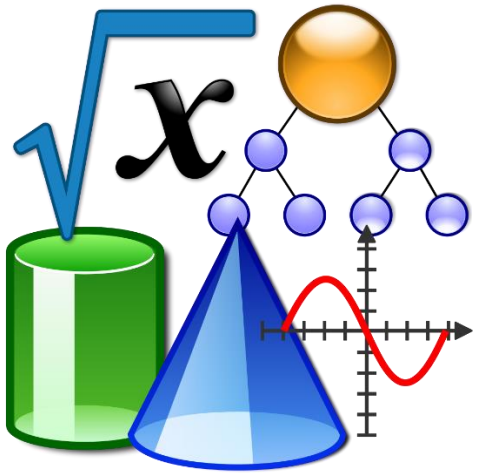
NPS Learning in Place

Algebra I



Name: _____ School: _____ Teacher: _____

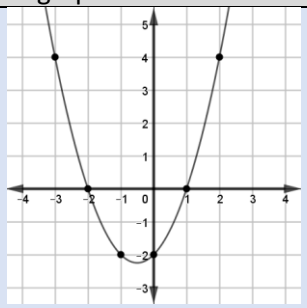
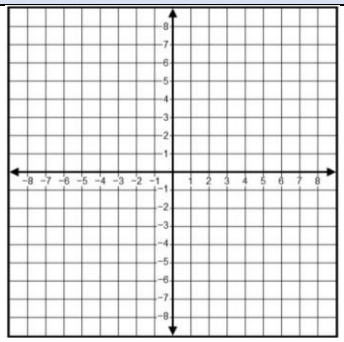
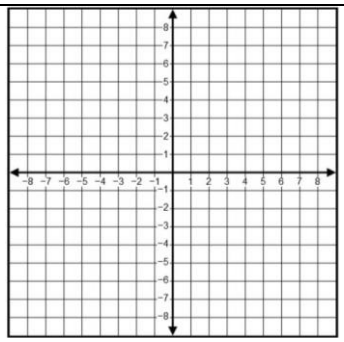
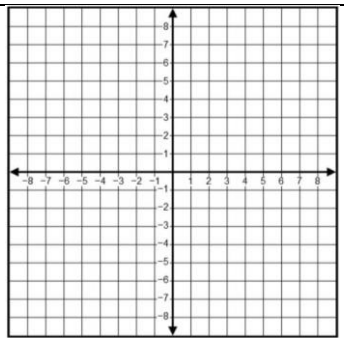
April 27- May 15

Week 1	• X-intercepts and zeros
Week 2	• Multi-step Equations
Week 3	• Multi-step Inequalities

Week 1 Finding x-intercepts

Quadratic Connections For each quadratic equation below,

a. Rewrite the quadratic equation in factored form.
b. Complete the table to help you sketch the graph of the function with the same polynomial expression set equal to y instead of 0.
c. List the x-intercepts seen on the graph

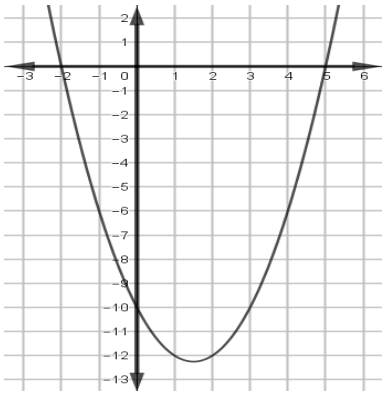
<table>
<tr><th>Quadratic Equation</th><th>a. factored form</th><th>b. graph</th><th>c. x-intercepts</th></tr>
<tr><td>Exaple
$x^2 + x - 2 = 0$
<table>
<tr><td>x</td><td>Y = x²+ x - 2</td><td>y</td></tr>
<tr><td>-3</td><td>$(-3)^2 + (-3) - 2 = 4$</td><td>4</td></tr>
<tr><td>-2</td><td>$(-2)^2 + (-2) - 2 = 0$</td><td>0</td></tr>
<tr><td>-1</td><td>$(-1)^2 + (-1) - 2 = -2$</td><td>-2</td></tr>
<tr><td>0</td><td>$(0)^2 + (0) - 2 = -2$</td><td>-2</td></tr>
<tr><td>1</td><td>$(1)^2 + (1) - 2 = 0$</td><td>0</td></tr>
<tr><td>2</td><td>(2) + (2) – 2 =</td><td>4</td></tr>
</table></td><td>$(x - 1)(x + 2) = 0$</td><td> 
Y = x²+ x - 2</td><td>(-2, 0) and (1, 0)</td></tr>
<tr><td>1. $x^2 + x - 6 = 0$
<table>
<tr><td>x</td><td>Y = x²+ x - 6</td><td>y</td></tr>
<tr><td>-3</td><td></td><td></td></tr>
<tr><td>-2</td><td></td><td></td></tr>
<tr><td>-1</td><td></td><td></td></tr>
<tr><td>0</td><td></td><td></td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
</table></td><td></td><td>  </td><td></td></tr>
<tr><td>2. $x^2 - 5x + 4 = 0$
<table>
<tr><td>x</td><td>Y = x²– 5x + 4</td><td>y</td></tr>
<tr><td>0</td><td></td><td></td></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
<tr><td>5</td><td></td><td></td></tr>
</table></td><td></td><td>  </td><td></td></tr>
<tr><td>3. $x^2 + 4x + 3 = 0$
<table>
<tr><td>x</td><td>Y = x² +4x + 3</td><td>y</td></tr>
<tr><td>-4</td><td></td><td></td></tr>
<tr><td>-3</td><td></td><td></td></tr>
<tr><td>-2</td><td></td><td></td></tr>
<tr><td>-1</td><td></td><td></td></tr>
<tr><td>0</td><td></td><td></td></tr>
<tr><td>1</td><td></td><td></td></tr>
</table></td><td></td><td>  </td><td></td></tr>
</table>

4. Describe where you find the x-intercepts of a graph.

5. The x-intercepts for the graph of $y = x^2 + x - 2$ are located at (-2, 0) and (1, 0).
    a) What do *all* coordinate pairs for an x-intercept have in common?

6. What relationship do you notice between the factors you created in part *a* of the table on the previous page and the x-intercepts that you recorded in part *c*?

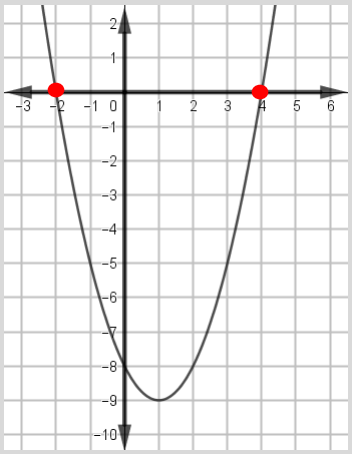
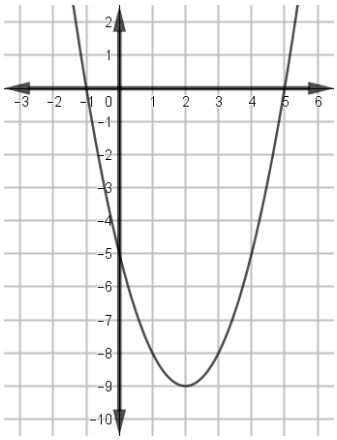
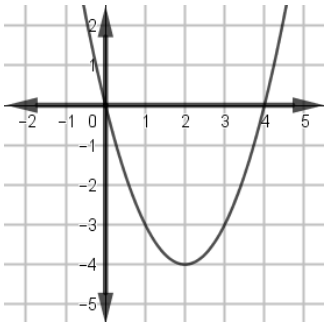
Use the relationship that you described in question 6 to predict what quadratic function (in factored form) was used to create the graph to the right.



7. Why is the x-coordinate of an x-intercept also referred to as a zero of the function?

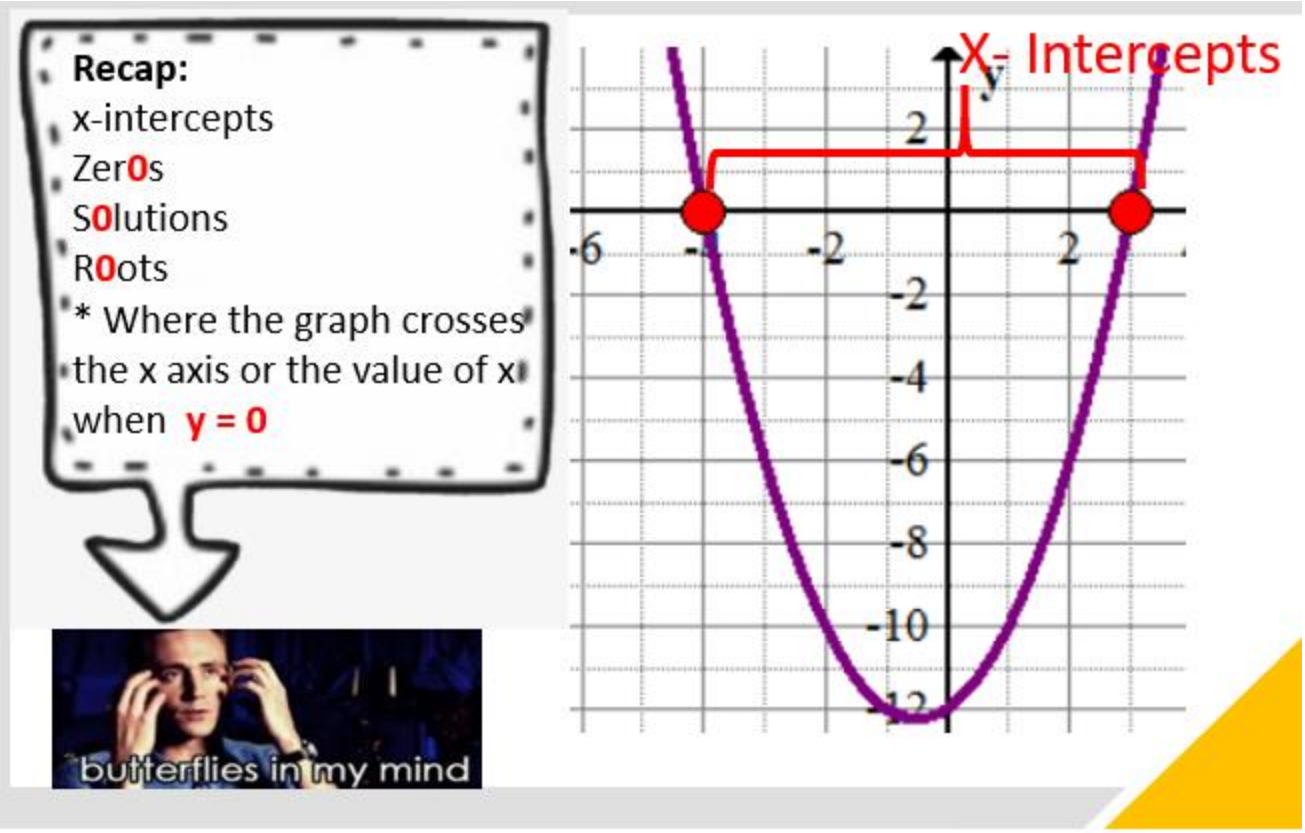
8. How do the zeros of a function relate to the solution set for the quadratic equation that, when set equal to zero, has a polynomial expression that matches that of the function?

Use your knowledge of the relationships between x-intercepts, zeros, factors, and solution sets to complete the table below.

Graph	x-intercepts	Zeros of the function	Quadratic Equation (in factored form) that may prompt you to look at the graph provided	Solution Set for the equation
Example: 	(–2, 0) and (4, 0)	-2 and 4	$(x+2)(x-4)=0$	{–2, 4}
10. 				
11. 				

Note: You may want to use your graphing calculator to verify that the equation you recorded in the fourth column produces the graph pictured in the first column.

Journal/Writing Prompt: Explain the relationship between the more general function $y = x^2 - 8x + 15$ and the specific equation $x^2 - 8x + 15 = 0$. Include in your explanation how the graph of the function can help you factor and solve the equation.



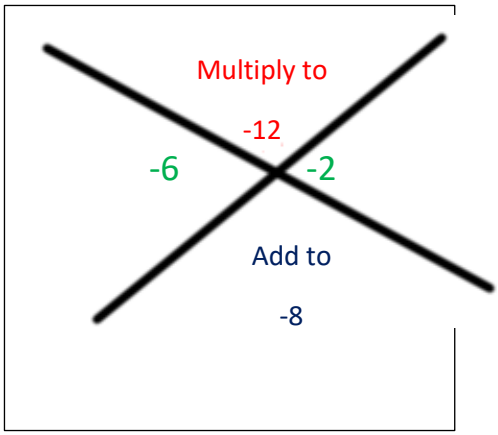
How to find the zeros, roots, solutions, x-intercepts algebraically

Step 1: Set the quadratic equal to zero
Step 2: Factor the side of the equation that does not include zero
Step 3: Set each factor equal to zero
Step 4: Solve for x

Example: Find the zeros, roots, solutions, x-intercept of the given expression
X^2- 8x + 12

Step 1:
X^2- 8x + 12 = 0

Step 2: Factor the side of the equation that does not include zero
(x – 6)(x -2)



Step 3: Set each factor equal to zero
(x – 6) = 0 (x -2) = 0

Step 4: Solve for x
X – 6 = 0 x – 2 = 0
+ 6 + 6 + 2 +2
X = 6 x = 2

X-intercepts (6, 0) and (2, 0) Roots/Zeros: 6 and 2 Solution: {6, 2}

Practice Time: Show your work on a separate sheet of paper.

Name Date

FACTORISING QUADRATIC EQUATIONS SHEET 5

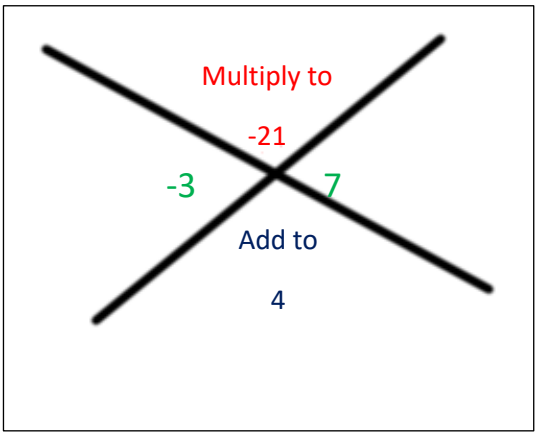
Factorise these quadratic equations.

1)	$x^2 + x - 6 = 0$	$(x + \_\_\_)(x - \_\_\_)$	$x =$ ___ or ___
2)	$y^2 + 4y - 5 = 0$		
3)	$z^2 - 2z - 8 = 0$		
4)	$a^2 - 5a - 6 = 0$		
5)	$b^2 - 4b + 3 = 0$		
6)	$c^2 - 5c + 4 = 0$		
7)	$d^2 - 3d + 2 = 0$		
8)	$e^2 + 6e + 9 = 0$		
9)	$f^2 - 2f - 15 = 0$		
10)	$g^2 - 4 = 0$		
11)	$h^2 - 6h + 5 = 0$		
12)	$i^2 + 8i + 12 = 0$		
13)	$j^2 - 8j + 12 = 0$		
14)	$k^2 + 13k - 14 = 0$		
15)	$m^2 - 5m - 14 = 0$		
16)	$n^2 + n - 20 = 0$		

How to find the zeros, roots, solutions, x-intercepts of a quadratic in non-standard form algebraically

Step 1: Write the equation in standard form using inverse operations
Step 2: Set the quadratic equal to zero
Step 3: Factor the side of the equation that does not include zero
Step 4: Set each factor equal to zero
Step 5: Solve for x

Example: Find the zeros, roots, solutions, x-intercept of the given expression
$X^2 + 4x = 21$



Step 1:
$X^2 + 4x = 21$
$-21 \quad -21$
$x^2 + 4x - 21$

Step 2: Set the quadratic equal to zero
$x^2 + 4x - 21 = 0$

Step 3: Factor the side of the equation that does not include zero
$(x - 3)(x + 7)$

Step 4: Set each factor equal to zero
$(x - 3) = 0 \qquad (x + 7) = 0$

Step 5: Solve for x
$x - 3 = 0 \qquad x + 7 = 0$
$+3 \quad +3 \qquad -7 \quad -7$
$X = 3 \qquad x = -7$

X-intercepts (3, 0) and (-7, 0) Roots/Zeros: 3 and -7 Solution: {3, -7}

You try! Example: Find the zeros, roots, solutions, x-intercept of the given expression
$X^2 + 12x = -32$

You try! Example: Find the zeros, roots, solutions, x-intercept of the given expression
$X^2 - 7 = -6x$

Practice:

Directions: Find the zeros, roots, solutions, x-intercept of the given expression	
1. $x^2 + 9x = -18$	2. $x^2 + 5x = 14$
3. $x^2 + 7 = -8x$	4. $x^2 -10 = -3x$
5. $x^2 = 6x + 72$	6. $x^2 = 14x + 48$
7. $x^2 -22x = -72$	8. $x^2 - 24 = 2x$
9. $x^2 = 8x - 15$	10. $-4x + 32 = x^2$
11. $14x = x^2 + 40$	12. $x^2 – 4x = 45$

How to find the zeros, roots, solutions, x-intercepts of a quadratic with a leading coefficient > 1

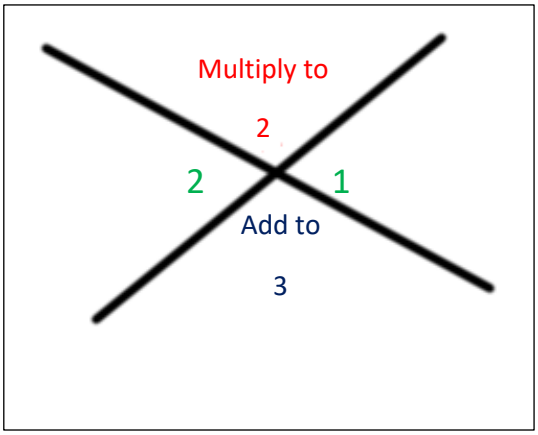
Step 1: Factor the GCF
Step 2: Set the quadratic equal to zero
Step 3: Factor the side of the equation that does not include zero
Step 4: Set each factor equal to zero
Step 5: Solve for x

Example: Find the zeros, roots, solutions, x-intercept of the given expression

$4x^2 + 12x + 8$

Step 1 Factor the GCF 4

$\left(\frac{4x^2}{4} + \frac{12x}{4} + \frac{8}{4}\right)$ → **$4(x^2 + 3x + 2)$**



Step 2: Set the quadratic equal to zero

$4(x^2 + 3x + 2) = 0$

Step 3: Factor the side of the equation that does not include zero

$4(x + 2)(x + 1)$

Step 4: Set each factor equal to zero

$4 = 0$ $(x + 2) = 0$ $(x + 1) = 0$

Step 5: Solve for x

$x + 2 = 0$ $x + 1 = 0$
$-2 = -2$ $-1 \quad -1$
$x = -2$ $x = -1$

X-intercepts (-2, 0) and (-1, 0) Roots/Zeros: -2 and -1 Solution: {-2, -1}

Notice: 4 is not a solution because 4 can never equal to zero

You try! Example: Find the zeros, roots, solutions, x-intercept of the given expression

If there is not GCF, Use the Slip and slide method to factor the quadratic and then complete steps 4 – 5
(Look up the notes on the slip and slide method found in the Learning in Place Phase 2 Plan)

$2x^2 + x - 6$

$(2x - 3)(x + 2)$

Step 4: Factor the side of the equation that does not include zero

$(2x - 3) = 0$ **$(x + 2) = 0$**

Step 5: Solve for x

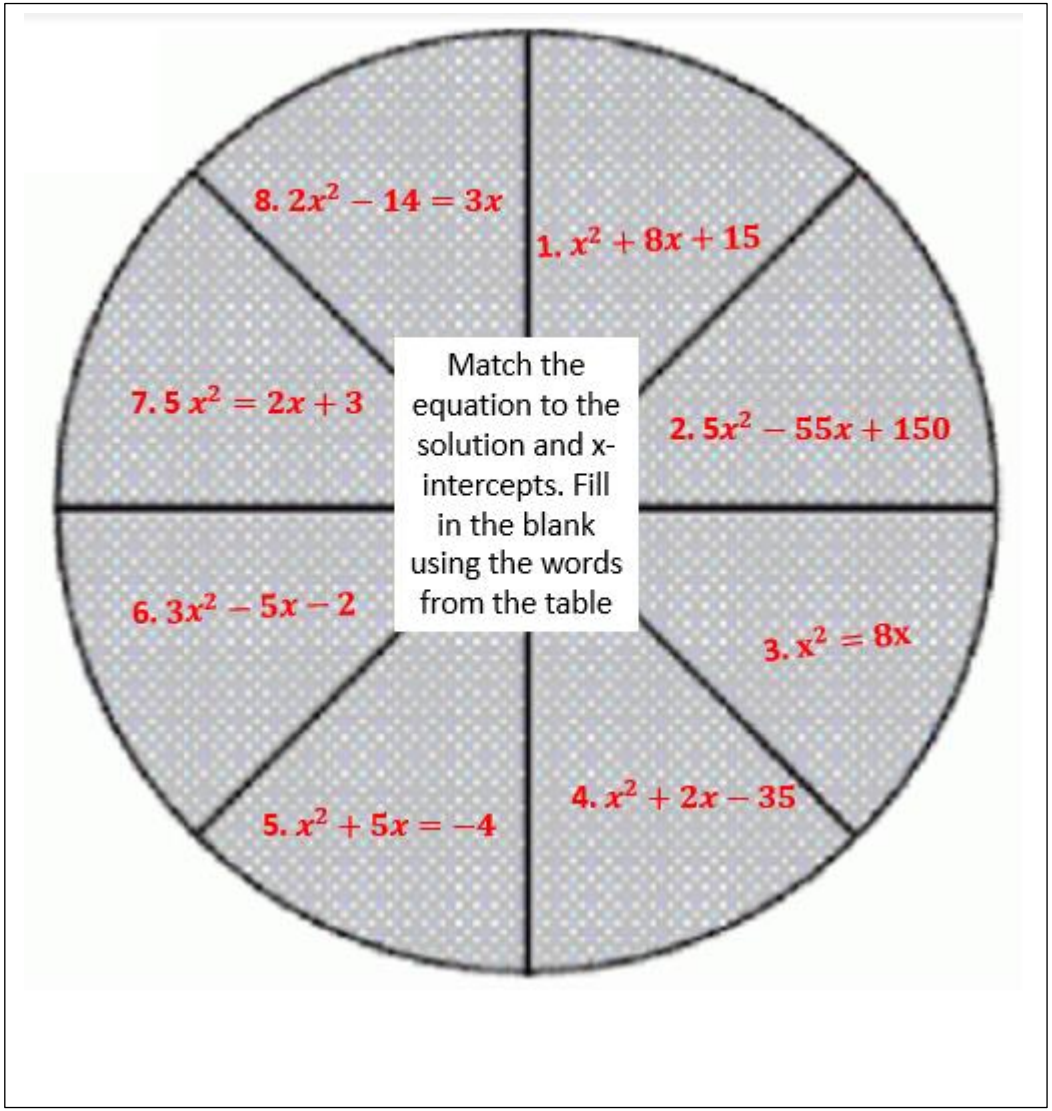
$2x - 3 = 0$ **$x + 2 = 0$**
$+3 \quad +3$ **$-2 \quad -2$**
$2x = 3$ **$x = -2$**
$\frac{2x}{2} = \frac{3}{2}$
$X = \frac{3}{2}$

X-intercepts $\left(\frac{3}{2}, 0\right)$ and (-2, 0)

Roots/Zeros: $\frac{3}{2}$ and -2

Solution: $\{\frac{3}{2}, -2\}$

x-intercepts	Solution/roots/Zeros
pass **A.** (-5,0) and (-3,0)	learning **I.**{-7, 5}
about **B.** $\left(-\frac{3}{5},0\right)$ and (1,0)	isn't **J.**{-1, -4}
to **C.** (8,0) and (0,0)	in **K.** $\left\{\frac{7}{2},-2\right\}$
the **D.** $\left(-\frac{1}{3},0\right)$ and (2,0)	for **L.** {6, 5}
waiting **E.** (6,0) and (5,0)	to **M.** $\left\{-\frac{3}{5},1\right\}$
life **F.** (-7, 0) and (5, 0)	rain N. {8, 0}
about **G.** (-1, 0) and (-4, 0)	it's **O.** $\left\{-\frac{1}{3},2\right\}$
storm **H.** $\left(\frac{7}{2},0\right)$ and (-2,0)	dance **P.** {-5, -3}



_____ _____ _____ _____ _____ the _____ _____ _____,

F **J** **B** **E** **L** **H** **M** **A**

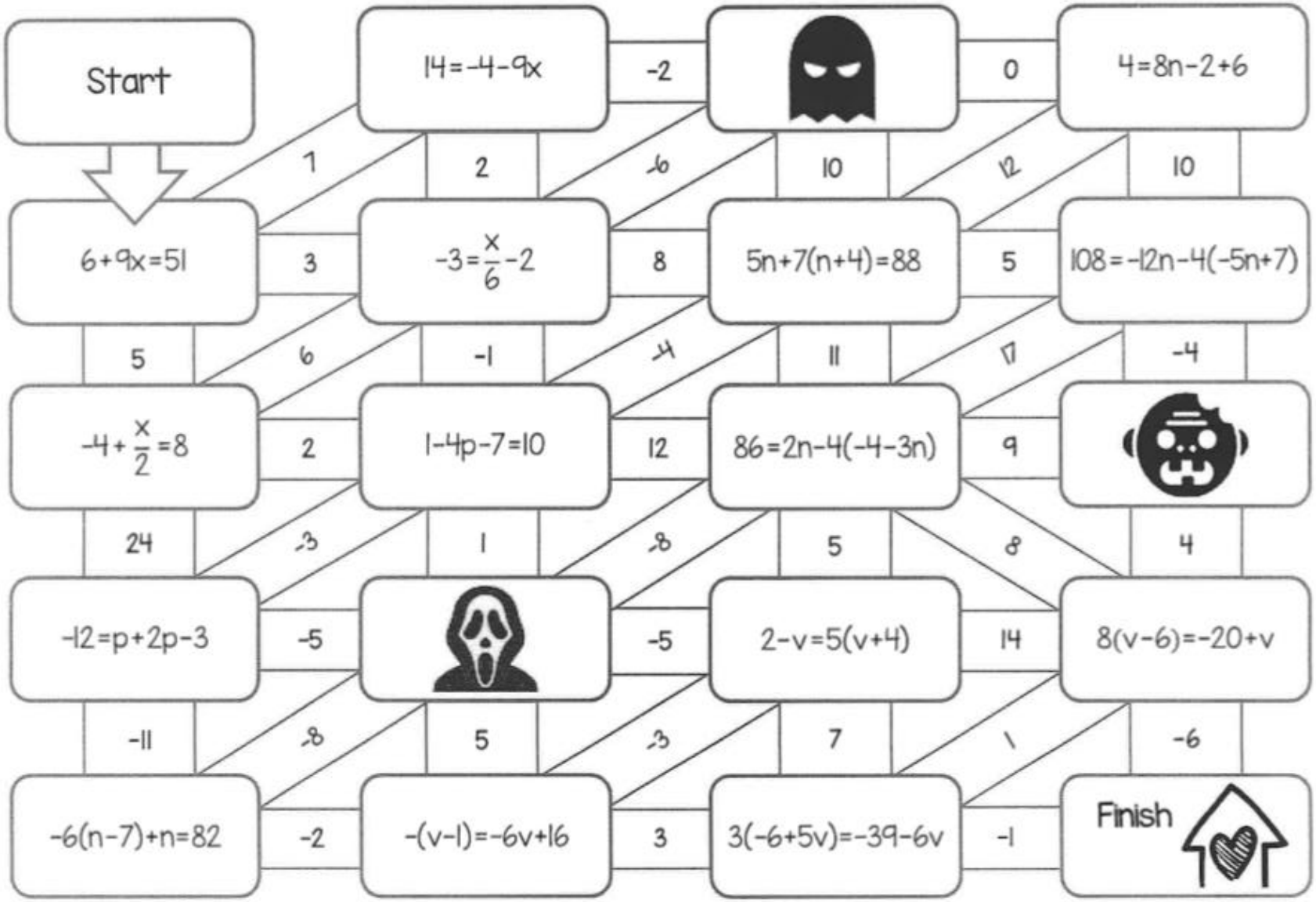
_____ _____ _____ _____ _____ _____ _____ _____.

O **G** **I** **C** **P** **K** **D** **N**

Solving Equations Maze

Name: _____

Dodge the monsters. Make it home. Solve problems along the way to reveal the right path.
If a correct answer takes you to a monster, you made a wrong turn earlier on!



Week 2

Multistep Equations (A.4a)

Algebra 1: Mountains of Equations!

Solve the following equations for each variable. Match the variable to the number in the table below to find the answer to the following question: **What is the tallest mountain we've ever discovered and where is it?**

Hint: N.S = No Solution and I.S = Infinite Solutions

1. r - 39 = -7(3r - 7)
2. 3(-4 + 2s) = 2(s + 2) - 4
3. -160 = 14m + 2(-10 - 12m)
4. -8(y - 1) = -2y - 40
5. 3p + 3(1 - p) = -1(p + 2)
6. 29 - 3u = -4(-u + 5)
7. -18 + 5o = 5(-3 + o)
8. 8 - 4(8 - 6s) = -3 + 3s
9. -221 = -13(n + 6)
10. -1(m + 1) = -2(4 + m)
11. -3(2a - 1) = 3 - 6a
12. -15 - 2n = 5(8n - 2) - 5
13. 23 - 5m = -1(2m - 5)
14. 12(-6 + 3L) = 360
15. -2(o - 4) + 4(2o - 4) = 1 + 2o - 1
16. 2(1 + 3o) + 8o = 32 + 8o
17. 2(-9s - 7) = -176

2=	12=	8=	-7=	-5=	7=	1=		6=	5=	0=	3=

N.S =	11=		14=	I.S=	4=	9=

BONUS: Solve the following equations to find out about how tall this mountain is! Match the variables to the numbers, and vice versa, below.

1. 14 - 3m = 7(m - 8)
2. 15 + 6i = 3(i + 5)
3. -32 - 4x = -6(-x + 7)
4. -2e + 12 = -2(e -6)
5. -6L - 20 = 4 - 6(6L - 6)
6. -2v + 20 = -4(v - 7)
7. 7 - 4s = -4(s - 5) - 8

x=	v=		η =	0=	2=	I.S=	N.S=

Name:_____ Date:_____

Puzzling Equations with No Solution, One Solution, or Infinitely Many Solutions

Use the numbers 0-9 to fill in the boxes below. You can only use each digit once. Your task is to complete each equation so that there will be at least 2 problems of each type. After you have completed all 10 problems, solve them to show that your answers are correct.

1. $4x + 3 - 4x = \square x - 7$

2. $-6x + 2 = -2(\square x - 1)$

3. $-5x - 10 = \square(-5x + 2)$

4. $4(x - 2) + x = \square x - 4$

5. $7x + 4 = 4 + \square x$

6. $2(4x + 5) = \square x - 9$

7. $2x - 6 = \frac{1}{2}(\square x + 8)$

8. $x - 5 = -1(\square x - 4) + 3x$

9. $6x + 4 = 2 + \square x$

10. $-2x + 3 + 11x = \square x + 3$

Literal Equations (A.4c)

Name: _____ Date: _____

Directions: Solve for the indicated variable in each formula below. Assign a shape to represent each variable. Rearrange the shapes, using the properties of equality, to solve for the indicated shape. Write your algebraic solution in the space provided.

1. $i = prt$ (interest = principal · rate · time)

   a) Solve for *p*: _____b) Solve for *r*: _____c) Solve for *t*: _____

2. $V = \pi r^2 h$ (volume of a cylinder = pi · radius^2 · height)

   a) Solve for *h*: _____b) Solve for *r*: _____

3. $A = \frac{1}{2}bh$ (area of a triangle = $\frac{1}{2}$ base · height)

   a) Solve for *b*: _____b) Solve for *h*: _____

4. $A = \frac{1}{2}h(b_1 + b_2)$ (area of a trapezoid = $\frac{1}{2}$ height · [base$_1$ + base$_2$])

   a) Solve for *h*: _____b) Solve for b_1: _____c) Solve for b_2: _____

5. $Ax + By = C$ (general form of a linear equation)

   a) Solve for *y*: _____b) Solve for *x*: _____

6. $y = mx + b$ (slope-intercept form for the equation of a line)

   a) Solve for *x*: _____b) Solve for *m*: _____c) Solve for *b*: _____

Some values or coefficients for the formulas above have been determined. With some of these values given, solve for the indicated variable.

7. $3y = \frac{1}{2}x + b$. *Solve for b:*

8. *36 = -pt. Solve for t:*

9. $A = \frac{1}{2} h\,(2 + -4b)$. *Solve for h:*

10. -7x + 7y = 21. *Solve for y:*

11. $112 = \frac{1}{2}bh$. *Solve for b:*

12. $V = 9\pi h$. *Solve for h:*

Error Analysis. Students were given equations and asked to solve for specific variables. In each solution, a mistake has been made. For each, determine between which two consecutive steps were either the properties of real numbers or the properties of equality applied incorrectly.

13. Solve for y in the equation: Step 0: $\frac{1}{2}(2x - 4y) = 3x + 4$ Step 1: $x - 2y = 3x + 4$ Step 2: $x - x - 2y = 3x - x + 4$ Step 3: $-2y = 2x + 4$ Step 4: $\frac{-2y}{-2} = \frac{2x+4}{-2}$ Step 5: $y = x - 2$ Error made between step _____ and step _____	14. Solve for x in the equation: Step 0: $\frac{2}{3}x = 3x + 4y$ Step 1: $3\left(\frac{2}{3}x\right) = 3(3x + 4y)$ Step 2: $2x = 9x + 12y$ Step 3: $2x - 9x = 9x - 9x + 12y$ Step 4: $-7x = 12y$ Step 5: $\frac{-7x}{-7} = \frac{12y}{7}$ Step 6: $x = \frac{12}{7}y$ Error made between step _____ and step _____
15. Solve for b in the equation: Step 0: $4a - 11 + c = 3(b - 5)$ Step 1: $4a - 11 + c = 3b - 5$ Step 2: $4a - 11 + 5 + c = 3b - 5 + 5$ Step 3: $4a - 6 + c = 3b$ Step 4: $\frac{4a-6+c}{3} = \frac{3b}{3}$ Step 5: $\frac{4}{3}a - 2 + \frac{1}{3}c = b$ Error made between step _____ and step _____	16. Solve for y in the equation: Step 0: $y - 3 = -2(x + 7)$ Step 1: $y - 3 = -2x - 14$ Step 2: $y - 3 + 3 = -2x - 14 - 3$ Step 3: $y = -2x - 17$ Error made between step _____ and step _____

Multistep Equations' Practical Problems (A.4e)

Read without numbers.

Eliminate unnecessary information.

Assign the variables.

Develop an equation.

Solve the equation.

Examples:

1. Jimmy is in New York City to see a Drake concert. He needs to get from his Airbnb to the concert venue, so he decides to take a cab. The cab charges a $3 boarding fee in addition to charging $0.50 per mile traveled. Jimmy gave the driver a $2 tip and paid $10. How far away was the concert venue?

2. Bob wants to frame a picture. He needs to know how long to cut the length and width of the wood for the frame. The length of the picture is six inches more than the width. If the perimeter of the picture is 108 inches, what are the length and the width of the picture?

Practical Problems Practice (A.4e)

Set up an equation and solve.

1. Two more than three times a number is six less than the product of two and a number.

2. Each of Mrs. Moore's students uses a certain number of pencils per week of school. There are 22 students in Mrs. Moore's class. If there are 36 weeks of school and Mrs. Moore's students use 3168 pencils in a school year, how many pencils does each student use per week?

3. Leona is comparing the cost of cell phone bills between two different companies. One option gives her unlimited data and texting for $40 a month, but charges $0.25 per minute talking on the phone. The other plan only charges $0.10 per minute talking on the phone, but charges $60 a month for unlimited data and texting. How many minutes would she spend talking on the phone for the plans to be the same price?

Review Problems (A.4a-c-e

1) What value of x will make the equation $3(x + 15) - 6x = -6(x - 3)$ true?

F -9 G -6 H 2 J 3

2)

Directions: Select the correct answer.

Michelle correctly solved a linear equation and the last line of her work was:
$1 = 2$

Which statement best describes the solution to the equation Michelle was solving?

The only solution is 1.	The equation has infinitely many solutions.
The only solution is 2.	The equation has no solutions.
The solutions are both 1 and 2.	

3)

Solve for n:

$$\frac{3n - 7}{6} = \frac{2n + 5}{3}$$

F -17

G -21

H -53

J 3

Review Problems Continued (A.4a-c-e)

4)

What is the solution to the equation?

$$\frac{2}{3}a + \frac{4}{3} = \frac{1}{3}(2a + 4) + 6$$

a) No solution

c) Infinite solutions

b) $\frac{1}{3}$

d) $-\frac{1}{6}$

5) Solve for n:

$$\frac{3n - 7}{6} = \frac{2n + 5}{3}$$

F -17

G -21

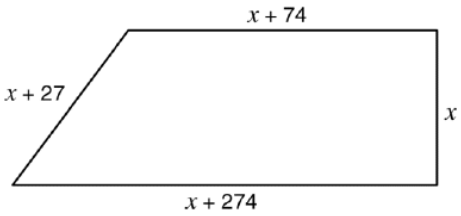
H -53

J 3

6) Connie and Jackie are shopping for new guitar strings in a music store. Connie buys two packs of strings. Jackie buys 2 packs of strings and a music book. The music book costs $16. Their total cost is $72. How much is one pack of strings?

Review Problems Continued (A.4a-c-e)

7)



Tambria's property has the shape of a trapezoid with the dimensions shown. If the perimeter of the property is 3,279 feet, what is the value of x?

F 726 ft

G 781.25 ft

H 913.5 ft

J 1,452 ft

8)

In addition to an \$80 bonus, Joan earned \$8 per hour working last week. Joan's total earnings last week were \$240. How many total hours did she work last week?

F 10 G 20 H 30 J 40

9) The formula shown can be used to find A, the amount of money Raul has in his savings account.

$$A = P + Prt$$

Raul wants to find r, the rate of interest his money earns. Which equation is correctly solved for r?

F $r = APt$ G $r = A - 2Pt$ H $r = \frac{A}{2Pt}$ J $r = \frac{A - P}{Pt}$

10) A formula to find the angle measures of an isosceles triangle is shown.

$$180 = 2x + y$$

Which equation can be used to find x?

F $x = \frac{180 - y}{2}$ G $x = \frac{180 + y}{2}$ H $x = 90 - y$ J $x = 90 + y$

Week 3

Notes

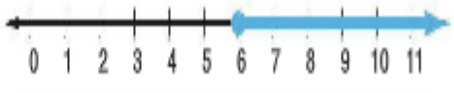
- You have learned to solve multistep linear inequalities in one variable algebraically and represent the solution graphically.
- You applied the properties of real numbers and properties of inequality to solve multistep linear inequalities in one variable algebraically.

Example:

Solve $3a + 6 \leq 4a$. Then graph the solution set on a number line.

$3a + 6 \leq 4a$	Original inequality
$3a - 3a + 6 \leq 4a - 3a$	Subtract $3a$ from each side.
$6 \leq a$	Simplify.

Since $6 \leq a$ is the same as $a \geq 6$, the solution set is $\{a \mid a \geq 6\}$.



Example:

Solve $4(3t - 5) + 7 \geq 8t + 3$. Graph the solution on a number line.

$4(3t - 5) + 7 \geq 8t + 3$	Original inequality
$12t - 20 + 7 \geq 8t + 3$	Distributive Property
$12t - 13 \geq 8t + 3$	Combine like terms.
$4t - 13 \geq 3$	Subtract $8t$ from each side and simplify.
$4t \geq 16$	Add 13 to each side.
$\frac{4t}{4} \geq \frac{16}{4}$	Divide each side by 4.
$t \geq 4$	Simplify.

The solution set is $\{t \mid t \geq 4\}$.

Example:

Solve $-11y - 13 > 42$. Graph the solution on a number line.

$-11y - 13 > 42$	Original inequality
$-11y > 55$	Add 13 to each side and simplify.
$\frac{-11y}{-11} < \frac{55}{-11}$	Divide each side by -11, and reverse the inequality.
$y < -5$	Simplify.

The solution set is $\{y \mid y < -5\}$.

You try! **Directions:** Solve each inequality in the space provided, graph the solution set on the blank number line provided & list 3 possible solutions for each. Use another sheet of paper if needed.

Solving Multistep Linear Inequalities

1.) $9x - 5 > -2(x - 3)$

Three possible solutions: _____, _____, _____

2.) $5x - 5 - 9x < 3$

Three possible solutions: _____, _____, _____

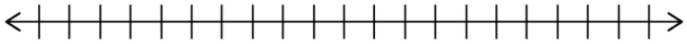
3.) $3x - 5(x + 1) \geq -7$

Three possible solutions: _____, _____, _____

4.) $\frac{3}{4}x - 10 + \frac{3}{8}x \leq \frac{1}{8}$

Three possible solutions: _____, _____, _____

5.) $\frac{3x-5}{8} > \frac{1}{2}$

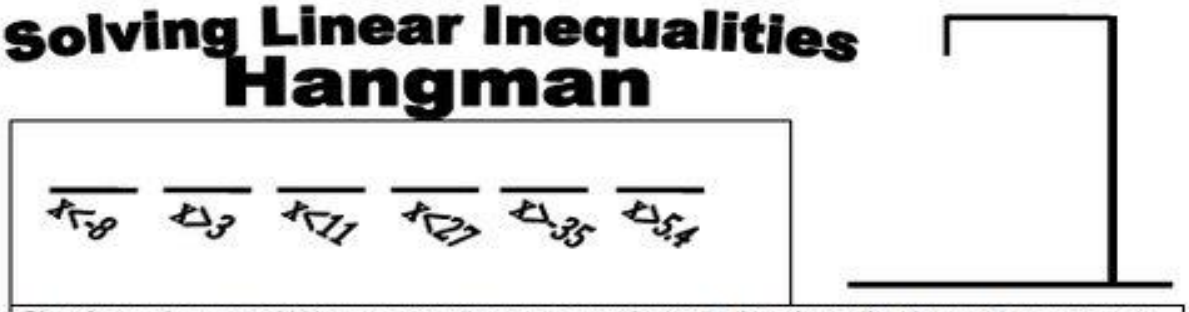


Three possible solutions: _____, _____, _____

Solving Linear Inequality Practice

YOU TRY!

Solving Linear Inequalities Hangman

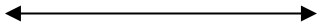
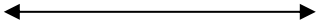
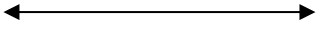


Directions: Discover the hidden message. Choose a letter and solve the linear inequality. Show work on a separate sheet of paper. Check to see if the solution matches the above blanks. Add a body part if guess does not match.

A $6 > -\frac{2}{3}(7x-2)$	J $-\frac{2}{7}(1-4x)+8>18$	S $-2x-5x-4<10$
B $-\frac{1}{3}(x-9)+4<-2$	K $-3(4+2x)<18$	T $-39.2>1.2(6-4.3x)-6.44x$
C $-\frac{1}{4}x-8<\frac{3}{4}$	L $-39.2<1.2(6-4.3x)-6.44x$	U $2-3(x+4)<17$
D $-\frac{2}{7}(1-4x)+8<18$	M $10<-2x-5x-4$	V $\frac{2.6x-4.8}{-2}+3.2<-8.7$
E $\frac{2.6x-4.8}{-2}+3.2>-8.7$	N $-2<-\frac{1}{3}(x-9)+4$	W $\frac{2}{7}(3-4x)+8>18$
F $7(2-x)+9>2$	O $-\frac{2}{7}(3-4x)+8<18$	X $-3x+4<5$
G $2-3(x+4)>17$	P $-\frac{1}{3}(5x-9)+4>-2$	Y $-3(4+2x)>18$
H $-\frac{1}{3}(5x-9)+4<-2$	Q $-3x+4>5$	Z $-\frac{1}{4}x-8>\frac{3}{4}$
I $-\frac{2}{3}(7x-2)>6$	R $7(2-x)+9<2$	

Error Analysis

You try! **Directions:** Identify the mistake in the first column and then correct it in the second. Once you make the correction and show the appropriate work, graph your solution.

Inequality	Correction	*Graph*
6x - 4 > –2 +2 +2 6x > –2 $x > -\frac{1}{3}$		
–x – 6 ≤ 2 - (3x – 4) –x – 6 ≤ 2 – 3x + 4 –x – 6 ≤ 6 – 3x +x +x –6 ≤ 6 – 2x –6 –6 0 ≤ –2x 0 ≥ x		
2(x – 4) – 7x < 37 2x – 8 – 7x < 37 +7x +7x 9x – 8 < 37 +8 < 45 9x < 45 X < 5		
2x - 6 ≥ 8 + 4x –4x ≥ –4x –2x – 6 ≥ 8 +6 +6 –2x ≥ 14 x ≥ –7		

Notes

- You have learned to solve practical problems involving linear inequalities.

Verbal problems containing phrases like *greater than* or *less than* can be solved by using inequalities. The chart shows some other phrases that indicate inequalities.

ConceptSummary Phrases for Inequalities

$<$	$>$	$\leq$	$\geq$
less than fewer than	greater than more than	at most, no more than, less than or equal to	at least, no less than, greater than or equal to

Example:

PETS **Felipe needs for the temperature of his leopard gecko's basking spot to be at least 82°F. Currently the basking spot is 62.5°F. How much warmer does the basking spot need to be?**

Words	The current temperature	needs to be at least	82°F.
Variable	Let t = the number of degrees that the temperature needs to rise.		
Inequality	$62.5 + t$	$\geq$	82

$$62.5 + t \geq 82 \quad \text{Original inequality}$$
$$62.5 + t - 62.5 \geq 82 - 62.5 \quad \text{Subtract 62.5 from each side.}$$
$$t \geq 19.5 \quad \text{Simplify.}$$

Felipe needs to raise the temperature of the basking spot 19.5°F or more.

You try! **Directions:** For each question below, write an inequality that could be used to answer the question. Then, solve each by applying the properties of real numbers and properties of inequality.

1. Matthew has $1,500 in his savings account. Currently, he pays $20 each month for an app that he has subscribed to and $30 each month at his favorite Italian restaurant. If he does not spend money on anything else or make any other deposits into his savings account, for how many months can he continue to make these purchases without going into debt?

2. My twin sisters, Laura and Layla, just celebrated their birthday. At our family celebration, one set of grandparents gave them each a gift card. The other set of grandparents gave them each a $50 check. Laura and Layla would not tell me how much was on their gift cards, just that combined they have a total of at least $160 from our two sets of grandparents. What are the possible values for the gift card each of my sisters received?

3. A submarine started at sea level and descended at a rate of –32 feet per minute for a given period of time, x. Then, the submarine slowed its descent to a rate of –12 feet per minute for another interval that lasted the same amount of time. If the current position of the submarine is, at most, 480 feet below sea level, describe the solution set for the number of minutes the submarine was travelling at each of these different speeds.

4. Company A has a cellphone plan that charges a monthly fee of $15 in addition to the $0.40 they charge per minute for calls. Company B does not charge a monthly fee, but they charge $0.50 per minute for calls. In a given month, describe the scenarios where Company B's plan would be less expensive

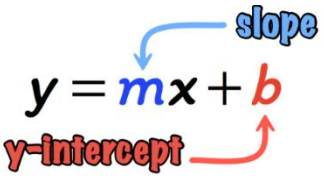
Notes

How to Graph a Linear Inequality in two variables

1. **Rearrange the equation so "y" is on the left and everything else on the right.**
2. **Plot the "y=" line (make it a solid line for y≤ or y≥, and a dashed line for y< or y>)**
3. **Shade above the line for a "greater than" (y> or y≥) or below the line for a "less than" (y< or y≤).**

When else have you had to rearrange an equation so that "y" is on the left?

Yes, slope! When you found slope you used



We can also use this understanding to help up graph inequalities.

Example:

Use a graph to solve $3x + 5 < 14$.

Step 1 First graph the boundary, which is the related equation. Replace the inequality sign with an equals sign, and solve for x.

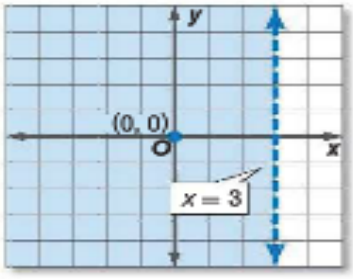
$3x + 5 < 14$	Original inequality
$3x + 5 = 14$	Change $<$ to $=$.
$3x = 9$	Subtract 5 from each side and simplify.
$x = 3$	Divide each side by 3.

Graph $x = 3$ with a dashed line.

Step 2 Choose (0, 0) as a test point. These values in the original inequality give us $5 < 14$.

Step 3 Since this statement is true, shade the half-plane that contains the point (0, 0).

Notice that the x-intercept of the graph is at 3. Since the half-plane to the left of the x-intercept is shaded, the solution is $x < 3$.



Example:

Graph $x + 5y \leq 10$.

Step 1 Solve for y in terms of x.

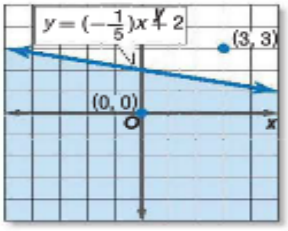
$x + 5y \leq 10$	Original inequality
$5y \leq -x + 10$	Subtract x from each side and simplify.
$y \leq -\frac{1}{5}x + 2$	Divide each side by 5.

Graph $y = -\frac{1}{5}x + 2$. Because the inequality symbol is $\leq$, graph the boundary with a solid line.

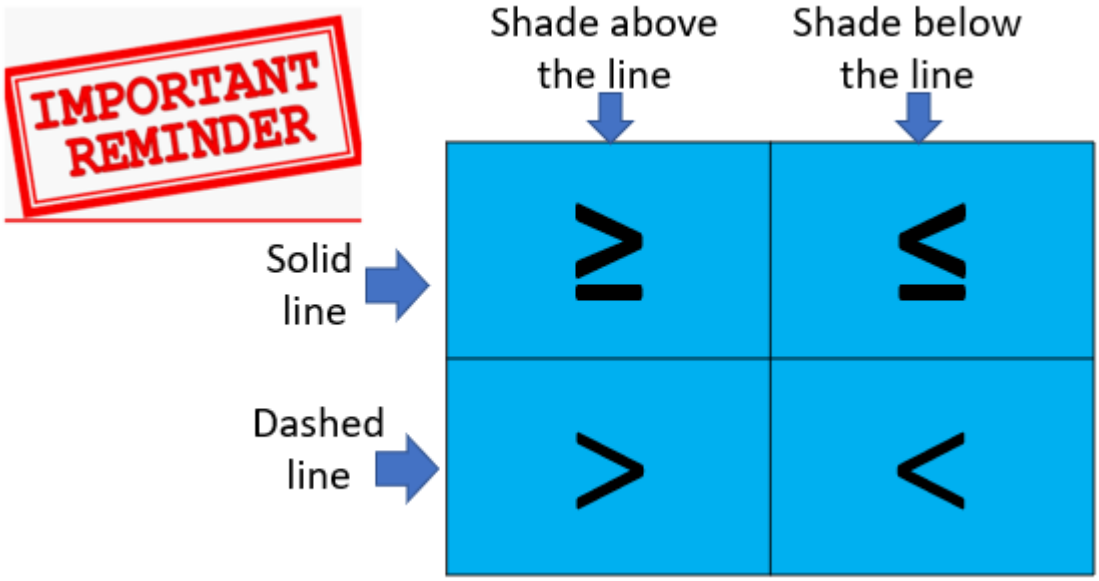
Step 2 Select a test point. Let's use (3, 3). Substitute the values into the original inequality.

$x + 5y \leq 10$	Original inequality
$3 + 5(3) \leq 10$	$x = 3$ and $y = 3$
$18 \not\leq 10$	Simplify.

Step 3 Since this statement is false, shade the other half-plane.

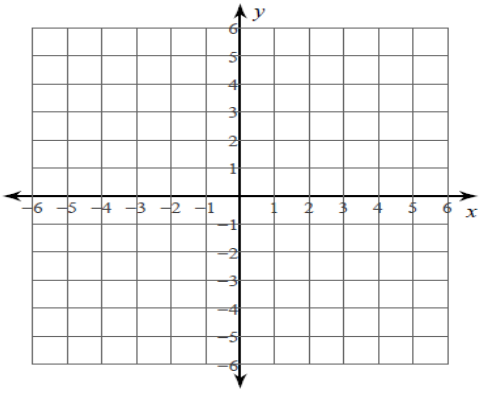


Recap

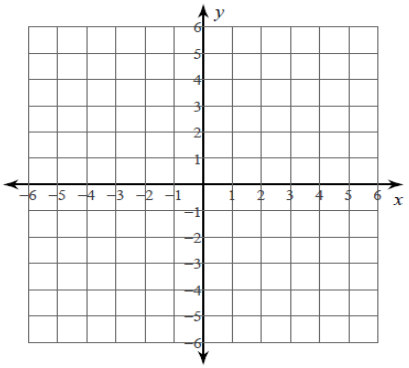


You try! Represent the solution of the linear inequality in two variables. Use another sheet of paper if needed.

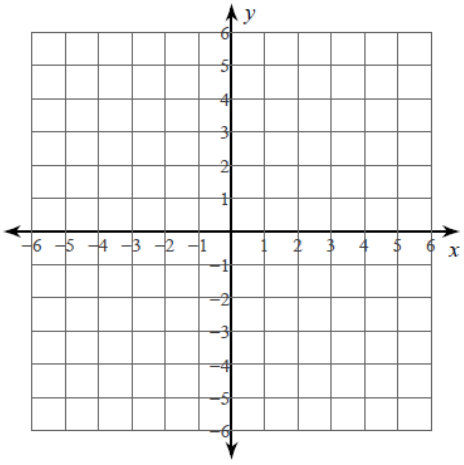
1) $y \geq -3x + 4$



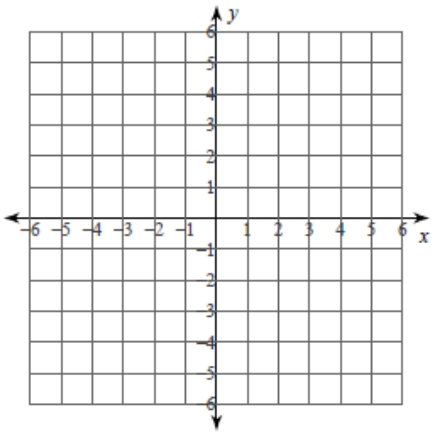
2) $y \leq \frac{3}{5}x - 5$



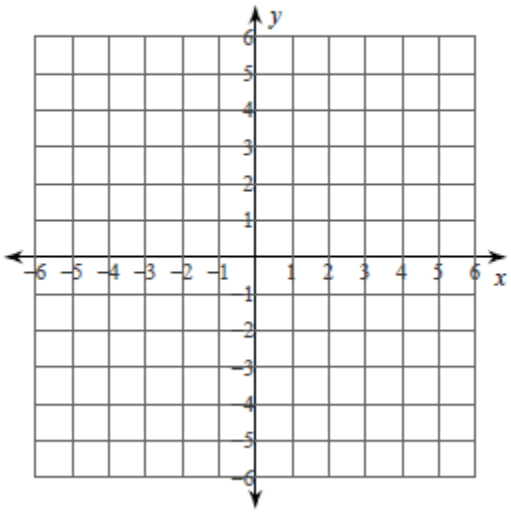
3) $y > -x - 5$



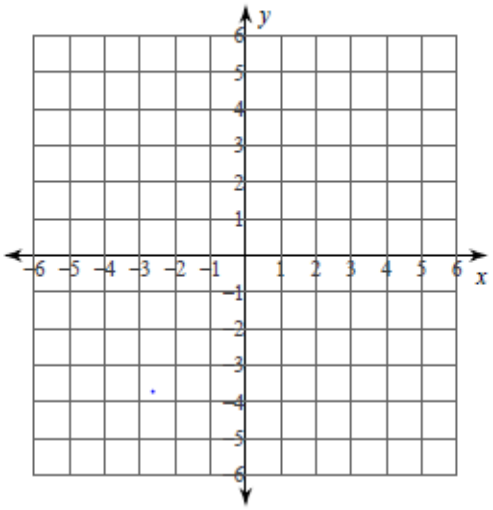
4) $y > -4$



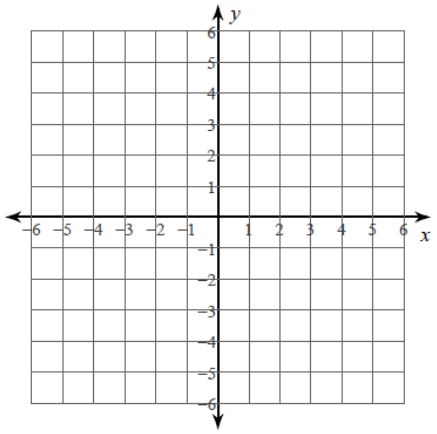
5) $5x - 3y \leq -15$



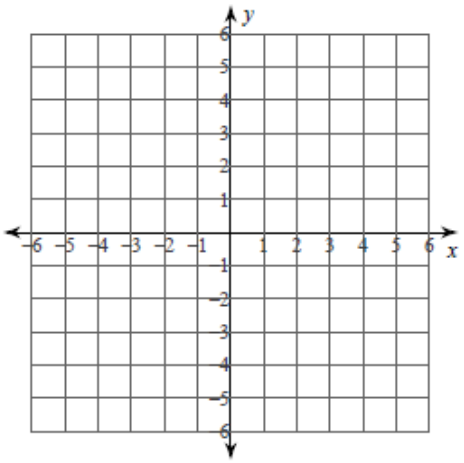
6) $x - y > 2$



7) $x < -5$



8) $y \leq \frac{4}{3}x - 4$



Journal: Summarize the steps to graph an inequality in two variables.