5	40.5	121.5	364.5

+1 +1 +1

×3 ×3 ×3

$y = 4.5(3)^x$

For the problems below, first assume a linear relationship and write the equation of the line passing between the points. Then, assume an exponential relationship and write the equation of the exponential curve passing between the points.

11.) (3, 12) and (4, 24)

Linear: $m = \frac{24-12}{4-3} = \frac{12}{1} = 12$

$y = 12x + b$

$12 = 12(3) + b$

$12 = 36 + b$

$-24 = b$

$y = 12x - 24$

Exponential: $GF = \frac{24}{12} = 2$

0	1.5
1	3
2	6
3	12

$\times 2$

$y = 1.5(2)^x$

12.) (1, 8) and (2, 24)

Linear: $m = \frac{24-8}{2-1} = \frac{16}{1} = 16$

$8 = 16(1) + b$

$8 = 16 + b$

$-8 = b$

$y = 16x - 8$

Exponential: $GF = \frac{24}{8} = 3$

0	$\frac{8}{3}$
1	8

$y = \frac{8}{3}(3)^x$

13.) (3, 20) and (4, 80)

Linear: $m = \frac{80-20}{4-3} = \frac{60}{1} = 60$

$20 = 60(3) + b$

$20 = 180 + b$

$-160 = b$

$y = 60x - 160$

Exponential: $GF = \frac{80}{20} = 4$

0	$\frac{5}{16}$
1	$\frac{5}{4}$
2	5
3	20

$y = \frac{5}{16}(4)^x$

14.) (1, 18) and (2, 27)

Linear: $m = \frac{27-18}{2-1} = \frac{9}{1} = 9$

$18 = 9(1) + b$

$18 = 9 + b$

$9 = b$

$y = 9x + 9$

Exponential: $GF = \frac{27}{18} = 1.5$

0	12
1	18

$y = 12(1.5)^x$

Write in standard form.

31.) 9×10^{0}

9

32.) 2.208×10^{10}

22089000000

33.) 545×10^{7}

5450000000

34.) 1×10^{-4}

0.0001

35.) 6.305×10^{-9}

0.000000006305

36.) 0.00076×10^{5}

76

Write an equation that best models the situation.

37.) A population of bugs has a growth factor of 4. After year 2, there are 480 bugs. After year 3, there are 1,920 bugs.

0	1	2	3
30	120	480	1920

$y = 30(4)^{x}$

38.) A plant is growing on a lake. At present, it covers 300 square feet. After 1 month, it covers 450 square feet.

$GF = \frac{450}{300} = 1.5$ $\quad y = 300(1.5)^{x}$

39.) Mold is growing exponentially on an old piece of bread. After day 1, 1.5 square centimeters are covered. After day 3, 13.5 square centimeters are covered.

0	1	2	3
.5	1.5		13.5

$y = 0.5(3)^{x}$

×GF ×GF

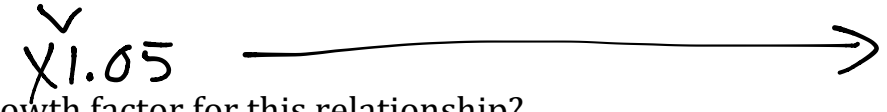
$\frac{13.5}{1.5} = 9$

$GF \cdot GF = 9$

$GF = 3$

Janelle deposits $2,000 in an interest bearing account that is growing exponentially. The growth of her money over the first five years of the account is shown in the table below.

year	0	1	2	3	4	5
balance ($)	2000	2100	2205	2315.30	2431	2552.60



40.) What is the growth factor for this relationship?

$\frac{2100}{2000} = 1.05$

41.) Write an equation that models the balance *b* at the end of any year *n*.

$b = 2000(1.05)^n$

42.) How many years will it take for Janelle's original deposit to double?

Yr. 14 = 3959.86

Yr. 15 = 4157.86

$4000

By Year 15.

43.) What is the growth rate for this situation?

Rate = Factor − 1

Rate = 1.05 − 1

Rate = .05

5%

Find the growth rate or factor using the given information.

44.) Growth factor: 1.75 Growth rate: 75%

45.) Growth factor: 3.2 Growth rate: 220%

46.) Growth factor: 1.1 Growth rate: 10%

47.) Growth factor: 2 Growth rate: 100%

48.) Growth rate: 3% Growth factor: 1.03

49.) Growth rate: 40% Growth factor: 1.4

50.) Growth rate: 14.5% Growth factor: 1.145

51.) Growth rate: 500% Growth factor: 6

52.) Which of these is growing at the fastest rate: the equation $y = 50(2.5^x)$, a growth rate of 250%, or a growth factor of 1.5?

GF = 3.5

① GR of 250%
② $y = 50(2.5)^x$
③ GF of 1.5