Warm Up

12/13

Write the equation for the data in the table below?

x	2	3	4	5
y	48	192	768	3072

+1 +1 +1

0 1 2 3

÷4 ÷4

x4 x4 x4

Growth Factor

y-int

Let's use Algebra to find the y-int:

$y = ab^x$

$y = a(4)^x$

Let's use (2, 48)

$\frac{48}{4^2} = \frac{a(4)^2}{4^2}$

$3 = a$

$y = 3(4)^x$

$= 3(4^x)$

Questions on Problem 3.2?

Answers to Problem 3.2

A. 1. Sam's Stamp Collection at 6%

Year	Value	
0	$2,500	
1	$2,650	$\times 1.06$
2	$2,809	$\times 1.06$
3	$2,977.54	$\times 1.06$
4	$3,156.19	$\times 1.06$
5	$3,345.56	$\times 1.06$

Every year we have 6% more

2. Yes. This is exponential growth with a growth factor of 1.06.

3. $v = 2{,}500(1.06)^n$

4. It will take about 12 years to double the value of the investment.

B. 1. Sam's Stamp Collection at 4%

Year	Value
0	$2,500
1	$2,600
2	$2,704
3	$2,812.16
4	$2,924.65
5	$3,041.63

×1.04
×1.04
×1.04

4% every year

2. 1.04

3. $v = 2{,}500(1.04)^n$

4. It will take about 18 years to double the value of the investment.

5. The graph of the equation for 6% growth rate will increase faster than the graph of the equation for 4% growth rate.

C. 1. a. 1.00 = GF = 0% change

b. 1.15 = GF = 15% increase

c. 1.3 = GF 30% increase

d. 1.75 = GF 75% increase

e. 2 = GF 100% increase

f. 2.5 = GF 150% increase

2. Possible answer: Change the growth rate to a decimal and add 1. (Be sure students know why this works.)

D. 1. a. 50% → 1.5 GF

b. 25% → 1.25 GF

c. 10% → 1.1 GF

d. 0% → 1 GF

2. Possible answer: Change the growth factor to a percent and subtract 100%. (Be sure students know why this works.)

Do you notice the relationship between the factor and the growth rate?

Growth Factor = 1 + Growth Rate (written as a decimal)

33% growth

Factor = 1 + 0.33 = 1.33

1 represents 100% of original

0.33 adding 33%

Factor = 1 + Rate

(written as a decimal)

What is the factor for 63% increase?

$$\text{Factor} = 1 + 0.63$$
$$= 1.63$$

What is the % change if the factor = 3.24

$$\text{Factor} = 1 + \text{Rate}$$
$$3.24 = 1 + \text{Rate}$$
$$-1 \qquad -1$$
$$2.24 = \text{Rate}$$

224%

Classwork

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Find the growth rate associated with the given growth factor.

10. 1.4 **11.** 1.9 **12.** 1.75

Find the growth factor associated with the given growth rate.

13. 45% **14.** 90% **15.** 31%

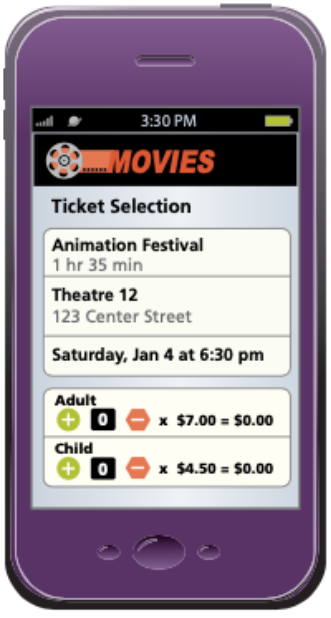
16. Suppose the price of an item increases by 25% per year. What is the growth factor for the price from year to year?

19. Suppose a movie ticket costs about $7, and inflation causes ticket prices to increase by 4.5% a year for the next several years.

a. How much will a ticket cost 5 years from now?

b. How much will a ticket cost 10 years from now? 30 years from now?

c. How many years will it take for the cost of a ticket to exceed $26?



41. In 2000, the population of the United States was about 282 million and was growing exponentially at a rate of about 1% per year.

a. At this growth rate, what will the population of the United States be in the year 2020?

b. At this rate, how long will it take the population to double?

c. The population in 2010 was about 308 million. How accurate was the growth rate?

For Exercises 43–45, write an equation that represents the exponential function in each situation.

43. A population is initially 300. After 1 year, the population is 361.

44. A population has a yearly growth factor of 1.2. After 3 years, the population is 1,000.

45. The growth rate for an investment is 3 % per year. After 2 years, the value of the investment is $2,560.

Homework

Finish classwork