

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

## Equations and Inequalities 1.1

## Ready, Set, Go!

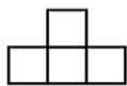
## Ready

Topic: Create and solve equations in one variable.

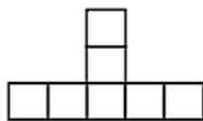
Use the pictures below to answer questions 1 – 2.



Step 1



Step 2



Step 3

1. Each square represents one tile, how many total tiles are in Step 5? Step 6?

**Step 5 = 13, Step 6 = 16**

2. What might you do to determine the number of tiles in Step 25?

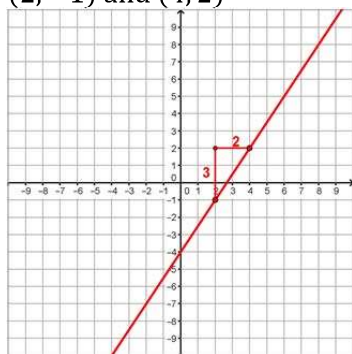
**Possible answers: make a table, draw a picture...**

## Set

Topic: Graph linear equations

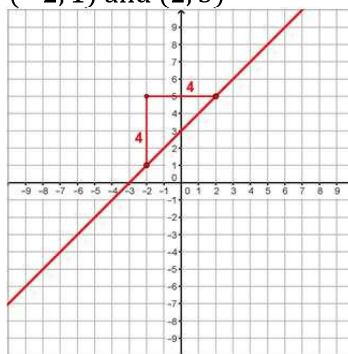
For the following problems, two points and a slope are given. Use the graph to plot these points, draw the line, and *clearly* label the slope on the graph.

3.  $(2, -1)$  and  $(4, 2)$



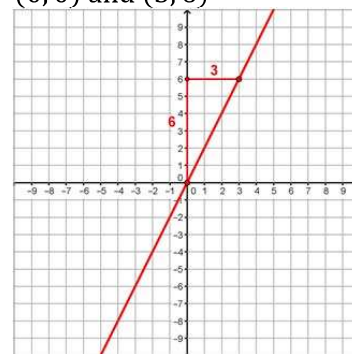
Slope:  $m = \frac{3}{2}$

4.  $(-2, 1)$  and  $(2, 5)$



Slope:  $m = 1$

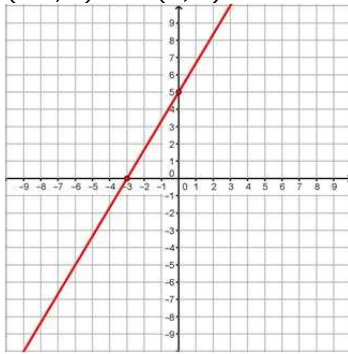
5.  $(0, 0)$  and  $(3, 6)$



Slope:  $m = 2$

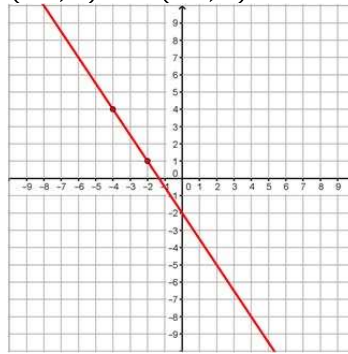
For the following problems, two points are given. Use the graph to plot these points *and* find the slope.

6.  $(-3, 0)$  and  $(0, 5)$



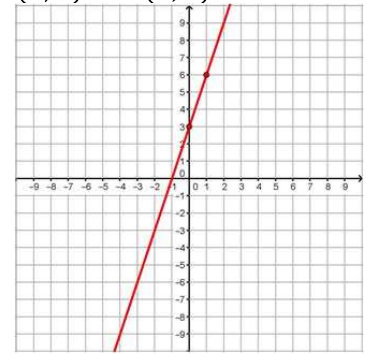
Slope:  $m = \frac{5}{3}$

7.  $(-2, 1)$  and  $(-4, 4)$



Slope:  $m = -\frac{3}{2}$

8.  $(0, 3)$  and  $(1, 6)$

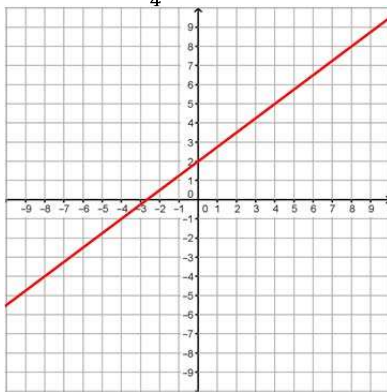


Slope:  $m = 3$

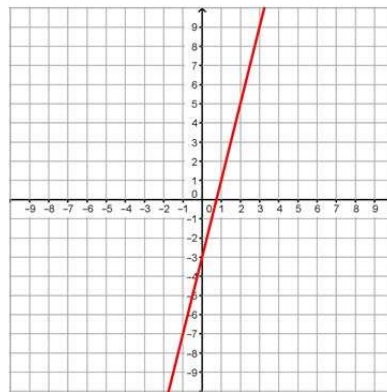
### Go

For problems 9 and 10, the y-intercept and the slope of a line are given. Graph the line on the coordinate axes, clearly labeling the slope and y-intercept.

9.  $(0, 2); m = \frac{3}{4}$



10.  $(0, -3); m = 4$



The equations below are represented in the above graphs. Explain how the slope and y-intercept show up in both the graph and algebraic representations.

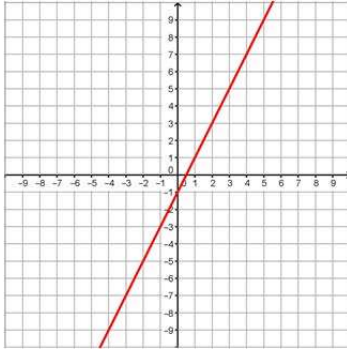
$$y = \frac{3}{4}x + 2$$

$$y = 4x - 3$$

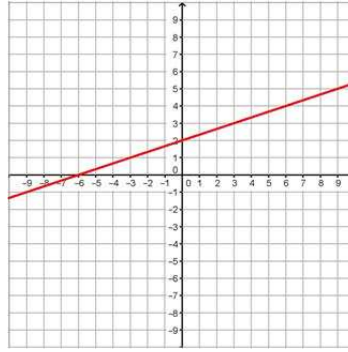
**Look for students to discuss the slope as the coefficient of x and the y-intercepts as the constant**

For problems 11 - 13, graph the following equations on the provided coordinate axes.

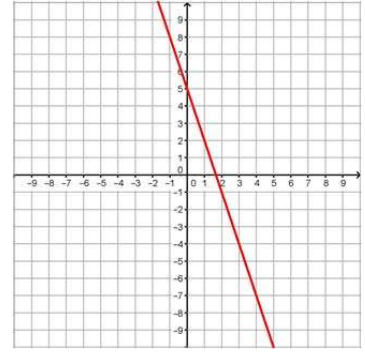
11.  $y = 2x - 1$



12.  $y = \frac{1}{3}x + 2$



13.  $y = -3x + 5$



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

## Equations and Inequalities 1.2

**Ready, Set, Go!****Ready**

Topic: Linear modeling



1. The local amusement park sells summer memberships for \$50 each. Normal admission to the park costs \$25; admission for members costs \$15.
  - a. If Darren wants to spend no more than \$100 on trips to the amusement park this summer, how many visits can he make if he buys a membership with part of that money?  
**3 visits**
  - b. How many visits can he make if he does not?  
**4 visits**
  - c. If he increases his budget to \$160, how many visits can he make as a member?  
**7 visits**
  - d. How many can he make as a non-member?  
**6 visits**
  
2. Jae just took a math test with 20 questions, each worth an equal number of points. The test is worth 100 points total.
  - a. Write an equation relating the number of questions Jae got right to the total score he will get on the test.  
 **$y = 5x$**
  - b. If a score of 70 points earns a grade of *C*, how many questions would Jae need to get right to get a *C* on the test?  
**14 questions**
  - c. If a score of 83 points earns a grade of *B*, how many questions would Jae need to get right to get a *B* on the test?  
**17 questions**
  - d. Suppose Jae got a score of 60% and then was allowed to retake the test. On the retake, he got all the questions right that he got right the first time, and also got half the questions right that he got wrong the first time. What percent did Jae get right on the retake?  
**80%**

**Set**

Topic: Using variables in context

Variable	Meaning
<b>B</b>	the number of Boys in the classroom
<b>G</b>	the number of Girls in the classroom
$P_B$	the number of Pencils each Boy has (assume all boys have the same number of pencils)
$P_G$	the number of Pencils each Girl has (assume all girls have the same number of pencils)
<b>L</b>	the cost of a Lunch for each students (in cents)
<b>S</b>	the cost of a Snack for each students (in cents)
<b>M</b>	the amount of time each student spends in Math class per day (in minutes)
<b>E</b>	the amount of time each student spends in English class per day (in minutes)
$H_M$	the amount of time each student spends on Homework for Math per day (in minutes)
$H_E$	the amount of time each student spends on Homework for English per day (in minutes)

3. Use the variables and their meanings from above to describe what each algebraic expression means (if anything).

a.  $B + G$

**The total number of students in the classroom**

b.  $GP_G$

**The total number of pencils all of the girls have**

c.  $BM + BH_M$

**The total amount the boys spend on math each day (in school and at home)**

d.  $LS$

**makes no sense**

4. Write an algebraic expression for each phrase

a. The total number of pencils for the students in the class

$$BP_B + GP_G$$

b. The cost of lunch for the whole class

$$(B + G)L \text{ or } BL + GL$$

c. The total amount of time students in the class spend on English each day, both in class and on homework

$$(B + G)(E + H_E)$$

**Go**

Topic: Evaluating expressions

**Complete each of the following:**

5. Evaluate  $5 + 6q$  at  $q = 9$ .

**59**

6. Find the value of  $3z + 20$  when  $z = -8$ .

**-4**

7. Get the numeric value of  $15 - 4x$  for  $x = -1$ .

**19**

8. Evaluate  $3t^2 + 7$  if  $t = -2$ .

**19**

9. What is  $-r^2$  when  $r = 8$ ?

**-64**

10. Find  $-w^2$  with  $w = -6$ .

**-36**

11. Compare the results.

a. Substitute  $b = 6$  into  $5b + 4 + 3b + 7$ .

**59**

b. Substitute  $b = 6$  into  $8b + 11$ .

**59**

c. Comment on what happens in parts a and b and explain why.

**The results are the same because the expressions are equivalent. When like terms are combined in part a,  $8b + 11$  is the result.**

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

## Equations and Inequalities 1.3

Ready, Set, Go!

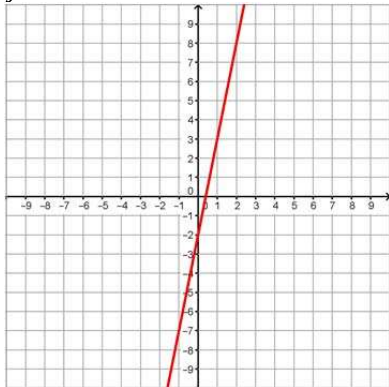
Ready

Topic: Solutions to an equation

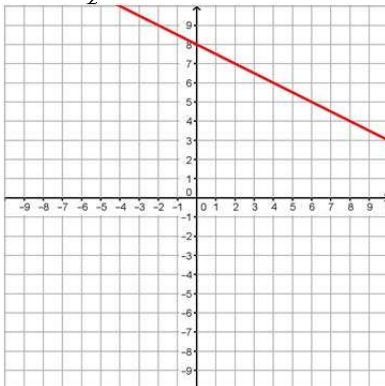


Graph the following equations using the coordinate graph, then say if the given point is a solution to the equation.

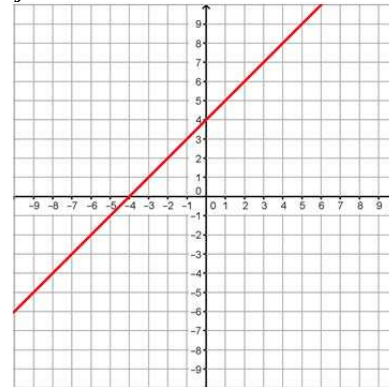
1.  $y = 5x - 2$

Point: (1, 3)  Yes /  No

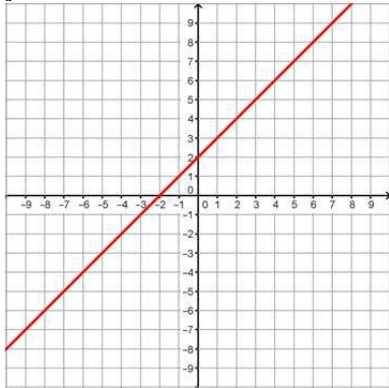
2.  $y = -\frac{1}{2}x + 8$

Point: (0, 4) Yes /  No

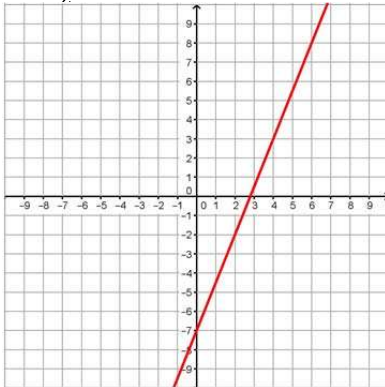
3.  $y = x + 4$

Point (-2, 2)  Yes /  No

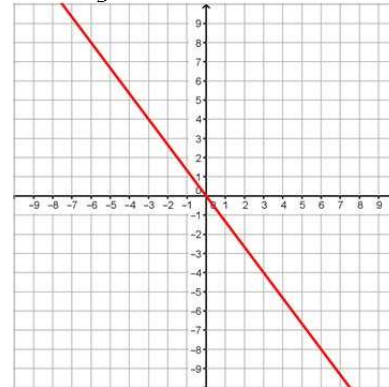
4.  $y = x + 2$

Point (1, 3)  Yes /  No

5.  $y = \frac{5}{2}x - 7$

Point (2, -2)  Yes /  No

6.  $y = -\frac{4}{3}x$

Point (0, 4) Yes /  No

**Set**

Topic: Equivalent Equations

7. The solution to an equation is  $n = -5$ . The equation has parentheses on at least one side of the equation and has variables on both sides of the equation. What could the equation be?

**Answers vary**

8. Create a two-step equation with the given solution. Draw a model to represent your expanded equations.

a.  $x = 3$

**answers vary**

b.  $m = -2$

**answers vary**

c.  $a = 0$

**answers vary**

9. Without solving, determine if the left and right sides of each equations are equivalent. Explain your reasoning.

a.  $14 - (3a + 2) = 14 - 3a + 2$

**not equivalent**

b.  $4a - 10 = 2(2a - 5)$

**equivalent**

10. Without solving, determine if these two equations have the same solution.

$3(x - 5) = 25$  and  $3x - 5 = 35$

**yes**

11. Which of the following expressions are equivalent?

$\frac{4t-10}{2}$

$\frac{4t}{2} - 10$

$2t - 10$

$4t - 5$



Solving equations can be similar to finding the unknown weights on a balance scale like the one shown below. Each rectangle represents an unknown amount. Each circle represents a weight of one unit. Some of these are grouped together as shown. Question 12 is drawn out for you. Your task is to fill in the equations that are represented in each step of the diagram. The first few are begun for you.

12.

	$3(2x + 1) = 2(x + 3) + 3x$
	$6x + \underline{3} = \underline{5x} + 6$
	$1x + \underline{3} = \underline{6}$
	$\underline{x} = \underline{3}$

13. Translate the diagrams into the four algebraic equations:

	$4(x + 2) + 2 = 3(2x + 1) + x + 1$
	$4x + 10 = 7x + 4$
	$6 = 3x$
	$2 = x$

**Go**

Topic: Checking solutions to equations

**Check whether the given number is a solution to the corresponding equation.**

14.  $a = -3$ ;  $4a + 3 = -9$

**yes**

15.  $x = \frac{4}{3}$ ;  $\frac{3}{4}x + \frac{1}{2} = \frac{3}{2}$

**yes**

16.  $y = 2$ ;  $2.5y - 10.0 = -0.5$

**no**

17.  $z = -5$ ;  $2(5 - 2z) = 20 - 2(z - 1)$

**no**

Topic: Solving multi-step linear equations

**Solve each equation, justify each step you use.**

18.

$5p - 2 = 32$	Justification
$+2 \quad +2$	<b>add 2 to both sides</b>
$\frac{5p}{5} = \frac{34}{5}$	<b>divide by 5 on both sides</b>
$p = \frac{34}{5}$	

19.

$3x + 9 = 44 - x$	Justification
$+x \quad +x$	<b>add x to both sides</b>
$4x + 9 = 44$ $-9 \quad -9$	<b>subtract 9 from both sides</b>
$\frac{4x}{4} = \frac{35}{4}$	<b>divide by 4 on both sides</b>
$x = \frac{35}{4}$	

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

## Equations and Inequalities 1.4

Ready, Set, Go!

Ready

Topic: Inequalities

Use the inequality  $4 < 6$  to complete each row in the table.

Apply each operation to the original inequality $4 < 6$	Result	Is the inequality true or false?
1. Add 4 to both sides	$8 < 10$	True
2. Add $-4$ to both sides	$0 < 2$	True
3. Subtract 10 from both sides	$-6 < -4$	True
4. Multiply both sides by 4	$16 < 24$	True
5. Divide both sides by 2	$2 < 3$	True
6. Multiply both sides by $-3$	$-12 < -18$	False
7. Divide both sides by $-2$	$-2 < -3$	False

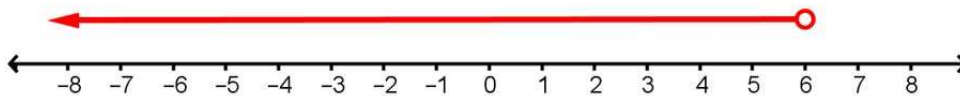
8. Which operations in the table create a false inequality? What do they have in common?  
**Multiply or divide both sides by a negative number**

9. In general, what operations, when performed on an inequality, *reverse* the inequality?  
**Multiply or divide both sides by a negative number**

10. Solve the inequality and graph the solution on a number line.

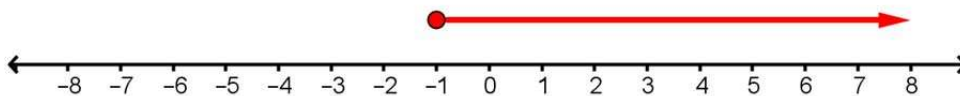
a.  $2x - 3 < 9$

$x < 6$



b.  $3x + 5 \geq 2$

$x \geq -1$



**Set**

Topic: Solve literal equations

**Solve for the indicated variable.**11. Solve the following equation to isolate  $F$ :  $C = \frac{5}{9}(F - 32)$ 

$$F = \frac{9}{5}C + 32$$

12. For  $V = \frac{1}{3}\pi r^2 h$ , rewrite the formula to isolate the variable  $h$ .

$$h = \frac{3V}{\pi r^2}$$

13. The area formula of a regular polygon is  $A = \frac{1}{2}Pa$ . The variable  $a$  represents the apothem and  $P$  represents the perimeter of the polygon. Rewrite the equation to highlight the value of the perimeter,  $P$ .

$$P = \frac{2A}{a}$$

14. The equation  $y = mx + b$  is the equation of a line. Isolate the variable  $m$ .

$$m = \frac{y-b}{x}$$

15. The equation  $y = mx + b$  is the equation of a line. Isolate the variable  $x$ .

$$x = \frac{y-b}{m}$$

16.  $Ax + By = C$  is the standard form of a line. Isolate the equation for  $x$ .

$$x = \frac{C-By}{A}$$

Rearrange the following equations to solve for  $y$  (slope-intercept form).

$$17. 4x + y = 3$$

$$y = -4x + 3$$

$$18. 2y = 6x + 9$$

$$y = 3x + \frac{9}{2}$$

$$19. 5x - 2y = 10$$

$$y = \frac{5}{2}x - 5$$

$$20. 3x + 6y = 25$$

$$y = -\frac{1}{2}x + \frac{25}{6}$$

$$21. x - 8y = 12$$

$$y = \frac{1}{8}x - \frac{3}{2}$$

$$22. 3x - 7y = 20$$

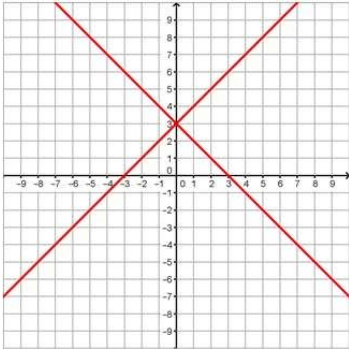
$$y = \frac{3}{7}x - \frac{20}{7}$$

## Go

Topic: Solve the systems of linear equations

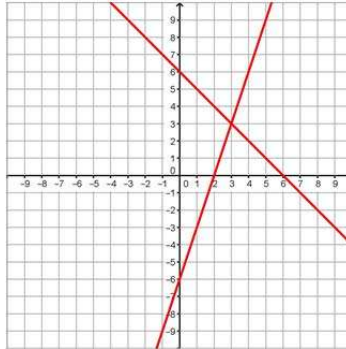
Solve linear equations and pairs of simultaneous linear equations (simple, with a graph only) by graphing both lines and finding where they intersect. Justify the solution numerically by checking your solutions in both equations.

$$23. y = x + 3 \text{ and } y = -x + 3$$



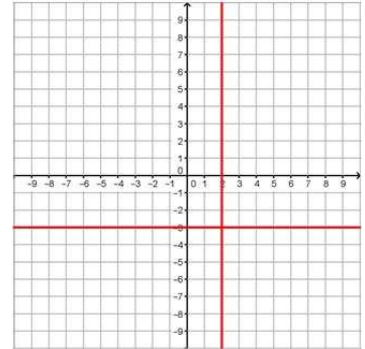
$(0, 3)$

$$24. y = 3x - 6 \text{ and } y = -x + 6$$



$(3, 3)$

$$25. 2x = 4 \text{ and } y = -3$$



$(2, -3)$

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

## Equations and Inequalities 1.5

## Ready, Set, Go!

## Ready

Topic: Solve absolute value equations

Find values of  $x$  that make each equation true.

$$1. |x| = 3$$

$$x = \pm 3$$

$$2. -2|x| = -12$$

$$x = \pm 6$$

$$3. |x - 4| = 20$$

$$x = 24 \text{ or } x = -16$$

$$4. |5 + x| = 10$$

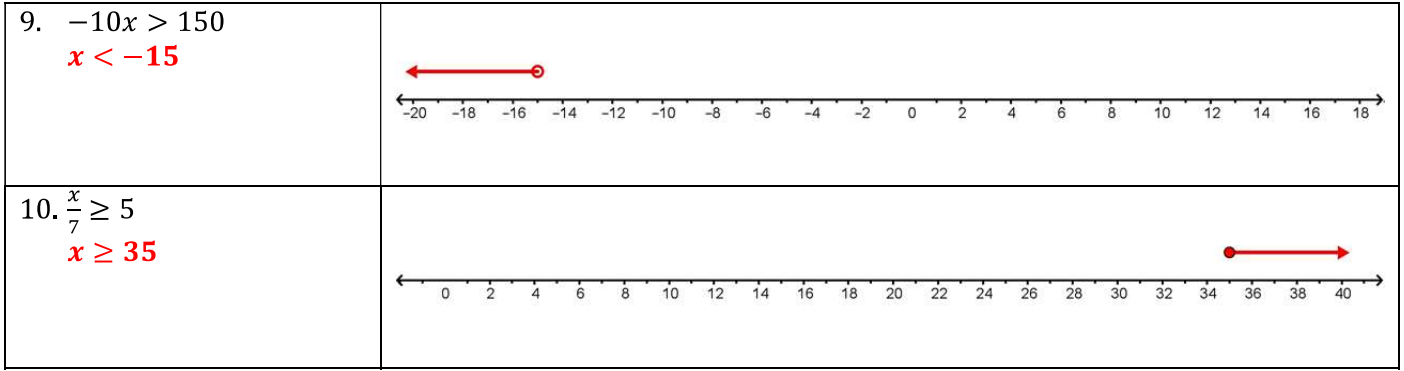
$$x = 5 \text{ or } x = -15$$

## Set

Topic: Solve inequalities

Solve each inequality and graph the solution on a number line.

$5. x - 2 \leq 1$ $x \leq 3$	
$6. x - 8 > -20$ $x > -12$	
$7. 3x \leq 6$ $x \leq 2$	
$8. \frac{x}{5} > -\frac{3}{10}$ $x > -\frac{3}{2}$	



Solve each multi-step inequality.

11.  $2x - 9 < 3$   
 $x < 6$

12.  $6x - 4 < 26$   
 $x < 5$

13.  $x - 5 > 2x + 3$   
 $x < -8$

14.  $\frac{3(x-4)}{12} \leq \frac{2x}{3}$   
 $x \geq -\frac{12}{5}$

15.  $2(x - 3) \leq 3x - 2$   
 $x \geq -4$

For each situation you are given a mathematical statement and two expressions beneath it.

- Decide which of the two expressions is greater, if the expressions are equal, or if the relationship cannot be determined from the statement.
- Write an equation or inequality that shows your answer.
- Explain why your answer is correct.

16. Statement:  $3n + 2 = 27$   
Which is greater?  $n$  or  $3$

**When the equation is solved,  $n = \frac{25}{3} \approx 8.3$ ,  
therefore  $n > 3$ .**

17. Statement:  $5 > 4$

Which is greater?  $5x$  or  $4x$

**$5x > 4x$  for any positive value of  $x$ ,  $5x = 4x$   
when  $x = 0$ , and  $5x < 4x$  when  $x$  is negative.**

18. Statement  $x > y$   
Which is greater?  $x + a$  or  $y + a$

**$x + a > y + a$  because adding the same value  
to  $x$  and  $y$  does not change the comparison.**

19. Statement:  $5 > 4$

Which is greater?  $\frac{4}{x}$  or  $\frac{5}{x}$

**$\frac{5}{x} > \frac{4}{x}$  for any positive value of  $x$  and  $\frac{5}{x} < \frac{4}{x}$   
when  $x$  is negative.**

## Go

Topic: Systems of equations

**Write two equations to represent the following situation.**

20. A tortoise and hare decide to race 30 feet. The hare, being much faster, decides to give the tortoise a 20 foot head start. The tortoise runs at 0.5 feet/sec and the hare runs at 5.5 feet per second. How long until the hare catches the tortoise?

**$d = 0.5t + 20$**

**$d = 5.5t$**



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

## Equations and Inequalities

## 1.6

## Ready, Set, Go!

## Ready

Topic: Solve and justify one variable inequalities



Solve each inequality, justifying each step you use.

2.

$x - 5 < 35$	Justification
$+5 \quad +5$	<b>add 5 to both sides</b>
$x < 40$	

$x + 68 \geq 75$	Justification
$-68 \quad -68$	<b>subtract 68 from both sides</b>
$x \geq 7$	

1.

3.

$2x - 4 \leq 10$	Justification
$+4 \quad +4$	<b>add 4 to both sides</b>
$\frac{2x}{2} \leq \frac{14}{2}$	
$x \leq 7$	<b>divide both sides by 2</b>

4.

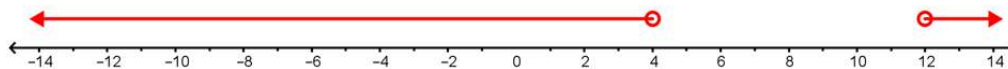
$5 - 4x \leq 17$	Justification
$-5 \quad -5$	<b>subtract 5 from both sides</b>
$\frac{-4x}{-4} \leq \frac{12}{-4}$	
$x \geq -3$	<b>divide both sides by -4 and reverse inequality</b>

## Set

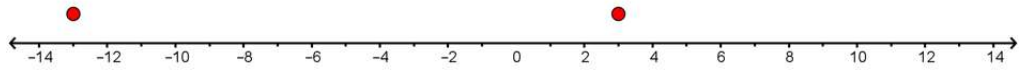
Topic: Solving absolute value equations and inequalities

Solve each inequality and graph the solution on the number line.

5.  $|x - 8| > 4$   
 $x > 12$  or  $x < 4$



6.  $|x + 5| = 8$   
 $x = 3$  or  $x = -13$



Topic: Solving multi-step inequalities

7.  $4x + 3 < -1$   
 $x < -1$

8.  $4 - 6x \leq 2(2x + 3)$   
 $x \geq -\frac{1}{5}$

9.  $5(4x + 3) \geq 9(x - 2) - x$   
 $x \geq -\frac{11}{4}$

10.  $\frac{2}{3}x - \frac{1}{2}(4x - 1) \geq x + 2(x - 3)$   
 $x \leq \frac{3}{2}$

Topic: Solve literal equations

11. The equation  $y = mx + b$  is the equation of a line. Isolate the variable  $b$ .  
 $b = y - mx$

12. For  $A = 2\pi rh$ , rewrite the formula to isolate the variable  $h$ .  
 $h = \frac{A}{2\pi r}$

13. Solve the following equation to isolate  $B$ :  $A = 2\pi rh + 2B$   
 $B = \frac{A - 2\pi rh}{2}$

14. The equation for the circumference  $c$  of a circle with radius  $r$  is  $c = 2\pi r$ . Solve the equation for the radius  $r$ .  
 $r = \frac{c}{2\pi}$

Solve the following equations for the unknown variable.

$$15. 3(2x + 1) = 2(x + 3) + 3x$$

$$x = 3$$

$$16. 2(2x + 3) + 5(x + 4) = 4(2x + 5) + 8$$

$$x = 2$$

Calculate the slope. Be sure to simplify your answers.

$$17. (10, 3) \text{ and } (7, 9)$$

$$m = -2$$

$$18. (4, -2) \text{ and } (4, 3)$$

$$\text{undefined slope}$$

$$19. (2, 10) \text{ and } (8, 7)$$

$$m = -\frac{1}{2}$$

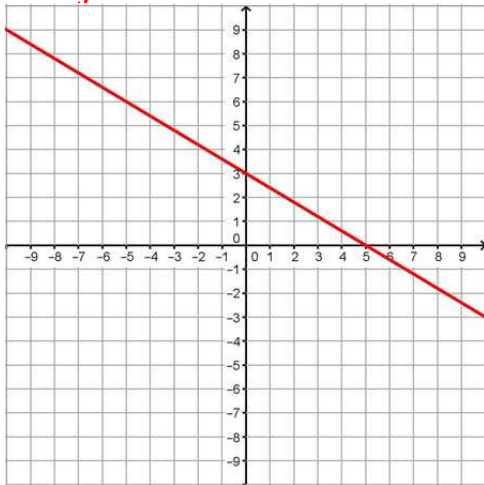
$$20. (7, 3) \text{ and } (8, 5)$$

$$m = 2$$

Write the equation of the line in slope intercept form by solving for  $y$ . Then graph each line.

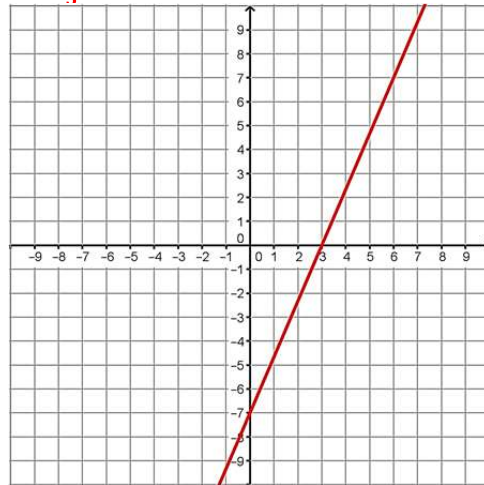
$$21. 3x + 5y = 15$$

$$y = -\frac{3}{5}x + 3$$



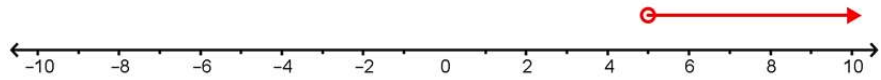
$$22. 7x - 3y = 21$$

$$y = \frac{7}{3}x - 7$$



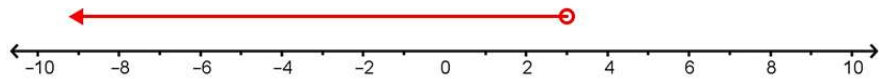
For #23-26, solve each inequality. Graph the solutions on the number line AND state 3 numbers in the solution set. Show all your work!

23.  $2x + 7 > 17$   
 $x > 5$



3 numbers in the solution set: **6, 7, 8**

24.  $20 > 6z + 2$   
 $z < 3$



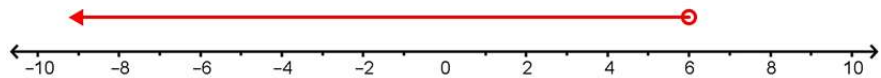
3 numbers in the solution set: **2, 1, 0**

25.  $9 < -3w + 6$   
 $w < -1$



3 numbers in the solution set: **-1, -2, -3**

26.  $7y - 1 \leq 29 + 2y$   
 $y \leq 6$



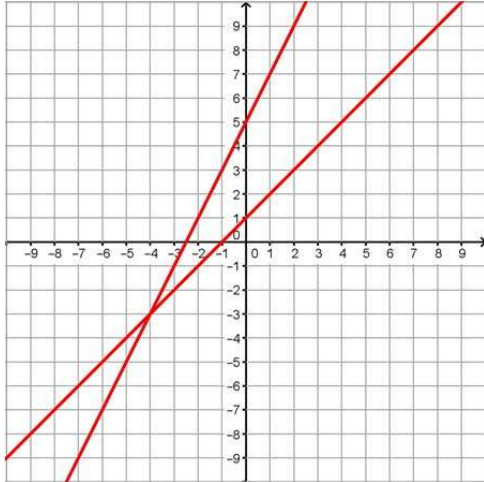
3 numbers in the solution set: **5, 4, 3**

**Go**

Topic: Solve systems of equations

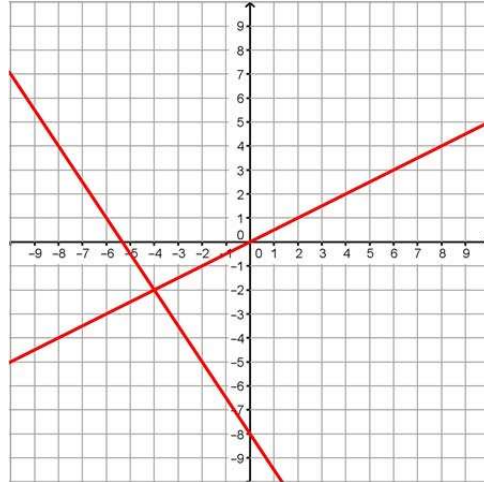
**Graph the following pairs of linear equations on the same grid. Find the point of intersection. Justify the solution numerically.**

$$27. \begin{cases} y = 2x + 5 \\ y = x + 1 \end{cases}$$



**$(-4, -3)$**

$$28. \begin{cases} y = -\frac{3}{2}x - 8 \\ x - 2y = 0 \end{cases}$$



**$(-4, -2)$**