

Directions: *Show some thinking for each question for maximum credit. You may use a calculator on this test. Each question worth 5 points unless noted. "Tell the truth - all the time!"*

GGG Investigations 3 - 5.1 Practice Test

Short Answer

1. Use tables or graphs to compare these two equations for x values from 1 to 10:

$$y = 2(3^x) \qquad y = 64(1.5^x)$$

- a. In which equation does the y value increase at a faster rate? How do you know?
- b. For what x value are the y values equal?
- c. The equation $y = 2(3^x)$ might represent the growth pattern for a population of mice. Complete the following sentence by circling your choices. Your sentence should describe the pattern in words.
 - i. The population started with _____ mice.

2
3
200
300
 x
 - ii. The population grew at a rate of _____.

200%
300%
2%
3%
 $x\%$

2. The table below shows an exponential pattern.

x	0	1	2	3	4	■
y	1	6	36	216	1,296	■

- a. Continue the table by giving the values for the next column.
- b. Write an equation that represents the pattern in the table.
- c. What is the growth factor? Explain how you determined the growth factor.

3. The table below shows an exponential pattern.

x	0	1	2	3	4	■
y	1	1.2	1.44	1,728	■	■

- Continue the table by giving the values for the next column.
- Write an equation that represents the pattern in the table.
- What is the growth factor? Explain how you determined the growth factor.

4. A tree farm has begun to harvest a section of trees that was planted a number of years ago. The table shows the number of trees remaining for each of 8 years of harvesting.

Year	0	1	2	3	4	5	6	7	8
Trees remaining	10,000	9502	9026	8574	8145	7737	7350	6892	6543

- Suppose the relationship between the year and the trees remaining is exponential. Approximate the decay factor for this relationship.
- Write an equation for the relationship between time and trees remaining.
- Evaluate your equation for each of the years shown in the table below to find the approximate number of trees remaining.

Year	10	15	20	25	30	35	40
Trees remaining							

- The owners of the farm intend to stop harvesting when only 15% of the trees remain. During which year will this occur? Explain your reasoning.

5. Kai's brother collects fuzzy insects called tribetts. The tribett population decreases by 30% each year.

- a. Make a table showing the number of tribetts at the end of the first 5 years for a starting population of 10,000 tribetts.

Year	0	1	2	3	4	5
Tribetts						

- b. Write an equation for the relationship between years and number of tribetts.

- c. In what year will there first be fewer than 1,000 tribetts?

6. Identify the initial amount a and the growth factor b in the exponential function.

$$A(x) = 680 \cdot 4.3^x$$

7. Suppose the population of a town is 2,700 and is growing 4% each year.

- a. Write an equation to model the population growth.

- b. Predict the population after 12 years.

Find the balance in the account.

8. \$2,400 principal earning 2%, compounded annually, after 7 years

9. A boat costs \$15,500 and decreases in value by 10% per year. How much will the boat be worth after 5 years?

10. In parts (a)–(d), find the units digit of the standard form of the expression.

a. 12^{10}

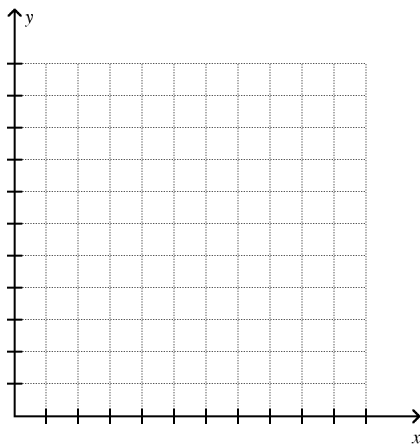
b. 11^{23}

c. 23^{19}

d. 17^{17}

11. Consider these three equations: $y = 0.625^x$, $y = 0.375^x$, and $y = 1 - 0.5x$.

a. Sketch graphs of the equations on one set of axes.



b. What points, if any, do the three graphs have in common?

c. In which graph does the y -value decrease at a faster and faster rate as the x -value increases?

d. Which of the equations is not an example of exponential decay? Use the graphs or the equations to answer this question.

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Answer Section

SHORT ANSWER

1. $y = 2(3^x)$

x	y
1	6
2	18
3	54
4	162
5	486
6	1458
7	4374
8	13,122
9	39,366
10	118,098

$y = 64(1.5^x)$

x	y
1	96
2	144
3	216
4	324
5	486
6	729
7	1093.5
8	1640.25
9	2460.375
10	3690.5625

- a. The y value in $y = 2(3^x)$ has a greater growth rate (3 as opposed to 1.5). Each y value is 3 times the previous y value while each y value in $y = 64(1.5^x)$ is only 1.5 times the previous y value.
- b. When $x = 5$, $y = 486$.
- c. i. 2
ii. 300%

2. a. $x = 5, y = 7776$

b. $y = 6^x$

c. The growth factor is 6. It can be found by dividing any y value by the previous y value.

3. a. $x = 4, y = 2.0736$

b. $y = 1.2^x$

c. The growth factor is 1.2. It can be found by dividing any y value by the previous y value.

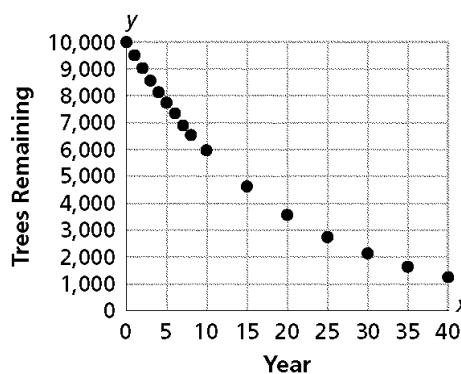
4. a. 0.95

b. $r = 10,000(0.95^t)$, where r is trees remaining and t is time in years

c.

Year	10	15	20	25	30	35	40
Trees remaining	5987	4633	3585	2774	2146	1661	1285

d. This will be when about 1500 of the trees remain, which will occur around year 37 (when about 1499 trees remain). (Note: Students can solve this by trial-and-error or by graphing.)



5. a.

Year	0	1	2	3	4	5
Tribetts	10,000	7,000	4,900	3,430	2,401	1,681

b. $T = 10,000(0.7)^x$

c. Year 7

6. 680, 4.3

7. $y = 2,700 \cdot 1.04^x$; about 4,323 people

8. \$2,756.85

9. \$9,152.6

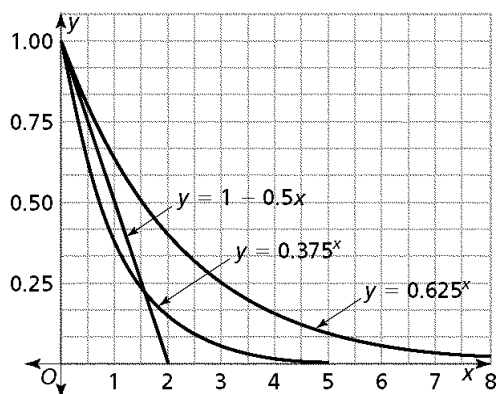
10. a. 4

b. 1

c. 7

d. 7

11. a.



- b. All three graphs intersect at the point (0, 1). If students consider the intersections of just two graphs, the graphs of $y = 0.375^x$ and $y = 1 - 0.5x$ intersect at about the point (1.57, 0.214).
- c. None; as the x value increases, the y value starts to "level off" in the exponential relationships; in the linear relationship, the decrease remains constant.
- d. The equation $y = 1 - 0.5x$ is not an example of exponential decay. The graph of the equation is a straight line, and the equation does not contain a variable as an exponent.