Warm Up

x	y
0	5
1	15
2	45
3	135
4	405

(each x step $+1$, each y step $\times 3$)

Species X

What is the growth factor for Species X?

Growth Factor = 3

How many animals were present when they started counting?

5 animals

What is the equation that describes the growth of Species X?

$$y = 5(3^x)$$

$$y = 5(3)^x$$

For Exercises 9–12, find the growth factor and the *y*-intercept of the equation's graph.

9. $y = 300(3^x)$

Always has an exponent on it.

10. $y = 300(3)^x$

11. $y = 6{,}500(2)^x$

12. $y = 2(7)^x$

$y = (300)3^x$

13. The following graph represents the population growth of a certain kind of lizard.

Growth of Lizard Population

Number of Lizards (y-axis: 0, 50, 100, 150, 200, 250, 300)

Year (x-axis: 0, 1, 2, 3, 4, 5)

Points plotted: (1, 20), (2, 40), (3, 80), (4, 160)

Handwritten annotations:
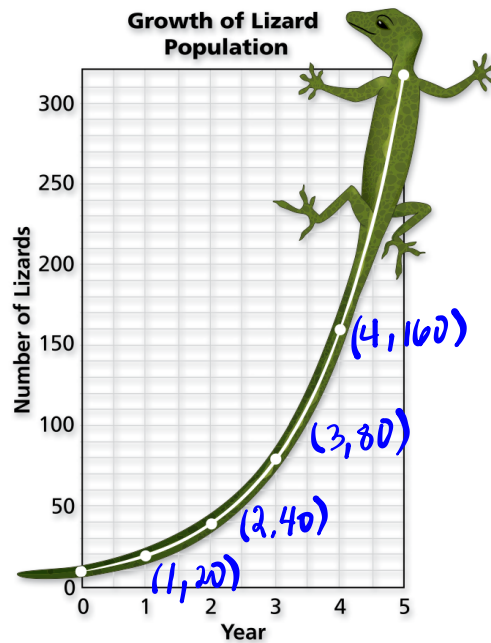
How many lizards did we start with?

10

Equation?

$y = 10(2^x)$

a. What information does the point (2, 40) on the graph tell you?

b. What information does the point (1, 20) on the graph tell you?

c. When will the population exceed 100 lizards?

d. Explain how you can use the graph to find the growth factor for the population.

Classwork

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4. As a biology project, Talisha is studying the growth of a beetle population. She starts her experiment with 5 beetles. The next month she counts 15 beetles.

One Month   Two Months   Three Months
0 months   1 month   2 months
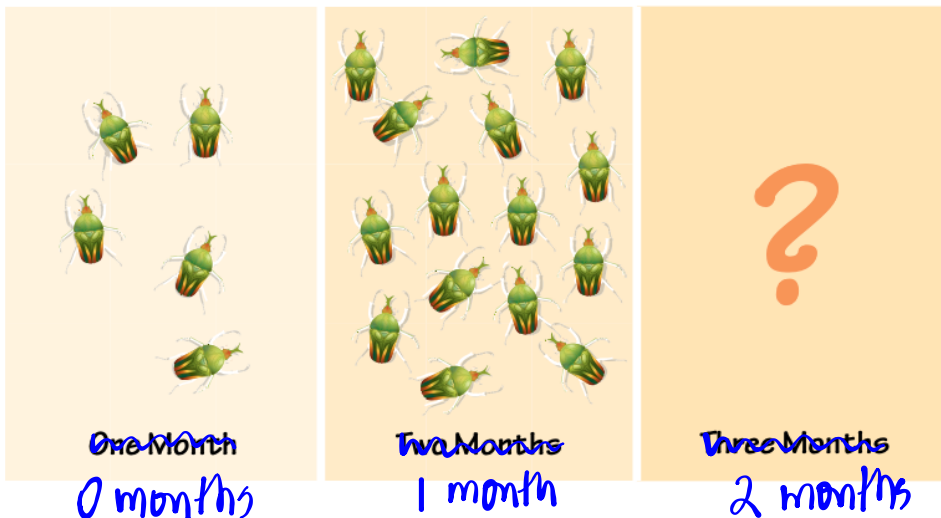
a. Suppose the beetle population is growing linearly. How many beetles can Talisha expect to find after 2, 3, and 4 months?

b. Suppose the beetle population is growing exponentially. How many beetles can Talisha expect to find after 2, 3, and 4 months?

c. Write an equation for the number of beetles b after m months if the beetle population is growing linearly. Explain what information the variables and numbers represent.

d. Write an equation for the number of beetles b after m months if the beetle population is growing exponentially. Explain what information the variables and numbers represent.

e. How long will it take the beetle population to reach 200 if it is growing linearly?

f. How long will it take the beetle population to reach 200 if it is growing exponentially?

5. Fruit flies are often used in genetic experiments because they reproduce very quickly. In 12 days, a pair of fruit flies can mature and produce a new generation. The table below shows the number of fruit flies in three generations of a laboratory colony.

Growth of Fruit-Fly Population

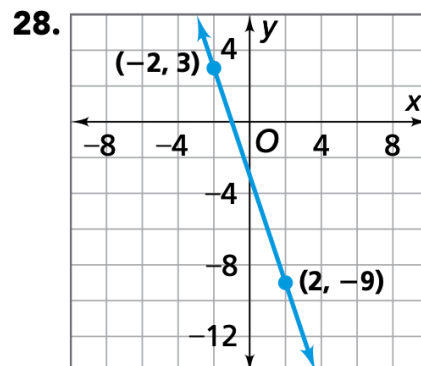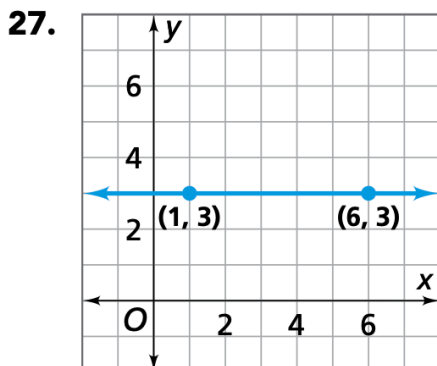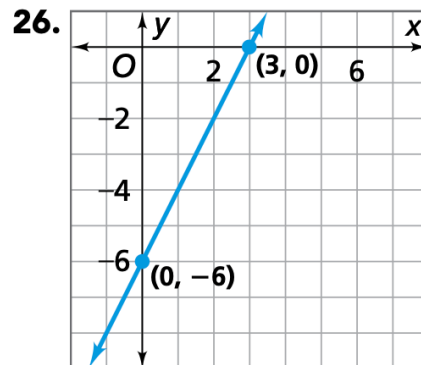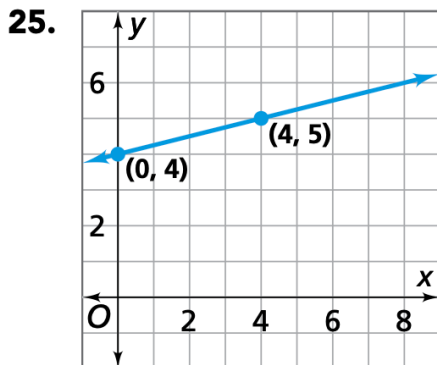| Generations	0	1	2	3
Number of Fruit Flies	2	120	7,200	432,000

a. Does this data represent an exponential function? If so, what is the growth factor for this fruit-fly population? Explain how you found your answers.

b. Suppose this growth pattern continues. How many fruit flies will be in the fifth generation?

c. Write an equation for the population p of generation g.

d. After how many generations will the population exceed one million?

6. A population of mice has a growth factor of 3. After 1 month, there are 36 mice. After 2 months, there are 108 mice.

    a. How many mice were in the population initially (at 0 months)?

    b. Write an equation for the population after any number of months. Explain what the numbers and variables in your equation mean.

7. Fido did not have fleas when his owners took him to the kennel. The number of fleas on Fido after he returned from the kennel grew according to the equation $f = 8(3^n)$, where f is the number of fleas and n is the number of weeks since he returned from the kennel. (Fido left the kennel at week 0.)

a. How many fleas did Fido pick up at the kennel?

b. Is the relationship represented by the equation an exponential function? If so, what is the growth factor for the number of fleas?

c. How many fleas will Fido have after 10 weeks if they are untreated?

For Exercises 25–28, write an equation for each line. Identify the slope and *y*-intercept.

25.

26.

27.

28.

Homework

Finish classwork