Wilkinson Junior High School

Mary Mimbs, Vice-Principal | Christina Cornwell, Principal | Chris Carella, Asst. Principal

Activities Director: Miranda Knox | Counselor: Sheree Krause | Counselor: Melanie Bartholomew

Dear Parent & Student,

Attached to this letter is the math packet for the summer. The purpose of this math packet is to retain math skills taught this year that will be needed for the upcoming school year. <u>This packet is not optional.</u> It must be completed and given to your math teacher during the first week of school. This will be your first grade in the grade book. Wilkinson Junior High is a no-opt out school. This means that all homework and summer assignments must be completed.

The math packet has examples for each section to help you with the problems. If that is not enough help, please feel free to use some of the resources listed below. During the first week of school students will also be able to ask questions over a problem that is giving them difficulty. After the first week, students who haven't finished the packet or have many wrong answers will be assigned to the Math Success Lab for help during their elective period. This support will ensure that your child doesn't struggle right off the bat in their new class.

Thank you for your help with this over the summer. The math department and the school want your child to be successful in the upcoming school year.

Sincerely,

Cornwell

Mrs. Cornwell
Principal
Wilkinson Junior High - Eagles
N.E.S.T. - Northeast Exemplary School of Technology

Resources:
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Algebraic Vocabulary

Term	Definition
Absolute Value	The distance a number is from zero on the number line. It is always positive or zero.
Algebraic Expressions	An expression consisting of one or more numbers and variables along with one or more arithmetic operations.
Base	In an expression of the form x^2, the base is x; the number or expression being multiplied.
Coefficient	The numerical factor of a term. A number that is multiplied by a variable. The coefficient in 7n is 7.
Combine Like Terms	Combine terms that have the same variable to the same power by adding or subtracting their coefficients. Constants, numbers without variables, are like terms and can be combined. $2x - 7 + 5x + 9 = 7x + 2$
Constant	A fixed value, typically a number.
Cross Products	If the cross products in a ratio are equal then the ratio forms a proportion. In the proportion $\frac{2}{3} = \frac{8}{12}$, the cross products are $2 \times 12 = 3 \times 8$
Difference	The answer to a subtraction problem.
Equation	A mathematical sentence that contains an equal sign
Evaluate	To find the value of an expression
Exponent	In an expression of the form x^2, the exponent is 2. It indicates the number of times that x is used as a factor.
Factors	In an algebraic expression, the quantities being multiplied are factors
Greatest Common Factor (GCF)	The product of prime factors common to two or more integers. The largest factor that divides into both numbers.
Identity	An equation that is true for every value of the variable
Inequality	An open sentence that contains the symbols $<$, $\leq$, $>$, or $\geq$.
Input	A value of the independent variable "x".
Integers	Whole numbers and their opposites.
Inverse operations	Operations that undo each other.
Irrational Number	Numbers that cannot be expressed as a terminating or repeating decimals.
Isolate	Using properties of equality and inverse operations to get a variable with a coefficient of 1 alone on one side of the equation.

Least Common Multiple (LCM)	The smallest number that is a common multiple of two or more numbers
Like terms	Terms with exactly the same variable factors in a variable expression.
Linear equation	An equation whose graph forms a straight line. It is in the form of Ax + By = C.
Natural Numbers	The set {1,2,3, ...} . Also called counting numbers.
Numerical Expression	A mathematical phrase involving numbers and operation symbols, but no variables.
Ordered pair	Two numbers that identify the location of a point.
Order of operations	1. Perform any operation inside grouping symbols 2. Simplify powers 3. Multiply and divide in order from left to right 4. Add and subtract in order from left to right
Origin	The point at which the axes of the coordinate plane intersect.
Output	A value of the dependent variable "y"
Perfect Square	A number with a square root that is a rational number. Examples - $\sqrt{1}$, $\sqrt{4}$, $\sqrt{9}$, $\sqrt{16}$...
Prime Factorization	A whole number expressed as a product of factors that are all prime numbers.
Prime Number	A whole number, greater than 1, with only factors that are 1 and itself.
Product	The answer to a multiplication problem.
Proportion	A proportion is an equation that shows that two ratios are equivalent; $\frac{a}{b} = \frac{c}{d}$ *and* $b \neq 0$ *and* $d \neq 0$
Quotient	The answer to a division problem.
Radical sign	The symbol $\sqrt{\cdots}$, used to indicated a nonnegative square root
Ratio	A comparison of two numbers by division. The ratio comparing 2 to 3 can be stated as 2 out of 3, 2:3, or $\frac{2}{3}$.
Rational Numbers	The set of numbers expressed in the form of a fraction $\left(\frac{a}{b}\right)$, where a and b are integers and $b \neq 0$.
Real Numbers	The set of rational numbers and the set of irrational numbers together.
Reciprocal	Given a nonzero rational number a/b, the reciprocal, or multiplicative inverse, is b/a. The product of a nonzero number and its reciprocal is 1.
Sequence	An ordered list of numbers that often forms a pattern.

Simplify	To replace an expression with its simplest name or form.
Slope	The ratio of the change in the y-coordinate (rise) to the corresponding change in the x-coordinates (run) as you move from one point to another along a line.
Slope-intercept form	An equation of the form y = mx + b, where m is the slope and b is the y-intercept.
Solution	The answer that makes an equation true.
Square Root	One of two equal factors of a number.
Sum	The answer to an addition problem.
Term	A number, variable, or the product or quotient of a number and one or more variables.
Variable	Symbols used to represent unspecified numbers or values
Whole Numbers	The non negative integers.
X-axis	The horizontal axis of the coordinate plane.
X- coordinate	The first number in an ordered pair, specifying the distance left or right of the y-axis of a point in the coordinate plane.
X - intercept	The x-coordinate of a point where a graph crosses the x-axis.
Y- axis	The vertical axis of the coordinate plane.
Y- coordinate	The second number in an ordered pair, specifying the distance above or below the x - axis of a point in the coordinate plane.
Y- intercept	The y-coordinate of a point where a graph crosses the y-axis. (0,y)

Properties of Numbers and Algebra

Addition Property of Equality	If you add the same number to each side of an equation, the two sides remain equal. If a = b , then $a+c=b+c$ *or* $a+(-c)=b+(-c)$
Additive Identity	For any number *a*, *a* + 0 = *a*; 0 is the additive identity
Additive Inverse	Any two integers whose sum is 0. 7 and -7 are additive inverses. $x + (-x) = 0$
Associative Property of Addition	For any numbers a, b and c, $(a+b)+c = a+(b+c)$ (5 + 9) + 1 = 5 + (9 + 1)
Associative Property of Multiplication	For any numbers a, b, and c $(a\times b)\times c=a\times(b\times c)$ (7 x 2) x 5 = 7 x (2 x 5)
Commutative Property of Addition	For any numbers a and b, $a+b=b+a$ 12 + 7 = 7+ 12
Commutative Property of Multiplication	For any numbers a and b, $a\times b=b\times a$ 5 x 8 = 8 x 5
Division Property of Equality	If each side of an equation is divided by the same nonzero number, then the two sides remain equal. If a = b and c $\neq$ 0 , then $\frac{a}{c}=\frac{b}{c}$
Distributive Property of Division	The sum of two addends divided by a number is the sum of the quotient of each addend and the number. a $\neq$ 0. $\frac{(b+c)}{a}=\frac{b}{a}+\frac{c}{a}$ $\frac{(a+b)}{5}=\frac{a}{5}+\frac{b}{5}$
Distributive Property of Multiplication	The sum of two addends multiplied by a number is the sum of the product of each addend and the number. $a\bullet(b+c)=a\bullet b+a\bullet c$ $5(a+b)=5a+5b$
Multiplication Property of Equality	If each side of an equation is multiplied by the same number, then the two sides remain equal. *If* $a=b$, *then* $a\bullet c=b\bullet c$
Multiplicative Identity	For any number a, $a\ x\ 1 = a$ and $1\ x\ a = a$; one is the multiplicative identity
Multiplicative Inverse	Two numbers with a product of 1. 3 *and* $\frac{1}{3}$ are multiplicative inverses. $x\bullet\frac{1}{x}=1$ *or* $\frac{1}{x}\bullet x=1$ $x\neq 0$
Multiplicative Property of Zero	The product of any number and zero is 0. $a\times 0 = 0$ *or* $0\times a=a$

Substitution Property	If a = b , then b can be substituted for a in any equality or inequality. $a = 7$ and $2a - 5 = 9$, then $2(7) - 5 = 9$ $x = 2y + 1$ and $y = 4x$, then $y = 4(2y + 1)$
Subtraction Property of Equality	If you subtract the same number from each side of an equation, then the two sides remain equal. *If* $a = b$, *then* $a - c = b - c$.
Symmetric Property	If a=b, then b = a. If $12 = 2x - 2$, then $2x - 2 = 12$
Zero Property of Multiplication	If the product of two numbers is zero, then at least one of the factors must be zero. *If* $ab = 0$, *then* $a = 0$ *or* $b = 0$.

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Rules for Working with Exponents

$$Base^{Exponent} = \underbrace{Base\ x\ Base\ x\ Base\ x \ldots Base}_{Exponent\ number\ of\ times}$$

Write the following powers in expanded form. The first two are done for you.

1) $x^6 = x \cdot x \cdot x \cdot x \cdot x \cdot x$ 2) $(4a)^5 = 4a \cdot 4a \cdot 4a \cdot 4a \cdot 4a$

3) $y^5 =$ ______________________ 4) $(5b)^3 =$ ______________________

5) $m^3 =$ ______________________ 6) $(4ab)^4 =$ ______________________

Product of Powers – When multiplying powers with the same base, add the exponents and keep the base.
Examples: $5^3 \cdot 5^6 = 5^{3+6} = 5^9$: $x^4 \cdot x^3 \cdot x^{-2} \cdot x^5 = x^{4+3+(-2)+5} = x^{10}$: $c^3 \cdot d^4 \cdot c^5 \cdot d^{-1} \cdot d = c^{3+5}d^{4+(-1)+1} = c^8d^4$

Simplify the following expressions using the product of powers.

1) $6^3 \cdot 6^{11} =$ ______________________ 2) $a^2 \cdot b^3 \cdot b^2 \cdot a^6 =$ ______________________

3) $m^6 \cdot m^{-2} =$ ______________________ 4) $p^{-3} \cdot p^6 \cdot p^2 \cdot s^3 \cdot s =$ ______________________

Quotient of Powers – When dividing powers with the same base, subtract the exponents and keep the base.
Examples: $b^{12} \div b^3 = b^{12-3} = b^9$: $\frac{9^7}{9^4} = 9^{7-4} = 9^3$: $\frac{b^{12}c^5}{b^{-3}c^2} = b^{12-(-3)}c^{5-2} = b^{12+3}c^3 = b^{15}c^3$

Simplify the following expressions using the quotient of powers.

1) $\frac{12^7}{12^3} =$ ______________________ 2) $a^{13} \div a^5 =$ ______________________

3) $\frac{m^9n^6}{m^4n^{-1}} =$ ______________________ 4) $x^{15}y^7 \div x^6y =$ ______________________

Power of Zero – Any non-zero number raised to the zero power is 1.
Examples: $9^0=1$; $25^0=1$; if $x \neq 0$, then $x^0 = 1$

Simplify the following expressions.

1) $125^0 =$ ______________ 2) $73^0 =$ ______________ 3) $a^0=$ ______________ $(a \neq 0)$

Negative Powers – If a number if raised to a negative power, it can be rewritten as a positive power in the denominator of a fraction. $a^{-n} = \frac{1}{a^n}$ In addition, $\frac{1}{a^{-n}} = a^n$ $7^{-3} = \frac{1}{7^3}$ $3r^{-8} = \frac{3}{r^8}$

Simplify the following expressions using a positive exponent.

1) $8^{-3} =$ 2) $y^{-6} =$ 3) $5t^{-2} =$

Power of Powers – When a power (base with exponent) is raised to another power, the exponents are multiplied together. $(x^3)^4 = x^3 \cdot x^3 \cdot x^3 \cdot x^3 = x^{3 \cdot 4} = x^{12}$ $(2^3)^5 = 2^{15}$
$(4d^5)^7 = 4^{1 \cdot 7}d^{5 \cdot 7} = 4^7d^{35}$

Simplify the following expressions.

1) $(6^3)^7=$ ______________ 2) $(t^3)^6 =$ ______________ 3) $(2w^4)^5 =$ ______________

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Prime Factorization is used in Algebra I to find common factors, multiples, and simplifying radicals.

Prime Numbers have only 2 factors- 1 and itself. Here are the first 10 prime numbers – 2, 3, 5, 7, 11, 13, 17, 19 ,23 and 29.

Unit: EXPRESSIONS & EQUATIONS

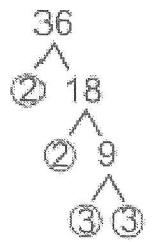
Objective: Prime factorization of a number.

Key Concepts:

- Prime factorization – the number written as a product of its prime factors
- Can use a factor tree or ladder diagram

Example (Using a factor tree (Using a factor tree)

Use a factor tree to find the prime factorization of 36



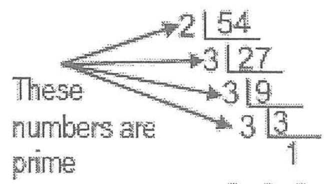
Number is prime

Prime factorization is $2^2 \cdot 3^2$

MUST SHOW WORK!!

Example using a ladder diagram

Use a ladder diagram to find prime factorization of 54.



$2 \cdot 3 \cdot 3 \cdot 3$

$2 \cdot 3^3$ Exponential Form

1. Find the prime factorization of 891 using either method.

   Exponential Form: ____________________

2. Find the prime factorization of 27 using either method.

   Exponential Form: ____________________

3. Find the prime factorization of 230 using a tree diagram.

   Exponential Form: ____________________

4. Find the prime factorization of 402 using the ladder diagram.

   Exponential Form: ____________________

Name ______________________ Date ______________ Class ______________

LESSON 1-4

Solving Two-Step Equations

Practice and Problem Solving: A/B

Solve each equation. Cross out each number in the box that matches a solution.

−18	−8	−6	−4	−3	−2	2	3	4	6	8	18

1. $5x + 8 = 23$ ______

2. $-2p - 4 = 2$ ______

3. $6a - 11 = 13$ ______

4. $4n + 12 = 4$ ______

5. $9g + 2 = 20$ ______

6. $\frac{k}{6} + 8 = 5$ ______

7. $\frac{s}{3} - 4 = 2$ ______

8. $\frac{c}{2} + 5 = 1$ ______

9. $9 + \frac{a}{6} = 8$ ______

Solve. Check each answer.

10. $3v - 12 = 15$ ______

11. $8 + 5x = -2$ ______

12. $\frac{d}{4} - 9 = -3$ ______

Write an equation to represent the problem. Then solve the equation.

13. Two years of local Internet service costs $685, including the installation fee of $85. What is the monthly fee?

______

14. The sum of two consecutive numbers is 73. What are the numbers?

______

To solve 2 step equations:

1) Isolate the variable by undoing operations
2) Undo operations in the opposite order of PEDMAS
3) Typically undo addition or subtraction FIRST
4) Be sure to do any operations to BOTH sides
5) Simplify before completing the next step
6) Then undo multiplication or division.
7) Check answer by replacing the variable with the answer and evaluating to see if statement is true.

$$4x + 7 = 31$$
$$-7 \quad -7$$
$$\frac{4x}{4} = \frac{24}{4}$$
$$x = 6$$
$$4(6) + 7 = 31 \text{ True}$$

Name ______________________________ Date ______________ Class ______________

LESSON 2-3

Solving Two-Step Inequalities

Practice and Problem Solving: A/B

Fill in the blanks to show the steps in solving the inequality.

1. $3x - 5 < 19$

   $3x - 5 +$ ______ $< 19 +$ ______

   $3x <$ ______________

   $3x \div$ ______ $<$ ______ $\div$ ______

   $x <$ ______________

2. $-2x + 12 < -4$

   $-2x + 12 -$ ______ $< -4 -$ ______

   $-2x <$ ______________

   $-2x \div$ ______ $>$ ______ $\div$ ______

   $x >$ ______________

3. Why do the inequality signs stay the same in the last two steps of Exercise 1?

   ____

4. Why is the inequality sign reversed in the last two steps of Exercise 2?

   ____

Solve the inequalities. Show your work.

5. $-7d + 8 > 29$

6. $12 - 3b < 9$

7. $\frac{z}{7} - 6 \geq -5$

8. Fifty students are trying to raise at least $12,500 for a class trip. They have already raised $1,250. How much should each student raise, on average, in order to meet the goal? Write and solve the two-step inequality for this problem.

   ____

   ____

9. At the end of the day, vegetables at Farm Market sell for $2.00 a pound, and a basket costs $3.50. If Charlene wants to buy a basket and spend no more than $10.00 total, how many pounds of vegetables can she buy? Write and solve the inequality.

   ____

To solve inequalities – Follow the same steps for solving equations (see p.1). <u>The only difference is</u> when you multiply or divide by a **<u>negative number</u>** you need to <u>change the direction</u> of the inequality sign.

$$\begin{array}{rcl} -5x - 9 & > & -39 \\ +9 & & +9 \\ \underline{-5x} & > & \underline{-30} \\ -5 & & -5 \\ x & < & 6 \end{array}$$

check

$-5(5) - 9 > -39$

$-25 - 9 > -39$

$-34 > -39$

true

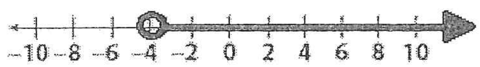
Name____ Date ____________________

Solving Two Step Inequalities

To graph inequalities

$>$ or $<$ open circle on number

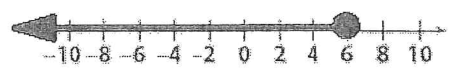
x > -4



$\leq$ or $\geq$

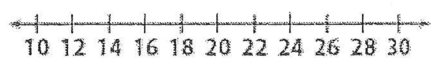
closed or filled in circle on number

$x \leq 6$

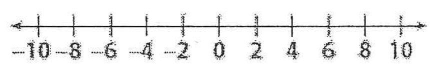


Solve each inequality. Graph and check the solution.

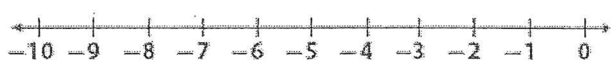
1) $2s + 5 \geq 49$ ________________



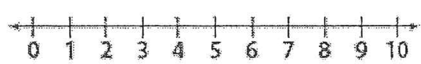
2) $-3t + 9 \geq -21$ ________________



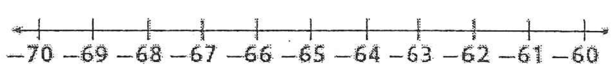
3) $55 > -7v + 6$ ________________



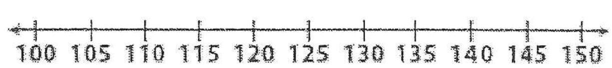
4) $41 > 6m - 7$ ________________



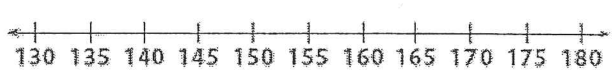
5) $\frac{a}{-8} + 15 > 23$ ________________



6) $\frac{f}{2} - 22 < 48$ ________________



7) $-25 + \frac{t}{2} \geq 50$ ________________



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Solving Equations with Variables on Both Sides

Steps to solve equations with variables on both sides

1) Simplify each side before moving any variables or constants.
2) Move the variable with the smallest coefficient using subtraction (coefficient is positive) or addition (coefficient is negative).
3) Using addition or subtraction to move any constants to the opposite side of the variable.
4) Using multiplication or division to remove any coefficients from the variable.
5) Check answer.

$$4x + 8 = 7x - 18 - 1$$
$$4x + 8 = 7x - 19$$
$$-4x \qquad -4x$$
$$8 = 3x - 19$$
$$+19 \qquad +19$$
$$\frac{27}{3} = \frac{3x}{3}$$
$$9 = x$$

Check

$$4(9) + 8 = 7(9) - 18 - 1$$
$$36 + 8 = 63 - 18 - 1$$
$$44 = 45 - 1$$
$$44 = 44 \quad \text{True}$$

Solve each equation

1) $8u = 3u + 35$
2) $7y = 33 - 4y$
3) $2x + 48 = 10x$
4) $5t - 26 = 18t$
5) $k = 8k + 28$
6) $-27n - 63 = -30n - 3$
7) $4x + 4 = 2x + 36$
8) $9y - 1 = y - 25$
9) $14p - 8 = 19 + 20p + 3$

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Solving Multiple Step Equations with the Distributive Property

Steps to solve multiple step equations -

Goal – to isolate the variable

1) Use the Distributive Property, if necessary.
2) Common any like terms on each side of the equation BEFORE using inverse operations.
3) Using inverse operation isolate the variable.
   a. To remove any constants -Undo addition or subtraction FIRST
   b. To remove any coefficients (numbers with the variable) – Undo the multiplication or division.
      i. Exception – remove fraction coefficients by multiplying by the reciprocal
4) Check your answer by replacing the variable with the answer and evaluating the equation.

$$\frac{1}{5}(5x+30) = -2(8-x)$$
$$x+6 = -16+2x$$
$$-x \quad = \quad -x$$
$$6 = -16+x$$
$$+16 \quad +16$$
$$22 = x$$

$$4(3x-5)+1 = 5(5-2x)$$
$$12x-20+1 = 25-10x$$
$$12x-19 = 25-10x$$
$$+10x \quad\quad +10x$$
$$22x-19 = 25$$
$$+19 \quad +19$$
$$\frac{22x}{22} = \frac{44}{22}$$
$$x = 2$$

Solve for x.

1) $4(x+8)-4 = 34-2x$

2) $-3x(x+4)+15 = 6-4x$

3) $10+4x = 5(x-6)$

4) $\frac{2}{3}(9+6x) = -2(3x-8)+10$

5) $-6(x-1)-7 = -7(x-1)$

Name ______________________ Date ______________ Class______________

LESSON 12-3

Graphing Linear Nonproportional Relationships Using Slope and y-Intercept

Reteach

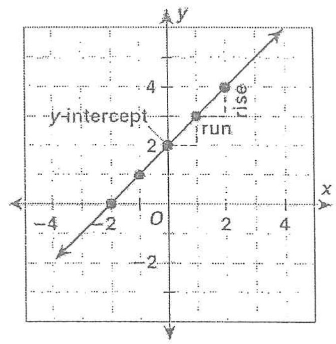
You can graph a linear function by graphing the y-intercept of the line and then using the slope to find other points on the line.

The graph shows $y = x + 2$.

To graph the line, first graph the y-intercept which is located at (0, 2).

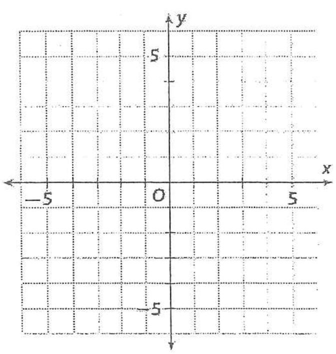
Because the slope is 1 or $\frac{1}{1}$, from the y-intercept, rise 1 and run 1 to graph the next point.

Connect the points with a straight line.



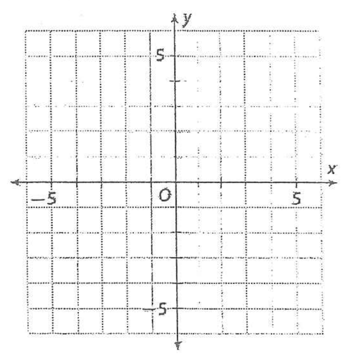
Graph each equation using the slope and the y-intercept.

1. $y = 4x - 1$



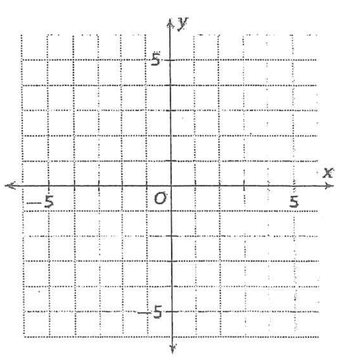
slope = _____ y-intercept = _____

2. $y = -\frac{1}{2}x + 2$



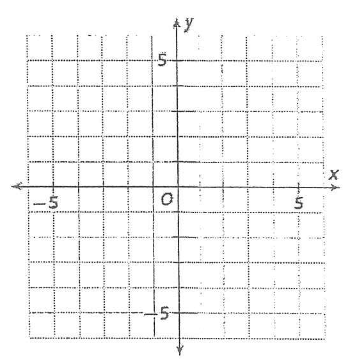
slope = _____ y-intercept = _____

3. $y = -x + 1$



slope = _____ y-intercept = _____

4. $y = 2x - 3$



slope = _____ y-intercept = _____

Name ______________________ Date ______________ Class ______________

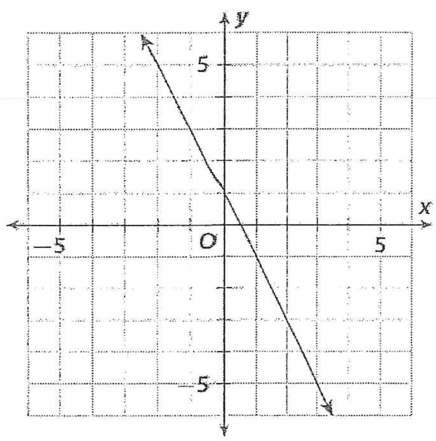
LESSON 12-3

Graphing Linear Nonproportional Relationships Using Slope and y-Intercept

Practice and Problem Solving: D

Graph each equation using the slope and the y-intercept. The first one is done for you.

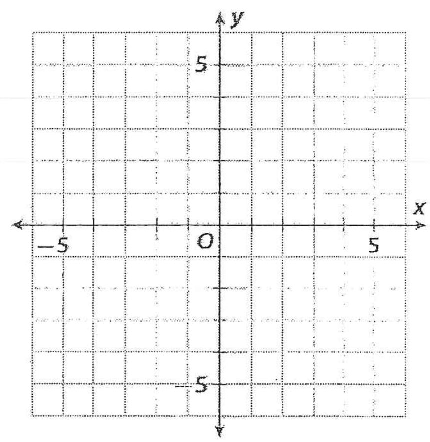
1. $y = -2x + 1$



slope = −2

y-intercept = 1

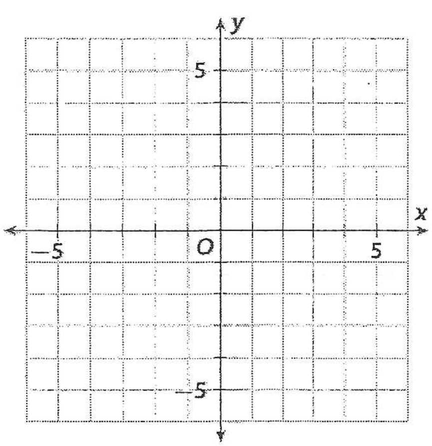
2. $y = 3x - 2$



slope = ______________

y-intercept = ______________

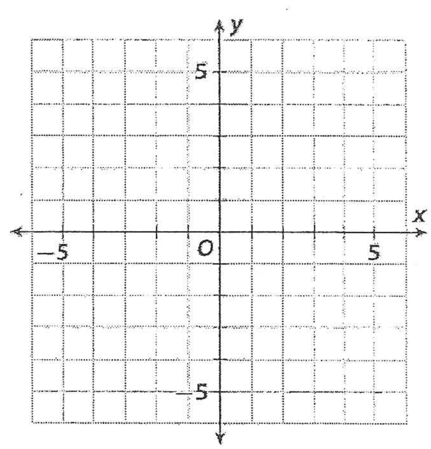
3. $y = \frac{1}{3}x + 1$



slope = ______________

y-intercept = ______________

4. $y = -x + 3$



slope = ______________

y-intercept = ______________

Name ______________________ Date ______________ Class ______________

LESSON 16-1

Solving Systems of Linear Equations by Graphing

Reteach

When solving a system of linear equations by graphing, first write each equation in slope-intercept form. Do this by solving each equation for y.

Solve the following system of equations by graphing.

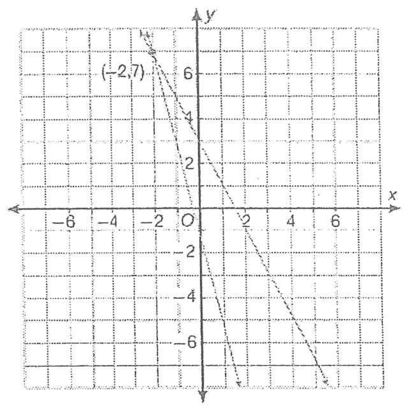
$y = -2x + 3$
$y + 4x = -1$

The first equation is already solved for y.

Write the second equation in slope-intercept form.
Solve for y.
$y + 4x - 4x = -1 - 4x$

$y = -4x - 1$

Graph both equations on the coordinate plane.



The lines intersect at (−2, 7). This is the solution to the system of linear equations.

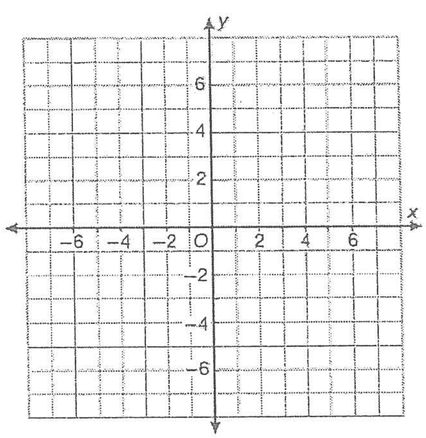
To check the answer, substitute −2 for x and 7 for y in the original equations.

$y = -2x + 3;\ 7 = -2(-2) + 3;\ 7 = 4 + 3;\ 7 = 7$

$y + 4x = -1;\ 7 + 4(-2) = -1;\ 7 - 8 = -1;\ -1 = -1$

Solve each linear system by graphing. Check your answer.

1. $y = x + 1$
   $y = -x + 5$



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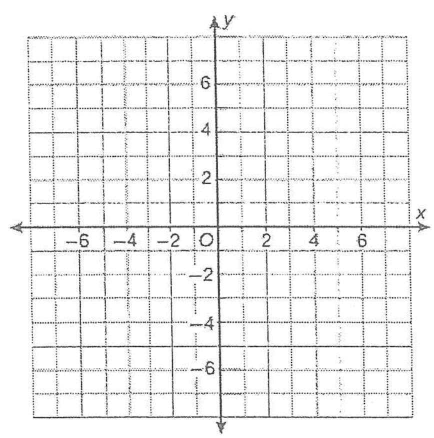
2. $y + 3x = 1$
   $y - 6 = 2x$



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Name ______________________ Date ______________ Class ______________

LESSON 16-1

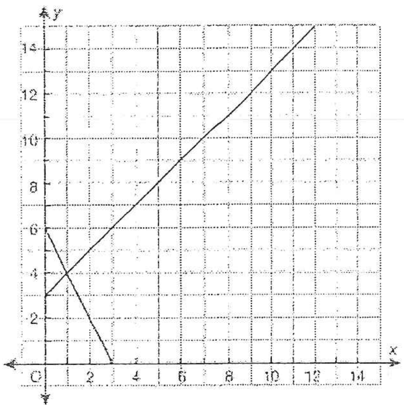
Solving Systems of Linear Equations by Graphing

Practice and Problem Solving: D

Solve each linear system by graphing. Check your answer. The first one is done for you.

1. $y = x + 3$

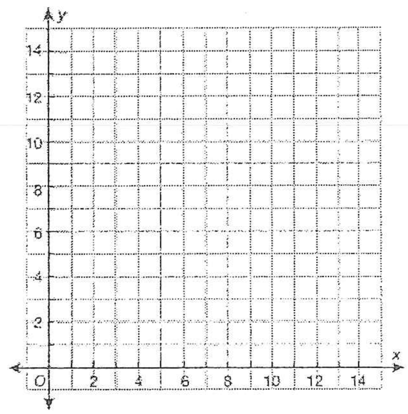
   $y = -2x + 6$



(1, 4)

2. $3x = y$

   $y = 2x + 2$



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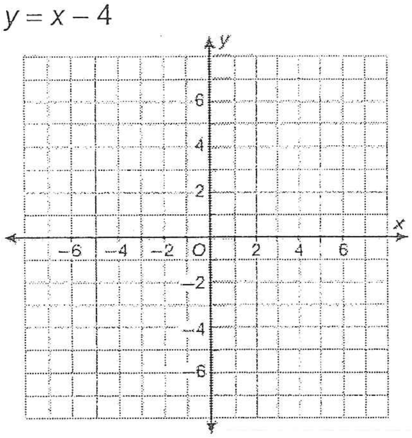
3. $x = 3y$

   $y = x - 4$



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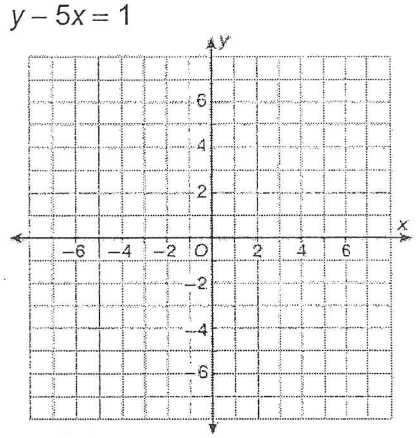
4. $y = 5x - 4$

   $y - 5x = 1$



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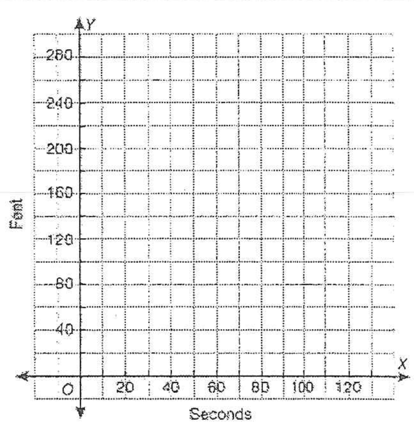
5. Wanda started walking along a path 27 seconds before Dave. Wanda walked at a constant rate of 3 feet per second. Dave walked along the same path at a constant rate of 4.5 feet per second. Graph the system of linear equations. How long after Dave starts walking will he catch up with Wanda?

____



Name ______________________ Date ______________ Class ______________

LESSON 16-2

Solving Systems by Substitution

Reteach

You can use substitution to solve a system of equations if one of the equations is already solved for a variable.

Solve $\begin{cases} y = x + 2 \\ 3x + y = 10 \end{cases}$

Step 1: Choose the equation to use as the substitute.

Use the first equation $y = x + 2$ because it is already solved for a variable.

Step 2: Solve by substitution.

$$\boxed{x+2}$$

$$\begin{aligned} 3x + y &= 10 \\ 3x + (x + 2) &= 10 && \textit{Substitute } x + 2 \textit{ for } y. \\ 4x + 2 &= 10 && \textit{Combine like terms.} \\ \underline{-2} \quad & \underline{-2} \\ 4x &= 8 \\ \frac{4x}{4} &= \frac{8}{4} \\ x &= 2 \end{aligned}$$

Step 3: Now substitute $x = 2$ back into one of the original equations to find the value of y.

$$\begin{aligned} y &= x + 2 \\ y &= 2 + 2 \\ y &= 4 \end{aligned}$$

The solution is (2, 4).

Check:

Substitute (2, 4) into both equations.

$y = x + 2$	$3x + y = 10$
$4 \stackrel{?}{=} 2 + 2$	$3(2) + 4 \stackrel{?}{=} 10$
$4 \stackrel{?}{=} 4$ ✓	$6 + 4 \stackrel{?}{=} 10$
	$10 \stackrel{?}{=} 10$ ✓

Solve each system by substitution. Check your answer.

1. $\begin{cases} x = y - 1 \\ x + 2y = 8 \end{cases}$

____

2. $\begin{cases} y = x + 2 \\ y = 2x - 5 \end{cases}$

____

3. $\begin{cases} y = x + 5 \\ 3x + y = -11 \end{cases}$

____

4. $\begin{cases} x = y + 10 \\ x = 2y + 3 \end{cases}$

____

Name: ______________________________ Date: ____________________

Solving Systems of Equations by Substitution

Steps for solving system of equations using substitution

1) Look at the two equations and determine which equation can be rewritten as x = or y= more easily.
2) Rewrite that equation as x= or y=.
3) Replace the variable in the second equation with the value of the variable in the rewritten equation.
4) Solve for the remaining variable.
5) Put this numerical value back into one of the original equations and find the value of the second variable.
6) Write the solution as (x- value, y-value)

$$\begin{cases} x - 5y = 16 \\ -3x + 7y = -8 \end{cases}$$

1/2) Equation 1 : solve for x

$$\begin{aligned} x - 5y &= 16 \\ +5y \quad &\quad +5y \\ x &= \boxed{16 + 5y} \end{aligned}$$

3/4) Replace x with 16+5y and solve for y.

$$\begin{aligned} -3x + 7y &= -8 \\ -3(16 + 5y) + 7y &= -8 \\ -48 - 15y + 7y &= -8 \\ -48 - 8y &= -8 \\ +48 \qquad &\quad +48 \\ -8y &= 40 \\ \overline{-8} \quad &\quad \overline{-8} \\ y &= -5 \end{aligned}$$

5) Replace y with -5 and solve for x.

$$\begin{aligned} x - 5y &= 16 \\ x - 5(-5) &= 16 \\ x - (-25) &= 16 \\ x + 25 &= 16 \\ -25 \quad &\quad -25 \\ x &= -9 \end{aligned}$$

6) Solution (-9 , -5)

1) 7x - 4y = -7
5x + y = 22

2) y = 8x - 9
y = 7

3) 3x + 23y = -4
5x = 20

4) $y = -\frac{1}{4}x + 6$
y = 4

5) 6x - 5y = 22
y = -8

6) -x + 9y = -5
x - 5y = 1

Name ______________________ Date ______________ Class ______________

LESSON 16-3

Solving Systems by Elimination

Reteach

Solving a system of two equations in two unknowns by **elimination** can be done by adding or subtracting one equation from the other.

Elimination by Adding

Solve the system: $x + 4y = 8$
$3x - 4y = 8$

Solution

Notice that the terms "$+4y$" and "$-4y$" are opposites. This means that the two equations can be added without changing the signs.

$$\begin{array}{r} x + 4y = 8 \\ \underline{3x - 4y = 8} \\ 4x + \ 0 = 16 \\ 4x = 16, \text{ or } x = 4 \end{array}$$

Substitute $x = 4$ in either of the equations to find y: $x + 4y = 8 \longrightarrow 4 + 4y = 8$

$4y = 4$, or

$y = 1$

The solution of this system is (4, 1).

Elimination by Subtracting

Solve the system: $2x - 5y = 15$
$2x + 3y = -9$

Solution

Notice that the terms "$2x$" are common to both equations. However, to eliminate them, it is necessary to *subtract* one equation from the other. This means that the *signs* of one equation will change. Here, the top equation stays the same. The signs of the bottom equation change.

$$\begin{array}{r} 2x - 5y = \ 15 \\ \underline{(-)2x\ (-)3y = (+)9} \\ 0 - 8y = \ 24, \text{ or } y = -3 \end{array}$$

Substitute $y = -3$ in either of the original equations to find x:

$2x - 5y = 15 \longrightarrow 2x - 5(-3) = 15$

$2x + 15 = 15$, or

$x = 0$

The solution of this system is (0, –3).

Solve the following systems by elimination. State whether addition or subtraction is used to eliminate one of the variables.

1. $3x + 2y = 10$
   $3x - 2y = 14$

   Operation: ______________

   Solution: (______, ______)

2. $\begin{cases} x + y = 12 \\ 2x + y = 6 \end{cases}$

   Operation: ______________

   Solution: (______, ______)

Name ______________________ Date ____________ Class ____________

LESSON 16-3

Solving Systems by Elimination

Practice and Problem Solving: A/B

Solve each system by eliminating one of the variables by addition or subtraction. Check your answer.

1. $\begin{cases} x - y = 8 \\ x + y = 12 \end{cases}$

2. $\begin{cases} 2x - y = 4 \\ 3x + y = 6 \end{cases}$

3. $\begin{matrix} x + 2y = 10 \\ x + 4y = 14 \end{matrix}$

(______, ______) (______, ______) (______, ______)

4. $\begin{cases} 3x + y = 9 \\ y = 3x + 6 \end{cases}$

5. $\begin{cases} 4x + 5y = 15 \\ 6x - 5y = 18 \end{cases}$

6. $\begin{cases} 5x = 7y \\ x + 7y = 21 \end{cases}$

(______, ______) (______, ______) (______, ______)

Write a system of equations for each problem. Solve the system using elimination. Show your work and check your answers.

7. Aaron bought a bagel and 3 muffins for $7.25. Bea bought a bagel and 2 muffins for $6. How much is a bagel and how much is a muffin?

____

8. Two movie tickets and 3 snacks are $25. Three movie tickets and 4 snacks are $35. How much is a movie ticket and what is the average price of a snack.

____

Explain why the system has the answer given. Solve each system by elimination to prove your answer.

9. $\begin{cases} x + 2y = 8 \\ x + 2y = 20 \end{cases}$

No solution.

____

____

10. $\begin{cases} 3x + y = 9 \\ 3x = 9 - y \end{cases}$

Many solutions

____

____

Name ______________________ Date ______________ Class ______________

LESSON 10-1

Integer Exponents

Reteach

A positive exponent tells you how many times to multiply the base as a factor. A negative exponent tells you how many times to divide by the base. Any number to the 0 power is equal to 1.

$4^2 = 4 \bullet 4 = 16$ $\quad 4^5 = 4 \bullet 4 \bullet 4 \bullet 4 \bullet 4 = 1{,}024$ $\quad a^3 = a \bullet a \bullet a$

$4^{-2} = \dfrac{1}{4^2} = \dfrac{1}{4 \bullet 4} = \dfrac{1}{16}$ $\quad 4^{-5} = \dfrac{1}{4^5} = \dfrac{1}{4 \bullet 4 \bullet 4 \bullet 4 \bullet 4} = \dfrac{1}{1{,}024}$ $\quad a^{-3} = \dfrac{1}{a^3} = \dfrac{1}{a \bullet a \bullet a}$

When you work with integers, certain properties are always true. With integer exponents, there are also certain properties that are always true.

When the bases are the same and you multiply, you add exponents.

$$2^2 \bullet 2^4 = 2^{2+4}$$

$$\underbrace{2 \bullet 2}_{2^2} \bullet \underbrace{2 \bullet 2 \bullet 2 \bullet 2}_{2^4} = 2^6$$

$$a^m \bullet a^n = a^{m+n}$$

When the bases are the same and you divide, you subtract exponents.

$$\frac{2^5}{2^3} = 2^{5-3}$$

$$\frac{2 \bullet 2 \bullet \cancel{2} \bullet \cancel{2} \bullet \cancel{2}}{\cancel{2} \bullet \cancel{2} \bullet \cancel{2}} = 2^2$$

$$\frac{a^m}{a^n} = a^{m-n}$$

When you raise a power to a power, you multiply.

$$(2^3)^2 = 2^{3 \bullet 2}$$

$$(2 \bullet 2 \bullet 2)^2$$

$$(2 \bullet 2 \bullet 2) \bullet (2 \bullet 2 \bullet 2) = 2^6$$

$$(a^m)^n = a^{m \bullet n}$$

Tell whether you will add, subtract, or multiply the exponents. Then simplify by finding the value of the expression.

1. $\dfrac{3^6}{3^3} \rightarrow$ ______________________

2. $8^2 \bullet 8^{-3} \rightarrow$ ______________________

3. $(3^2)^3 \rightarrow$ ______________________

4. $5^3 \bullet 5^1 \rightarrow$ ______________________

5. $\dfrac{4^2}{4^4} \rightarrow$ ______________________

6. $(6^2)^2 \rightarrow$ ______________________

Name ______________________ Date ______________ Class______________

LESSON 10-1

Integer Exponents

Practice and Problem Solving: D

Write each expression without exponents. Then find the value. The first one is done for you.

1. $4^{-4} = \frac{1}{4 \times 4 \times 4 \times 4} = \frac{1}{256}$

2. $6^2 =$ ______________________

3. $3^5 =$ ______________________

4. $24^0 =$ ______________________

5. $7^{-2} =$ ______________________

6. $10^5 =$ ______________________

Simplify each expression. Show your work. The first is done for you.

7. $\frac{(3 \cdot 2)^6}{(7-1)^4} = \frac{6^6}{6^4} = \frac{6^6}{6^4}$

$= 6^{6-4} = 6^2$

$= 36$

8. $(3)^2 \bullet (3^1)$

9. $4^2 \bullet 4^3$

10. $(4^2)^3$

11. $(4-3)^2 \bullet (5 \bullet 4)^0$

12. $(2+3)^5 \div (5^2)^2$

Answer the question.

13. Find the value of $(2^2)^3$. Then find the value of $(2^3)^2$. What is true about the results? Explain why.

Estimating Irrational Numbers

Name: ____________________

Select Rational or Irrational for Each Number Shown Below

Rational Number: **A rational number is a number that can be expressed as a fraction of integers.**

Irrational Number: **An irrational number cannot be expressed as a fraction of integers. It can be expressed as a non-repeating, non-terminating decimal.**

Number	Rational	Irrational
$\sqrt{9}$		
$\sqrt{2}$		
$\sqrt{31}$		
$\sqrt{78}$		
$\sqrt{400}$		
$\sqrt{121}$		
π		

Estimating Irrational Numbers to the Closest Whole Number

Steps

1. Determine what two perfect squares the number under the radical is between
2. Determine which number the number under the radical is closest to by subtraction

Examples:

a) $\sqrt{6} \approx$

b) $\sqrt{33} \approx$

c) $\sqrt{20} \cong$

d) $\sqrt{17} \approx$

Estimating Irrational Numbers to the Closest Decimal

Steps

1. Determine the perfect squares the number under the radical is between
2. The whole number for your fraction is the square root of the lowest perfect square
3. Subtract the lowest and highest perfect square… that becomes your denominator
4. Subtract your given square root and the lowest perfect square… that becomes your numerator
5. Simplify your fraction if needed

Examples:

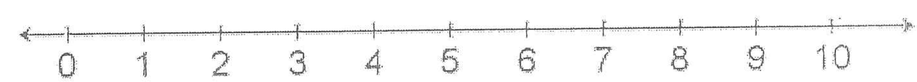
a) $\sqrt{6} \approx$

b) $\sqrt{33} \cong$

Place Examples in the Proper Location on the Number Line

Add the following numbers to the number line

$\sqrt{17}$ $\sqrt{29}$ $\sqrt{47}$ $\sqrt{65}$ $\sqrt{80}$ $\sqrt{91}$ $\sqrt{99}$



Use the steps above and to the left to determine where to place the square roots.