

## I. Writing Algebraic Expressions

Key Terms:

variable: a symbol representing an unknown quantity

algebraic expression: an expression that contains one or more numbers, one or more variables, and one or more arithmetic operations ~~AND =~~

Changing words into Symbols

Sum: +

Quotient: ÷

Less than: -

Product: x

Together: +

Times: x

Difference: -

Divided by: ÷

More than: +

*You Try: Write each phrase as an algebraic expression.*

1. thirteen plus  $v$

$$\frac{13 + v}{\text{_____}}$$

2. six less  $w$

~~$6 - w$~~

$$\frac{w - 6}{\text{_____}}$$

3. three times  $d$

$$\frac{3d}{\text{_____}}$$

4. the difference of  $h$  and 8

$$\frac{h - 8}{\text{_____}}$$

5. 23 divided into  $y$

$$\frac{y}{23} \quad y \div 23$$

6. \$18 less than the sale price

~~$18 - x$~~

$$\frac{x - 18}{\text{_____}}$$

7. the quotient of  $n$  and 12

$$\frac{n \div 12 \quad n/12}{\text{_____}}$$

8. 8 less than 25 multiplied by a number  $g$

$$25g - 8$$

$$\frac{25 \cdot g}{25 \times g}$$

9. 3 more than the difference of 20 and a number  $m$

$$(20 - m) + 3$$

10. 5 less than the quotient of a number  $z$  and 16

$$\frac{z}{16} - 5$$

$$z \div 16$$

11. 8 times the product of 28 and a number  $g$

$$8 \cdot 28g$$

$$\boxed{28g \cdot 8}$$

12. 10 plus a number  $s$  times 5

$$(10 + s)5$$

$$5s + 10$$

13. 10 less than the quantity  $j$  multiplied by 44

$$44j - 10$$

$$j44$$

## II. Combining Like Terms: A little vocabulary...

1. term: A number, variable, or product or quotient of numbers and variables.

2. like terms: Terms that contain the same variables.

3. coefficient: The numerical part of a term that contains a variable.  
Ex.  $5x$  is a term, 5 is the coefficient

## Simplifying Expressions

Identify the coefficient and constant(s) in expressions listed below:

1.  $8x + 9 - 3x$   
 Coefficient(s):  $8, -3$   
 Constant(s):  $9$

2.  $17 - 2a + 5a - 1$   
 Coefficient(s):  $-2, 5$   
 Constant(s):  $17, -1$

Steps to Simplifying an Expression:

1. Distribute to get rid of any parenthesis
2. Combine like terms
3. Put terms with variables in abc order and constants at the end.

Simplify the following expressions:

1.  $3(4x - 5)$   
 $12x - 15$

2.  $-4(x - 2)$   
 $-4x + 8$

3.  $7(b - 10)$   
 $7b - 70$

4.  $2(b - 3) + 4(2b + 2)$   
 $2b - 6 + 8b + 8$   
 $10b + 2$

5.  $5(-3y + 5)$   
 $-15y + 25$

6.  $-1(7y - 4)$   
 $-7y + 4$

7.  $-5(-8g - 3) - (5g + 3)$   
 $40g + 15 - 5g - 3$   
Examples  $35g + 12$

8.  $4(2a + b) - 3(3a - 4b)$   
 $8a + 4b - 9a + 12b$   
 $-a + 16b$

<p>1. <math>-18x + 9 - 23x</math></p>	<p>2. <math>15x^2 + 2x - 12 - 23x^2 - 15x</math></p>
<p>3. <math>-5 + 8p + 24 - 17p</math></p>	<p>4. <math>4(2e + 7) - 25e</math></p>
<p>5. <math>7(z^2 + 2) - 14z^2 - 14</math></p>	<p>6. <math>-3(2r + 5) - 12r + (-12)</math></p>

## Multi-Step Equations using the Distributive Property

**Solving Equations:** Equations are not fixed - they can be rearranged as long as the equality of the two sides is maintained. (**Think: whatever I do to one side...I have to do to the other**) We rewrite equations in order to make them simpler, or to solve them. The **goal** is to isolate the variable.

Ex:  $2x = 4$        $x = 2$       **Does the answer change if you add two on both sides?**

$2x + 2 = 4 + 2$                       **No, x will still be equal to 2.**

**Properties that help rearrange an equation but MAINTAIN equality on both sides:**

- **Commutative property:** The order in which numbers are added or multiplied does not change the sum or product.  
 $a + b = b + a$                       and                       $a \cdot b = b \cdot a$
- **Associative Property:** The way in which numbers are grouped when added or multiplied does not change the sum or product.  
 $(a + b) + c = a + (b + c)$                       and                       $(a \cdot b) \cdot c = a \cdot (b \cdot c)$
- **Additive and Multiplicative Inverses:** For every a, there is an inverse (opposite operation)  
 $a + (-a) = (-a + a) = 0$                       and                       $a \cdot 1/a = 1/a \cdot a = 1$
- **Distributive Property:** For any numbers a, b, and c:  
 $a(b + c) = ab + ac$                       and                       $(b+c)a = ba + ca$   
 $a(b - c) = ab - ac$                       and                       $(b-c)a = ba - ca$

**Steps to Solving Multi-Step Equations:**

1. Distribute to clear the parenthesis
2. Combine like terms
3. Use addition/ subtraction to get the variables on one side
4. Add or subtract to isolate the variable
5. Multiply or divide to isolate the variable



Name:

Date:

Period:

## Guided Practice:

$$\begin{aligned}
 (1) \quad 112 &= 7x + 7(-4x - 17) \\
 112 &= 7x - 28x - 119 \\
 112 &= -21x - 119 \\
 231 &= -21x \\
 -11 &= x
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad 7x - 6(5x + 3) &= -156 \\
 7x - 30x - 18 &= -156 \\
 -23x - 18 &= -156 \\
 -23x &= -138 \\
 x &= 6
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad -108 &= 3x + 3(3x - 16) \\
 -108 &= 3x + 9x - 48 \\
 -108 &= 12x - 48 \\
 -60 &= 12x \\
 -5 &= x
 \end{aligned}$$

$$\begin{aligned}
 (4) \quad -6x + 2(2x + 13) &= 48 \\
 -6x + 4x + 26 &= 48 \\
 -2x + 26 &= 48 \\
 -2x &= 22 \\
 x &= -11
 \end{aligned}$$

$$\begin{aligned}
 (5) \quad 88 &= 4x + 4(3x - 10) \\
 88 &= 4x + 12x - 40 \\
 88 &= 16x - 40 \\
 128 &= 16x \\
 8 &= x
 \end{aligned}$$

$$\begin{aligned}
 (6) \quad -126 &= -2x - 2(4x + 13) \\
 -126 &= -2x - 8x - 26 \\
 -126 &= -10x - 26 \\
 -100 &= -10x \\
 10 &= x
 \end{aligned}$$

$$\begin{aligned}
 (7) \quad -6x + 4(3x - 13) &= -82 \\
 -6x + 12x - 52 &= -82 \\
 6x - 52 &= -82 \\
 6x &= -30 \\
 x &= -5
 \end{aligned}$$

$$\begin{aligned}
 (8) \quad 5x - 7(x - 18) &= 146 \\
 5x - 7x + 126 &= 146 \\
 -2x + 126 &= 146 \\
 -2x &= 20 \\
 x &= -10
 \end{aligned}$$

$$\begin{aligned}
 (9) \quad -180 &= 5x + 5(2x - 3) \\
 -180 &= 5x + 10x - 15 \\
 -180 &= 15x - 15 \\
 -165 &= 15x \\
 -11 &= x
 \end{aligned}$$

$$\begin{aligned}
 (10) \quad 7x - 4(4x - 14) &= -43 \\
 7x - 16x + 56 &= -43 \\
 -9x + 56 &= -43 \\
 -9x &= -99 \\
 x &= 11
 \end{aligned}$$



Notes – Multi-Step Equations with Fractions/Decimals  
and Algebraic Proportions

Equations with Fractions/Decimals:

Steps:

1. Clear parentheses by using the distributive property.
2. If there are fractions or decimals, clear them by multiplying by the lowest common denominator (lowest decimal place value for decimal numbers).
3. Combine like terms on each side of the equal sign.
4. Add or subtract to isolate the variable
5. Multiply or Divide to isolate the variable

Example 1:  $7\left(\frac{2}{7}x + \frac{4}{7}x\right) = \left(-\frac{30}{7}\right)7$

Multiply by 7 to clear the fraction.  $2x + 4x = -30$ . Solve like other equations.

Example 2:  $10(28 - 2.2y) = (11.6y + 262.6)10$

$$6x = -30$$

$$x = -5$$

Multiply by 10 (since lowest decimal is tenths place).  $280 - 22y = 116y + 2626$ . Solve.

$$-2626 + 22y + 22y - 2626$$

$$234b = 138y$$

$$y = 17$$

Try on your own and check with a partner

1.  $24\left(\frac{17}{24}\right) = \left(-\frac{4}{3}x - \frac{7}{4} + \frac{1}{2}x\right)24$

$$-17 = -32x - 42 + 12x$$

$$+42 \quad +42$$

$$\frac{25}{20} = \frac{-20x}{-20}$$

$$x = -\frac{5}{4}$$

3.  $6\left(\frac{5}{6}\right)\left(-x - \frac{4}{3} - 1\right)6$

2.  $10(13.7b - 6.5) = (-2.3b + 8.3)10$

$$137b - 65 = -23b + 83$$

$$+23b \quad +65 \quad +23b \quad +65$$

$$\frac{160b}{160} = \frac{148}{160}$$

$$b = .925$$

4.  $27.67x - 8 = 22.56x + 40$

$$5 = -6x - 8 - 6$$

$$5 = -6x - 14$$

$$+14 \quad +14$$

$$\frac{19}{-6} = \frac{-6x}{-6}$$

$$x = 3\frac{1}{6}$$

$$-3.1\bar{6}$$

SKIP

Algebraic Proportions:

## Steps:

1. Cross multiply
2. Distribute
3. Combine like terms
4. Add or subtract to isolate the variable
5. Multiply or divide to isolate the variable

Example 1:  $\frac{x+4}{5} = \frac{x-2}{7}$   $7(x+4) = 5(x-2)$  Solve like other equations.

$$7x + 28 = 5x - 10$$

$$2x = -38$$

$$x = -19$$

Example 2:  $\frac{x+2}{14} = \frac{x}{5}$   $5(x+2) = 14(x)$  Solve.

$$5x + 10 = 14x$$

$$10 = 9x$$

$$x = 10/9 \text{ or } 1.\bar{1}$$

Example 3:  $\frac{12x-32}{4x} = 5$  Rewrite as  $\frac{12x-32}{4x} = \frac{5}{1}$   $5(4x) = 1(12x-32)$  Solve.

$$20x = 12x - 32$$

$$8x = -32$$

$$x = -4$$

Try on your own and check with a partner.

1.  $\frac{2x-2}{3x+6} = \frac{2}{5}$

$$5(2x-2) = 2(3x+6)$$

$$10x - 10 = 6x + 12$$

$$4x = 22 \quad x = 5.5$$

3.  $0.07x + 9.95 = 12.47 - .05x$

SKIP

2.  $\frac{5}{r-9} = \frac{8}{r+5}$   $5(r+5) = 8(r-9)$

$$5r + 25 = 8r - 72$$

$$97 = 3r$$

$$r = 32\frac{1}{3}$$

$$32.\bar{3}$$

4.  $\frac{10}{4x+2.5} = \frac{10}{-28.4-2.2x}$

$$40x + 25 = -284 - 22x$$

$$62x = -309$$

$$x = 4.98$$



## Guided Notes - Multi-Step Equations as Word Problems

Write each sentence as an algebraic equation.

1. Juan's salary plus \$125 is \$600.

$$\underline{s + 125 = 600}$$

$$6x \quad v = 120$$

2. Six times as many visitors is 120 visitors.

$$\underline{6v = 120}$$

3. Twenty-seven is seven fewer students than last year.

$$\underline{27 = y - 7}$$

4. Two and one-half times the amount of interest is \$2500.

$$\underline{2\frac{1}{2}i = 2500}$$

5. The number of cats decreased by 17 is 19.

$$\underline{n - 17 = 19}$$

6. Four times the number of feet is 12 feet.

$$\underline{4f = 12}$$

7. The price decreased by \$4 is \$29.

$$\underline{p - \$4 = \$29}$$

8. After dividing the money 5 ways, each person got \$67.

$$\underline{m/5 = 67}$$

9. Three more than 8 times as many trees is 75 trees.

$$\underline{3 + 8t = 75}$$

10. Twice as many points as Bob would be 18 points.

$$\underline{2B = 18}$$

Define the variable, write the equation, and solve.

1. Yesterday Josh sold some boxes of greeting cards. Today he sold seven boxes. If he sold 25 boxes in all, how many did he sell yesterday?

a. Variable:  $b$  - # of boxes Equation:  $b + 7 = 25$

b. Solve:  $b + 7 = 25$   
 $\quad \quad -7 \quad -7$   
 $b = 18$

18 boxes

2. After Hoshi spent \$27.98 for a sweater, she had \$18.76 left. How much money did she have to begin with?

a. Variable:  $m$  - amt of \$ to begin with Equation:  $m - \$27.98 = \$18.76$

b. Solve:  $m - 27.98 = 18.76$   
 $\quad \quad + 27.98 \quad + 27.98$   
 $m = 46.74$

\$46.74

3. After Simon donated four books to the school library, he had 28 books left. How many books did Simon have to start with?

a. Variable:  $b$  - books @ start Equation:  $b - 4 = 28$

b. Solve:  $b - 4 = 28$   
 $\quad \quad +4 \quad +4$   
 $b = 32$

32 books

4. One day Reeva baked several dozen muffins. The next day she made 8 dozen more muffins. If she made 20 dozen muffins in all, how many dozen did she make the first day?

a. Variable:  $d$  - # of dozen muffins 1st day Equation:  $m + 8 = 20$   
 b. Solve: 
$$\begin{array}{r} m + 8 = 20 \\ -8 \quad -8 \\ \hline m = 12 \end{array}$$

12 dozen muffins

5. Twelve notebooks cost \$15.48 in all. What is the price of one notebook?

a. Variable:  $p$  - price of notebook Equation:  $12p = 15.48$   
 b. Solve: 
$$\begin{array}{r} 12p = 15.48 \\ \hline 12 \quad 12 \\ \hline p = \$1.29 \end{array}$$

each notebook cost \$1.29

6. Skylar bought seven books at \$12.95 each. How much did Skylar spend?

a. Variable:  $T$  - total spent Equation:  $7 \cdot 12.95 = T$   
 b. Solve: 
$$\begin{array}{r} 7 \cdot 12.95 = T \\ \$90.65 = T \end{array}$$

Skylar spent \$90.65

7. Eugene has five payments left to make on his computer. If each payment is \$157.90, how much does he still owe?

a. Variable:  $T$  - total still owed Equation:  $5 \cdot \$157.90 = T$   
 b. Solve: 
$$\begin{array}{r} 5 \cdot \$157.90 = T \\ \$789.50 = T \end{array}$$

Eugene still owes \$789.50

8. Hugo received \$100 for his birthday. He then saved \$20 per week until he had a total of \$460 to buy a printer. Write an equation to show how many weeks it took him to save the money.

a. Variable:  $w$  - # of weeks Equation:  $20w + 100 = 460$   
 b. Solve: 
$$\begin{array}{r} 20w + 100 = 460 \\ -100 \quad -100 \\ \hline 20w = 360 \\ w = 18 \end{array}$$

It took Hugo 18 weeks

9. A health club charges a \$50 initial fee plus \$2 for each visit. Mary has spent a total of \$144 at the health club this year. Use an equation to find how many visits she has made.

a. Variable:  $v$  - # of visits Equation:  $50 + 2v = 144$   
 b. Solve: 
$$\begin{array}{r} 50 + 2v = 144 \\ -50 \quad -50 \\ \hline 2v = 94 \\ v = 47 \end{array}$$

Mary has made 47 visits.

### Multi-step Equations – Special Cases

So far we have looked at equations where there is exactly one solution. It is possible to have no solutions or infinite solutions to an equation.

- No solution would mean that there is no answer to the equation. It is impossible for the equation to be true no matter what value we assign to the variable.

Example:  $2x + 3 = 2x + 7$

$$\begin{array}{r} -2x \quad -2x \\ \hline 3 = 7 \end{array}$$

That can't be right! We know that three doesn't equal seven. It is a false statement to say  $3 = 7$ , so we say that there can be **NO SOLUTION!**

*\*all x's disappear*

You try:  $9x + 3x - 10 = 3(3x + x)$

$$\begin{array}{r} 12x - 10 = 12x \\ -12x \quad -12x \\ \hline -10 = 0 \end{array}$$

*different constant = different constant*  
*not true*

- Infinite solutions would mean that any value for the variable would make the equation true.

Example:  $2x + 3 = 2x + 3$

$$\begin{array}{r} -2x \quad -2x \\ \hline 3 = 3 \end{array}$$

When does three equal three? All the time! This means it doesn't matter what value we substitute for  $x$ , the equation will always be true. Try two numbers to verify this is true. The answer would be **ALL SOLUTIONS!**

*\*all x's disappear*

You try:  $-3 - 8x + 17 = -2(4x - 7)$

$$\begin{array}{r} -8x + 14 = -8x + 14 \\ -8x \quad -8x \\ \hline 14 = 14 \end{array}$$

*same # = same #*  
*true*

- When the solution is ZERO: Zero can be an answer! Don't get it confused with no solution!

Example:  $2x + 3 = 3$

$$\begin{array}{r} -3 \quad -3 \\ \hline 2x = 0, \quad x = 0 \end{array}$$

You try:  $a + 5 = -5a + 5$

$$\begin{array}{r} -a \quad -a \\ \hline 5 = -6a + 5 \\ -5 \quad -5 \end{array}$$

$$\begin{array}{r} 0 = -6a \\ -6 \quad -6 \end{array}$$

$$a = 0$$

Can you...

1. Create an equation with an answer of all solutions?

$$12x + 6 = 2(6x + 3)$$

2. Create an equation with an answer of no solution?

$$4x + 7 = 4x + 3$$

Name

Date:

Period:

Practice – Multi-step Equations – Special Cases

2, 3, 6, 8, 9

1.  $a + 5 = -5a + 5$

$$\begin{aligned} 5 &= -6a + 5 \\ -5 & \quad -5 \\ \hline 0 &= -6a \\ \hline -6 & \quad -6 \quad a = 0 \end{aligned}$$

2.  $6 = 1 - 2n + 5$

$$\begin{aligned} 6 &= -2n + 6 \\ -6 & \quad -6 \\ \hline 0 &= -2n \\ \hline -2 & \quad -2 \quad n = 0 \end{aligned}$$

3.  $p - 4 = -9 + p$   
 $-p \quad -p$   
 $-4 = -9$  \* not true  
no solution

4.  $12 = -4(-6x - 3)$   
 $12 = 24x + 12$   
 $0 = 24x$   
 $x = 0$

5.  $4m - 4 = 4m$   
 $-4m \quad -4m$   
 $-4 = 0$

no solution

6.  $24a - 22 = -4(1 - 6a)$   
 $24a - 22 = -4 + 24a$   
 $-22 = -4$   
no solution

7.  $11 + 3x - 7 = 6x + 5 - 3x$   
 $4 + 3x = 3x + 5$   
 $4 = 5$

no solution

8.  $6x + 5 - 2x = 4 + 4x + 1$   
 $4x + 5 = 4x + 5$

infinite solutions

9.  $13 - (2x + 2) = 2(x + 2) + 3x$   
 $13 - 2x - 2 = 2x + 4 + 3x$   
 $11 - 2x = 5x + 4$   
 $17 = 7x$   
 $x = 1$

10.  $7x - 4y + 12z + 4 = 5 - 3y + 7x - y + 12z$

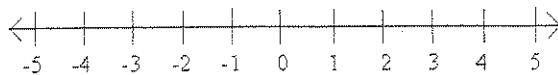
SKIP

11. Create an equation that has no solutions.

12. Create an equation with an answer of all solutions.

13. Pick two problems from above and plug-in your answer to check that they were solved correctly. You can do this with any problem to check your work!

## Inequalities



### Inequalities Vocabulary:

$<$	$\leq$	$>$	$\geq$
is less than	is at most no more than maximum oldest tallest highest cannot exceed under	is greater than must exceed	is at least no less than minimum youngest shortest lowest over

### Identifying Solutions to Inequalities:

- Numbers that satisfy an inequality are solutions to an inequality.

Ex:

Name three numbers that satisfy the following inequality:

$x < -1$      ~~5~~ -2 -3 -4  
 $y > 3$      4 5 6  
 $z \leq 0$      0 -1 -2  
 $w \geq -4$      -4 -3 -2

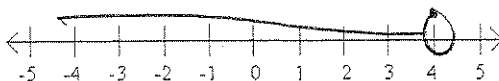
### Graphing Inequalities:

Inequality	Explanation	Direction	Graph
$n < 1$	Use an <u>○</u> to show that 1 is not a solution.	Less than $\rightarrow$ Shade to the <u>left</u>	
$a \geq 0$	Use a <u>●</u> to show that 0 is a solution	Greater than $\rightarrow$ Shade to the <u>right</u>	
$f > -3$	Use an <u>○</u> to show that -3 is not a solution	Greater than $\rightarrow$ Shade to the <u>right</u>	
$-2 \geq x$ $*x \leq -2$	Use a <u>●</u> to show that -2 is a solution	Less than $\rightarrow$ Shade to the <u>left</u>	

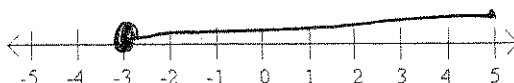
\*Rewrite inequalities so that the variable is on the left!

Graph the following on a number line:

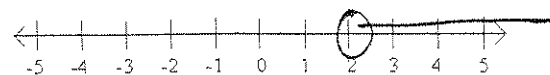
1.  $p < 4$



2.  $g \geq -3$



3.  $2 < k$



# Writing Inequalities

Words	Symbols	Graph
x is less than 3	$x < 3$	
b is at least 1	$b \geq 1$	
c is greater than -2	$c > -2$	
w is at most 0	$w \leq 0$	

## Examples:

1. Write an inequality and draw a graph for the following:

The amount of pennies is at least 15

$$x \geq 15$$



2. Write an inequality and draw a graph for the following:

d is no more than 4

$$d \leq 4$$



3. Write an inequality and a sentence for the following graph:



$$x > -1$$

4. Write an inequality and a sentence for the following graph:



$$x \leq -1$$

## You Try!

1. The school auditorium can seat at most 1200 people.

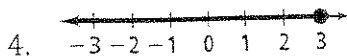
$$x \leq 1200$$

2. For a certain swim meet, a competitor must swim faster than 23 seconds to qualify.

$$x > 23$$

3. For a touch-typing test, a student must type at least 65 wpm to receive an "A."

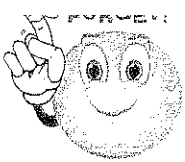
$$x \geq 65$$



$$x \leq 3$$



$$x > -1$$



### 3.3 Solving Inequalities Using Multiplication and Division

IMPORTANT: When you mult or divide by a negative number, you must change the direction of the inequality sign.

#### Using Multiplication

Ex.  $\frac{x}{2} > -1$

$x > -2$

Ex.  $-\frac{2}{3}n \leq 3$

$n \geq \frac{3}{1} \cdot \frac{3}{2}$

~~n~~  $n \geq \frac{9}{2}$

Ex.  $-8 \leq \frac{t}{-2}$

$t \leq 16$

Ex.  $4 > \frac{x}{4}$

$x < 16$

#### You Try!!

1.  $-\frac{k}{4} > -1$

$k < 4$

2.  $-t \geq \frac{1}{2}$

$t \leq \frac{1}{2}$

3.  $\frac{x}{4} \geq 18$

$x \geq 72$

#### Using Division

Ex.  $-4x < 8$

$x > -2$

Ex.  $4x < -8$

$x < -2$

Ex.  $-7 > 7p$

$p < -1$

Ex.  $-1 < -2p$

$p < \frac{1}{2}$

#### You Try!

1.  $-5x \geq 25$

$x \leq -5$

2.  $-9 > 3x$

$x < -3$

3.  $3.1x < -6.2$

$x < -2$

### 3.2 Solving Inequalities: Using Addition and Subtraction

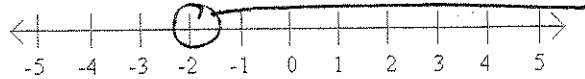
1. Isolate the variable (get the variable on one side)
2. find the solution
3. graph the solution

Examples:

1. Solve for x and graph the solution

$$x + 6 > 4$$

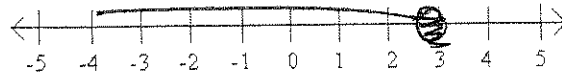
$$x > -2$$



2. Solve for y and graph the solution

$$y - 7 \leq -4$$

$$y \leq 3$$



3. Solve for z and graph the solution

$$3 \leq 4 + z$$

$$-1 \leq z$$



You TRY!

Using Addition:

1.  $x - 3 < 5$       $x < 8$

2.  $12 \leq x - 5$

3.  $-8 + y > 6$

4.  $1 \geq y - \frac{2}{3}$

$$\begin{array}{r} x < 8 \\ \hline x \geq 17 \\ \hline y > 14 \\ \hline y \leq \frac{5}{3} \\ \hline \end{array}$$

Using Subtraction:

1.  $y + 5 < -7$

2.  $-3.4 \geq c + 2$

3.  $1 + p > -1$

$$\begin{array}{r} y < -12 \\ \hline c \leq -5.4 \\ \hline p > -2 \\ \hline \end{array}$$



Name \_\_\_\_\_ Period: \_\_\_\_\_

# Inequality Review

Represent each of the following as an algebraic inequality.

1) x is at most 30

$$\underline{x \leq 30}$$

2) the sum of 5x and 2x is at least 14

$$\underline{5x + 2x \geq 14}$$

3) the product of x and y is less than or equal to 4

$$\underline{xy \leq 4}$$

4) 5 less than a number y is under 20

$$\underline{y - 5 < 20}$$

1<sup>st</sup>: Read carefully and underline key words

2<sup>nd</sup>: Write a let statement

3<sup>rd</sup>: Determine whether to use  $<$ ,  $\leq$ ,  $>$ , or  $\geq$

4<sup>th</sup>: Write and solve the inequality



5) If 5 times a number is increased by 4, the result is at least 19. Find the least possible number that satisfies these conditions.

$$\begin{array}{r} 5x + 4 \geq 19 \\ -4 \quad -4 \end{array}$$

$$\frac{5x}{5} \geq \frac{15}{5}$$

$$x \geq 3$$

3 is the least possible number.

6) The sum of twice a number and 5 is at most 15. What are the possible values for the number?

$$\begin{array}{r} 2x + 5 \leq 15 \\ -5 \quad -5 \end{array}$$

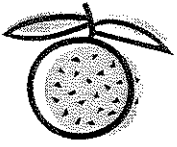
$$\frac{2x}{2} \leq \frac{10}{2}$$

$$x \leq 5$$

The number could be any number less than or equal to 5.



- 7) The cost of a gallon of orange juice is \$3.50. What is the maximum number of containers you can buy for \$15?



$$\frac{\$3.50x}{3.50} \leq \frac{15}{3.50}$$

$$x \leq 4.29$$

The maximum number of gallons of oj is 4.

- 8) Three times a number increased by 8 is no more than the number decreased by 4. Find the number.

$$3x + 8 \leq x - 4$$

$$2x + 8 \leq -4$$

$$\frac{2x}{2} \leq \frac{-12}{2}$$

$$x \leq -6$$

The number is -6.  
(or anything less than that)

- 9) Two-thirds of a number plus 5 is greater than 12. Find the number.

$$\frac{2}{3}x + 5 > 12$$

$$\frac{3}{2} \cdot \frac{2}{3}x > \frac{7}{1} \cdot \frac{3}{2}$$

$$x > \frac{21}{2}$$

$$x > 10.5$$

The number is ~~is~~.  
~~is~~ anything greater than 10.5.



Define a variable, write an inequality, and solve each problem.  
Then check your solution.

19. A number decreased by 10 is greater than -5.

$$x - 10 > -5$$

$$x > 5$$

20. A number increased by 2 is at most 6.

$$x + 2 \leq 6$$

$$x \leq 4$$

21. A number increased by -1 is less than 10.

$$x - 1 < 10$$

$$x < 11$$

22. A number decreased by -4 is at least 9.

$$x + 4 \geq 9$$

$$x \geq 5$$

Define a variable, write an inequality, and solve each problem.  
Then check your solution.

16. The sum of a number and 81 is greater than the product of -3 and that number.

$$x + 81 > -3x$$

$$81 > -4x$$

17. Four more than the quotient of a number and 3 is at least that number.

$$\frac{x}{3} + 4 \geq x$$

$$3 \cdot \frac{x}{3} \geq (x - 4) \cdot 3$$

Define a variable, write an inequality, and solve each problem.  
Then check your solution.

29. Four times a number is greater than -48.

$$4x > -48$$

$$x > -12$$

30. Negative three times a number is at least 57.

$$-3x \geq 57$$

$$x \leq -19$$

31. A number divided by negative six is

32. Two thirds of a number is no more

~~31.  $\frac{2}{3}x \leq -\frac{10}{1} \cdot \frac{3}{2}$~~

32.  $x \leq -\frac{30}{2}$

$x \leq -15$

31.  $\frac{x}{10} \geq 5$

$x \geq -30$

4. How many...



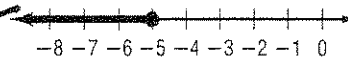
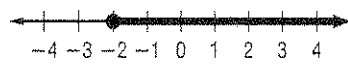
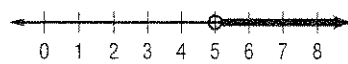


Name: \_\_\_\_\_

# Classwork

Match each inequality with its corresponding statement.

- |                          |   |
|--------------------------|---|
| 1. $-4n \geq 5$          | a. Negative four times a number is less than five.    |
| 2. $\frac{4}{5}n > 5$    | b. Four fifths of a number is no more than five.      |
| 3. $4n \leq 5$           | c. Four times a number is fewer than five.            |
| 4. $\frac{4}{5}n \leq 5$ | d. Negative four times a number is no less than five. |
| 5. $4n < 5$              | e. Four times a number is at most five.               |
| 6. $-4n < 5$             | f. Four fifths of a number is more than five.         |

Match each inequality with its corresponding graph.

- |                                   |   |
|-----------------------------------|---|
| 7. $x + 11 > 16$<br>$x > 5$       | a.   |
| 8. $x - 6 < 1$<br>$x < 7$         | b.  |
| 9. $x + 2 \leq -3$<br>$x \leq -5$ | c.  |
| 10. $x + 3 \geq 1$<br>$x \geq -2$ | d.  |
| 11. $x - 1 < -7$<br>$x < -6$      | e.  |

Define a variable, write an inequality, and solve each problem. Then check your solution.

12. A number decreased by 10 is greater than -5.  $x - 10 > -5$   $x > 5$
13. A number increased by 1 is less than 9.  $x + 1 < 9$   $x < 8$
14. Seven more than a number is less than or equal to -18.  $7 + x \leq -18$   $x \leq -25$
15. Twenty less than a number is at least 15.  $x - 20 \geq 15$   $x \geq 35$
16. A number plus 2 is at most 1.  $x + 2 \leq 1$   $x \leq -1$

