## ALGEBRA 2 PACKET – ARNETT, GARCIA, TAYLOR WEEKS 3 & 4 (APRIL 13 – APRIL 23)

Students are encouraged to use the suggested pacing schedule as we move forward and learn NEW material. We are going to finish the chapter on Logarithms and then assess 4/21-4/22. For each lesson, teachers have provided a video with instruction and a completed power point with examples. (The resources listed below provide additional support through video lessons and practice activities.) The intent is for you to **FIRST**, watch the video and work through the examples. **SECOND**, do the attached assignments. **THIRD**, reach out to your teacher if you have questions. **FOURTH**, submit the assignment via Remind, Email, Teams (Taylor) or Focus. Parents and students are encouraged to connect with the teachers via Remind or email.

<u>ADDITIONAL RESOURCES</u> <u>ClassLink >> Pearson Realize</u> (Textbook) <u>ClassLink >> Algebra Nation</u> <u>https://www.khanacademy.org/resources/teacher-essentials</u>

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	DAILY PACING SCHEDULE
4/13 - 4/14	Watch video 7.5, complete notes on 7.5, Do WS 7.5
4/15	WS 7.5 DUE
4/16 - 4/17	Watch video 7.6, complete notes on 7.6, Do WS 7.6
4/20	WS 7.6 DUE
4/21-4/22	Quiz on Ch 7 (More info to follow via Remind or teacher websites)
4/23-4/24	Watch video 8.1 & 2.2, complete notes on 8.1 & 2.2, Do WS 8.1 & 2.2

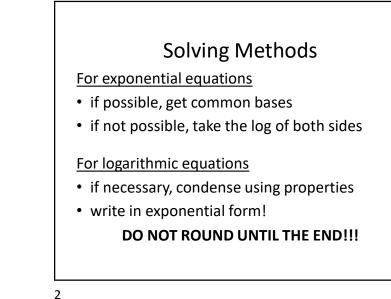
### 7.5 Exponential and Logarithmic Equations

Learning goals

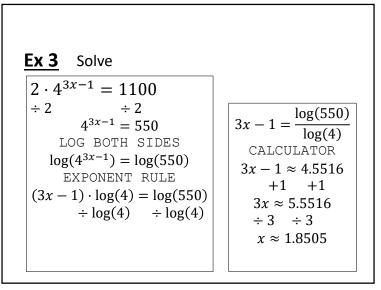
solve logarithmic and exponential equations

1

<b><u>Ex 1</u></b> Solve	
$3^{4x} = 9$	$27^{3x} = 81$
WRITE AS POWERS	WRITE AS POWERS
OF 3	OF 3
$3^{4x} = 3^2$	$3^{3x} = 3^4$
SET EXPONENTS	SET EXPONENTS
EQUAL	EQUAL
4x = 2	3x = 4
$\div 4  \div 4$	$\div 3 \div 3$
- <sup>1</sup>	4
$x = \overline{2}$	$x = \overline{3}$



**Ex 2** Solve  $7^{3x} = 20$  $5^{2x} = 16$ LOG BOTH SIDES LOG BOTH SIDES  $\log(5^{2x}) = \log(16)$  $\log(7^{3x}) = \log(20)$ EXPONENT RULE EXPONENT RULE  $3x \cdot \log(7) = \log(20)$  $2x \cdot \log(5) = \log(16)$  $\div \log(7) \div \log(7)$  $\div \log(5) \div \log(5)$ log(20)log(16) 2x =3x =log(5)log(7)CALCULATOR CALCULATOR  $3x \approx 1.5395$  $2x \approx 1.7227$  $\div 3 \div 3$  $\div 2 \div 2$  $x \approx 0.5132$  $x \approx 0.8614$ 



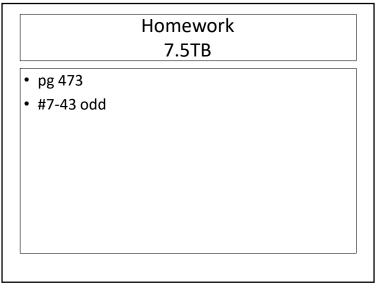
<b>Ex 5</b> Solve	
$\frac{1}{\log_8 7 + \log_8 (n-2)} = \log_8 (n-2) = \log_8 (n-2)$ CANCEL LOG <sub>8</sub>	CHECK THAT LOGS
7(n-2) = 6n DISTRIBUTE 7n - 14 = 6n -6n + 14 $-6n + 14n = 14$	

<b>Ex 4</b> Solve	
$log_{2} 5 + log_{2} x = log_{2} 15$ PRODUCT RULE $log_{2}(5x) = log_{2} 15$ CANCEL LOG <sub>2</sub> 5x = 15 $\div 5 \div 5$ x = 3	$CHECK THAT LOGS$ $ARE DEFINED!$ $\log_2 5 + \log_2(3) = \log_2 15$ $ \qquad $

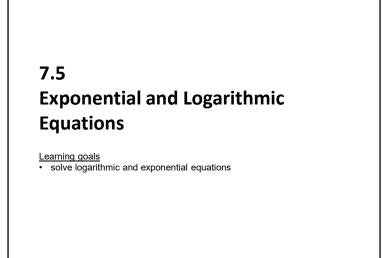
<b>Ex 6</b> Solve	CHECK THAT LOGS ARE DEFINED! $\log_2 8 + \log_2 2 = 4$
$\log_2 8 + \log_2 2 = x$	$\sqrt{\sqrt{\sqrt{2}}}$
PRODUCT RULE	
$\log_2 16 = x$	
CONVERT TO EXPONENTIAL	
EQUATION	
$2^x = 16$	
REWRITE AS POWERS OF 2	
$2^x = 2^4$	
SET EXPONENTS EQUAL	
x = 4	

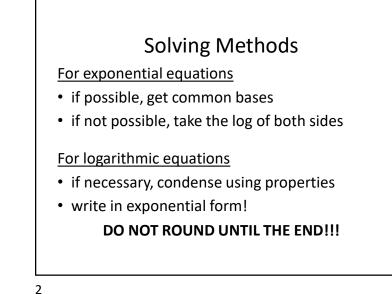
	CHECK THAT LOGS ARE DEFINED!
Ex 7 Solve	$4 \log_8(3) = \log_8 81$
$4 \log_8 x = \log_8 81$ EXPONENT RULE $\log_8(x^4) = \log_8 81$ CANCEL LOG <sub>8</sub>	$4 \log_8(-3) = \log_8 81$ X = -3  is extraneous
$x^4 = 81$	x = 3 is the only solution
RAISE TO RECIPRO $(x^4)^{1/4} = (81)^{1/4}$ SIMPLIFY $x = \pm 3$	OCAL EXPONENT

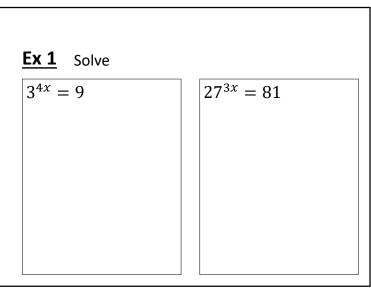


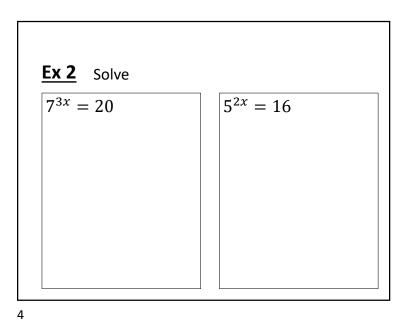


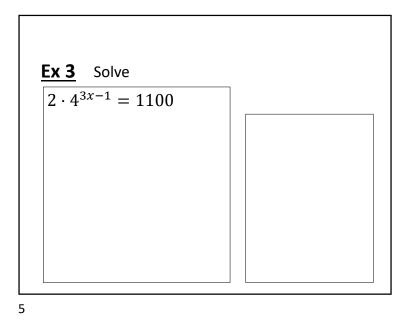
	CHECK THAT LOGS ARE DEFINED!
Ex 8 Solve	$\log(-5) + \log(-5+3) = 1$
$\log x + \log(x + 3) = 1$ <pre>PRODUCT RULE</pre>	x = -5 is extraneous
$\log(x(x+3)) = 1$	$\log(2) + \log(2+3) = 1$
CONVERT TO	x = 2 is the only solution
EXPONENTIAL EQUATIO $10^1 = x(x+3)$	N
SIMPLIFY AND DISTRI $10 = x^2 + 3x$	BUTE
$10 = x^2 + 3x$ Solve Quadratic EQU	ATION
<i>x</i> = −5, 2	









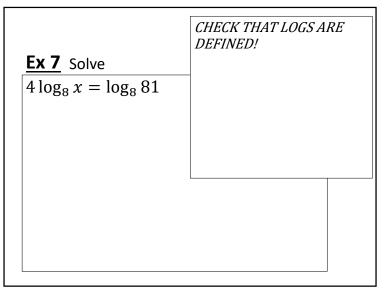


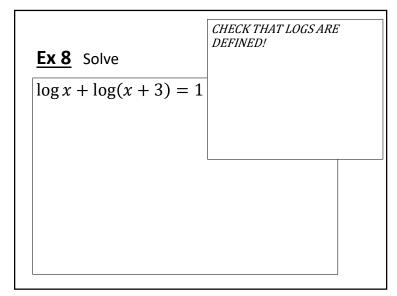
<b>Ex 5</b> Solve	
$\frac{1}{\log_8 7 + \log_8 (n-2) = 1}$	$og_8(6n)$
	CHECK THAT LOGS ARE DEFINED!

<b>Ex 4</b> Solve	
$\log_2 5 + \log_2 x = \log_2 15$	<i>CHECK THAT LOGS ARE DEFINED!</i>

<b>Ex 6</b> Solve $\log_2 8 + \log_2 2 = x$	CHECK THAT LOGS ARE DEFINED!

### 7.5 - Exponential and Logarithmic Functions





				A#		
Algebra 2 7.5 Exponential and Logarithmic Equatio	ang M/S	Name				
		Date		Period		
Solve each equation.						
<b>1.</b> $8^{2x} = 32$	<b>2.</b> $7^n = 343$		<b>3.</b> $9^{2x} = 27$			
$4.  25^{2n+1} = 625$	5. $36^{-2x+1} = 216$		6. $64^x = 4096$			
Solve each equation; round your answer to the nearest hundredth.						
<b>7.</b> $5^{2x} = 20$	8. $8^{n+1} = 3$		9. $4^{n-2} = 3$			
<b>10.</b> $4^{3n} = 5$	<b>11.</b> $15^{2n-3} = 245$		<b>12.</b> $4^x - 5 = 12$			

### Estimate to the nearest year.

**13.** The equation  $y = 281(1.01)^x$  is a model for the population of the United States in millions of people x number of years after the year 2000. Estimate when the United States population will reach 400 million people.

#### Solve each equation.

<b>14.</b> $\log 4x = -1$	<b>15.</b> $8\log x = 16$	
<b>16.</b> $\log(2x+5) = 3$	<b>17.</b> $\log(3x-2) = 3$	
<b>18.</b> $3\log(1-2x) = 6$	<b>19.</b> $2\log(2x+5) = 4$	
<b>20.</b> $2\log x + \log 4 = 16$	<b>21.</b> $\log(x+21) + \log x = 2$	
<b>22.</b> $\log 3x - \log 5 = 1$	<b>23.</b> $2\log x - \log 3 = 1$	

### For each problem, write an equation and answer each question.

- **24.** Suppose the population of a country is currently 8,100,000. Studies show this country's population is increasing 2% each year.
  - a. What exponential function would be a good model for this country's population?
  - **b.** Using the equation from part a, how many years will it take for the country's population to reach 9 million? Round your answer to the nearest hundredth.
- **25.** Suppose you deposit \$2500 in a savings account that pays you 5% interest per year.
  - a. How many years will it take for you to double your money?
  - b. How many years will it take for your account to reach \$8,000?

a natural logarithm (ln). Is when the base is E. 10gr X = lnK Vocabulary 7.6 Recall e is approximately 2.71828 Natural Logarithms natural logarithm function inverse of  $y = e^x$ Learning goals evaluate and simplify natural logarithm express solve equations using natural logarithms if  $y = e^x$ , then  $\log_e y = x$  or  $\ln y = x$ all the same properties app/4 USE your calculator. Ex 2 Ex1 A spacecraft can attain a stable orbit 300 km above Earth if it reaches velocity of 7.7 km/s. < Condense: (use same properties as common logarithms) The formula for the rocket's maximum velocity (V) is 2ln12-ln9  $V = -0.0098t + c \ln R$ ln12°-ln9 here t is firing time in seconds, c is the exhaust velocity, and R is the ratio of mass with fuel to its mass without fuel  $\frac{\ln 144}{\ln 4} = \ln 9$ velocity in km/s if the mass ratio (R) is 22, exhaust -, U098 (50) + 2.3ln 22 = Can the spacecraft achieve = ln 16 6.6194 In a - in 100 NOBC 6,61 \* always raind at the very end of The problem so that we all get the same answer Ewite MAD TE  $\frac{Ex4}{\text{solve}} \ln\left(\frac{x+2}{3}\right) = 12 \quad e^{l2} = \frac{\chi+2}{3}$ Ex 3  $\ln(2x-4)^3 = 6$ Solve e"= (2x-4) take cubed root of both sides O Do  $e^{12}$ @ times 3 l2= 2x-4 3 minus 2 Solve for K 488,262.3743 Ods e<sup>2</sup> (or 2 then e butter) 5.6945) to save an equation, with en suse e + by 2

### to solve an equation with 'e' - use en

Change of base Ex 5 formula Ex 6 Solve using natural logarithms Solve using natural logarithms ena EXD =  $4e^{3x} + 1.2 = 14$ 2x $e^{5} + 7.2 = 9.1$ -1,2 -1,2 enba 1.9 4p3x = 12.8 SO 2 en 1.9 3X= en3. = 3.7 e=.3877 6040 X = 8 you remember your formulas ??? Sowing Ex 8 Ex7 If you invest \$200 and it is worth \$315.24 after 7 years Dant If you invest \$200 and it is now worth \$254.25, at a rate of 6% compounded continuously, how long has the money been invested? of continuous compounding, what is the rate? forget to 10 315,24 = 2000 A= Pert olot Change It 1.5762 = e7r en 1.5762 254, 25 = 2000 toa when solving for an Dericht 2 or en. We use base 10 In for this one blc there is an e' in The ,06t 6.5 - 0 e. obt d ln 1.27125 06t= 4yrs

Form G

# 7-6 Practice Natural Logarithms (Pearson)

Name

Write each expression as a single natural logarithm.

 1.  $\ln 16 - \ln 8$  2.  $3 \ln 3 + \ln 9$  3.  $a \ln 4 - \ln b$  

 4.  $\ln z - 3 \ln x$  5.  $\frac{1}{2} \ln 9 + \ln 3x$  6.  $4 \ln x + 3 \ln y$  

 7.  $\frac{1}{3} \ln 8 + \ln x$  8.  $3 \ln a - b \ln 2$  9.  $2 \ln 4 - \ln 8$ 

Solve each equation. Check your answers. Round your answer to the nearest hundredth.

**10.**  $4 \ln x = -2$ **11.**  $2 \ln (3x - 4) = 7$ **12.**  $5 \ln (4x - 6) = -6$ **13.**  $-7 + \ln 2x = 4$ **14.**  $3 - 4 \ln (8x + 1) = 12$ **15.**  $\ln x + \ln 3x = 14$ **16.**  $2 \ln x + \ln x^2 = 3$ **17.**  $\ln x + \ln 4 = 2$ **18.**  $\ln x - \ln 5 = -1$ 

### Solve each equation. NO DECIMAL ANSWERS!

**19.**  $\ln e^x = 3$ **20.**  $3 \ln e^{2x} = 12$ **21.**  $\ln e^{x+5} = 17$ **22.**  $\ln 3x + \ln 2x = 3$ **23.**  $5 \ln (3x - 2) = 15$ **24.**  $7 \ln (2x + 5) = 8$ **25.**  $\ln (3x + 4) = 5$ **26.**  $\ln \frac{2x}{41} = 2$ **27.**  $\ln (2x - 1)^2 = 4$ 

Use natural logarithms to solve each equation. Round your answer to the nearest hundredth.

**28.**  $e^{x} = 15$  **29.**  $4e^{x} = 10$  **30.**  $e^{x+2} = 50$  **31.**  $4e^{3x-1} = 5$ **32.**  $e^{x-4} = 2$  **33.**  $5e^{6x+3} = 0.1$  **34.**  $e^{x} = 1$  **35.**  $e^{\frac{x}{5}} = 32$ 

Solve each equation. NO DECIMAL ANSWERS!

<b>36.</b> $3e^{3x-5} = 49$	<b>37.</b> $7e^{5x+8} = 0.23$	<b>38.</b> $6 - e^{12x} = 5.2$	<b>39.</b> $e^{\frac{x}{2}} = 25$
<b>40.</b> $e^{2x} = 25$	<b>41.</b> $e^{\ln 5x} = 20$	<b>42.</b> $e^{\ln x} = 21$	<b>43.</b> $e^{x+6} + 5 = 1$

Simplify each expression.

<b>44.</b> $\ln e^4$	<b>45.</b> 5 ln <i>e</i> <sup>5</sup>	<b>46.</b> $\frac{\ln e^2}{2}$	<b>47.</b> $\ln e^{100}$
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### Algebra 2 Assessment 7.4 – 7.6 Exponential & Logarithmic Equations

Name \_\_\_\_\_

 $\frac{3}{4}$ 

Condense each expression. **2.**  $3 \log_2 8 - 5 \log_2 3$ **1.**  $log_3 24 + log_3 2$ Expand each logarithmic expression. **3.**  $\log_7 \frac{23}{4}$ 4.  $\log_2(32x^3)$ Use the Change of Base formula to evaluate . 5.  $log_{125}25$ **6.**  $log_5 40$ Solve each equation. NO DECIMAL ANSWERS! **8.** log (6x - 2) = 3**7.**  $27^{4x} = 9$ **10.**  $log_{\chi} \frac{16}{625} = \frac{4}{3}$ **9.**  $log_8 x = -3$ Choose the best answer choice for each question. **12.**  $2^{3x+2} = 64$ **11.**  $9^x = 243$ a.  $\frac{8}{3}$  b.  $\frac{4}{3}$ 2 b. 5 a. c. 2 d. 2.5 d. 10 c. **14.**  $16^{2x} = 124$ **13.** log(3x + 25) = 20.869 b. 1.150 a. 25 a. b. 75 c.  $41\frac{2}{3}$  d. c. 1.739 d. 3.477 100

	Answers
1.	
2.	
3.	
4.	
5.	expression
	value
6.	expression
	value
7.	
8.	
9.	
10.	·
	·
12.	
13.	
14.	·

Choose the best answer choice for the problem.

**15.** 
$$2^{3x+1} = 7$$
  
a.  $3\left(\frac{\log 7}{\log 2} - 1\right)$ 
b.  $\frac{1}{3}\left(\frac{\log 2}{\log 7} - 1\right)$   
c.  $\frac{\log 7}{3\log 2} - 1$ 
d.  $\frac{1}{3}\left(\frac{\log 7}{\log 2} - 1\right)$ 

Solve the equation. NO DECIMAL ANSWER!

**16.**  $4^x = 19$ 

Condense the expression.

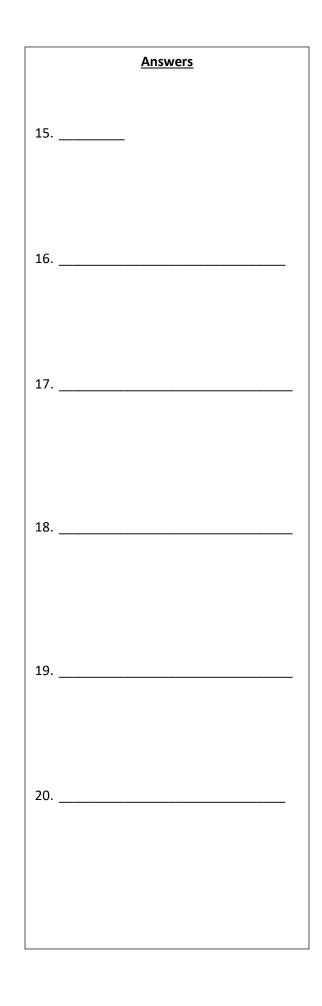
*17.* 3*ln*5 – ln 2

Solve each equation. NO DECIMAL ANSWERS!

**18.**  $e^{x+1} = 13$ 

**19.**  $ln(x-2)^2 = 6$ 

**20.** 
$$e^{\frac{x}{2}+1} + 3 = 8$$



two formulas: lino **Direct Variation Inverse Variation** a linear equation in the form y = kx where k cannot = 0  $y = \frac{k}{x}$  $k = \frac{y}{x}$ 8.1 Inverse Variation & 2.2 Direct Variation  $k \neq 0$ So k = xy 'k' is the constant of variation omust find K for all points - do either R= xy or or K= y to see which one gets all the same K values x/K=xy K= Ex 2 Ex 3 .7.3 Ex 1 Inc 3/7 Direct, inverse, or Direct, inverse, or neither? Nermen Direct, inverse, or neith direct 21 x y x . y x y 3 0.7 -2 6 -2 5 -1.3 \$ - 10 0.35 = 2.1 7 -4 21 0.1 - 15 .35 = 2.1  $\begin{array}{c} K = & Y \\ R = & -12 \end{array}$ K= YY K= 7 K= K= -3 K= -3.8 NU -40 NO K=-2.5 K=-6.5 -2.5 NO (3,1)1000/4=KX (time cups, Ex 6 K=28 Ex 5 A dripping faucet wastes a cup of water if it drips for three minutes. The amount of water wasted varies Are these direct variations? Suppose that x and y vary 1= 3K 5x = 2y3y = 7x + 7directly with the amount of time the faucet drips. Write yes 28 no 7 3 4= 3× How long must it drip to waste 4.5 cups? 4.5= 3x Min direct variation is JUST y=Kx+0 there can't be a 01 13,5 Constant (yint) 1

\* must words to We will never mention the # In the problem **Combined Variations** Ex 7 Ex 8 • y varies directly with the square of x:  $y = kx^2$ The mass *m* of a moving object is related to its kinetic energy *k* and its velocity **v** by  $m = \frac{2k}{v^2}$ Describe the relationship using a combined variation • y varies inversely with the cube of x:  $y = \frac{k}{x^5}$ A varies de jointly with Describe the relationship using a combined variation • z varies jointly with x and y and inversely with w:  $z = \frac{k_{\rm T}y}{m_{\rm T}}$ n varies directly + the sum of with K & Inv z varies directly with x and inversely with the product of w and y:  $z=\frac{k\chi}{z}$ ultre square of V WY (didn't mention (didn't mention the 2) the 12  $Z = \frac{Kx}{y^2}$   $50 = \frac{1(35)}{10}$ Ex 9 z varies directly as x and inversely as the square of y. When  $x=35,\,y=7,$  and z=50, write a function and find z when x=5 and y=10. $Z = \frac{70 \times}{4^2}$ KX Y2 2= 3.5 K=70 7= 70× SU then Z= 70(5 Z= 3.5 2

Algebra 2	Name:		
WS 8.1&2.2 Direct and Indirect Variation	Date:	Pd:	

Determine whether *y* varies directly with *x*. If so, find the constant of variation.

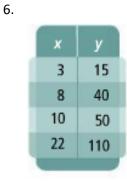
1. y = 12x 2. y = 4x - 3

### For problem numbers 3-4, y varies directly with x.

- 3. If y = 4 when x = -2, find x when y = 6.
- 4. If y = 7 when x = 2, find x when y = 3.

5. **Distance** For a given speed, the distance traveled varies directly with the time. Kate's school is 5 miles away from her home and it takes her 10 minutes to reach the school. If josh lives 2 miles from school and travels at the same speed as Kate, how long will it take him to reach the school?

Is the relationship between the values in each table a *direct variation*, and *inverse variation*, or *neither*? Write equations to model the direct and inverse variations.



7.

x	y
3	14
5	8.4
7	6
10.5	4

Is the relationship between the values in each table a *direct variation*, and *inverse variation*, or *neither*? Write equations to model the direct and inverse variations.



**10. Painting** The number of buckets of paint *n* needed to paint a fence varies directly with the total area *a* of the fence and inversely with the amount of paint *p* in a bucket. It takes three 1-gallon buckets of paint to paint 72 square feet of fence. How many 1-gallon buckets will be needed to paint 90 square feet of fence?

#### Write the function that models each variation. Find *z* when x = 4 and y = 9.

**11.** *Z* varies directly with *x* and inversely with *y*. When x = 6 and y = 2, z = 15.

**12.** *Z* varies jointly with *x* and *y*. When x = 2 and y = 3, z = 60.

**13.** *Z* varies inversely with the product of x and y. When x = 2 and y = 4, z = 0.5.