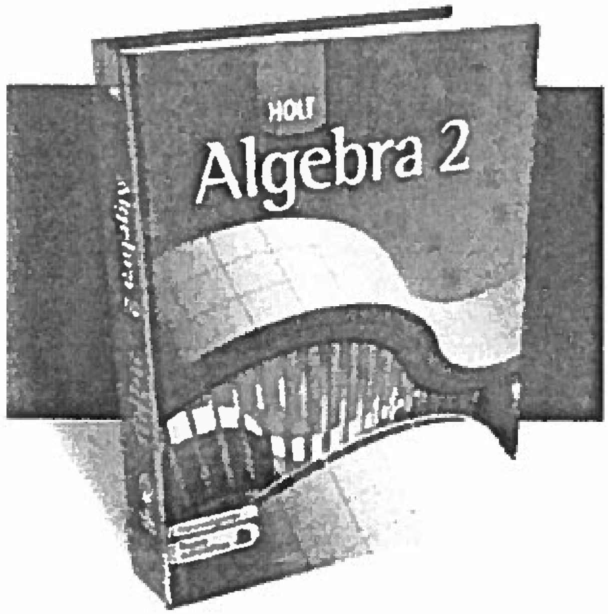
Honors Algebra 2



Summer Packet

Review of Algebra 1 Skills

Name Answers Only Key

Mods ______________

A Mr. Funfar and Mrs. Hughes Production

Square Roots

Targets: I can...estimate square roots.
simplify, add, subtract, multiply and divide square roots.

Use properties of square roots to simplify expressions with square roots.

Product Property: for $a > 0$ and $b > 0$, $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$

$\sqrt{200} = \sqrt{100 \cdot 2} = \sqrt{100}\sqrt{2} = 10\sqrt{2}$

Look for a perfect square factor.

$\sqrt{27} \cdot \sqrt{3} = \sqrt{27 \cdot 3} = \sqrt{81} = 9$

Multiply under the radical.

Quotient Property: for $a > 0$ and $b > 0$, $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

$\sqrt{\frac{25}{49}} = \frac{\sqrt{25}}{\sqrt{49}} = \frac{5}{7}$

Evaluate perfect square factors.

$\frac{\sqrt{108}}{\sqrt{3}} = \sqrt{\frac{108}{3}} = \sqrt{36} = 6$

Divide under the radical.

Rationalize the denominator to eliminate radicals from the denominator.

$\frac{3\sqrt{5}}{\sqrt{2}} = \frac{3\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{3\sqrt{5 \cdot 2}}{2} = \frac{3\sqrt{10}}{2}$

Multiply by 1: $\frac{\sqrt{2}}{\sqrt{2}} = 1$

Think: $\sqrt{2} \cdot \sqrt{2} = 2$

Combine like radical terms to add or subtract square roots.

$3\sqrt{2} + \sqrt{8}$

$3\sqrt{2} + \sqrt{4 \cdot 2}$ — Try to use $\sqrt{2}$ as a factor.

$3\sqrt{2} + 2\sqrt{2}$

$(3 + 2)\sqrt{2}$ — Both terms contain $\sqrt{2}$. Combine like terms.

$5\sqrt{2}$

Practice Problems—**Square Roots**

Estimate to the nearest tenth.

1. $\sqrt{78}$ 8.8
2. $-\sqrt{57}$ −7.5
3. $\sqrt{39}$ 6.2

Simplify each expression.

4. $\sqrt{243}$ $9\sqrt{3}$
5. $\dfrac{\sqrt{90}}{\sqrt{40}}$ $\dfrac{3}{2}$
6. $\sqrt{42} \cdot \sqrt{3}$ $3\sqrt{14}$
7. $-\dfrac{4}{\sqrt{144}}$ $-\dfrac{1}{3}$
8. $\sqrt{\dfrac{125}{5}}$ 5
9. $-\sqrt{320}$ $-8\sqrt{5}$

Simplify by rationalizing each denominator.

10. $\dfrac{6}{\sqrt{5}}$ $\dfrac{6\sqrt{5}}{5}$
11. $\dfrac{-3\sqrt{15}}{\sqrt{3}}$ $-3\sqrt{5}$
12. $\dfrac{\sqrt{13}}{4\sqrt{6}}$ $\dfrac{\sqrt{78}}{24}$

Add or subtract.

13. $7\sqrt{5} - 10\sqrt{5}$ $-3\sqrt{5}$
14. $12\sqrt{3} + 3\sqrt{12}$ $18\sqrt{3}$
15. $-6\sqrt{50} + 4\sqrt{32}$ $-14\sqrt{2}$

Solve.

16. A building has a mural painted on an outside wall. The mural is a square with an area of 14,400 ft^2. What is the width of the mural?

120 ft

Simplifying Algebraic Expressions

Targets: I can…simplify and evaluate algebraic expressions

To evaluate an algebraic expression you substitute numbers for variables. Then follow the **order of operations.**

Here is a sentence that can help you remember the order of operations.

Please	Excuse	My	Dear	Aunt	Sally
Parentheses	Exponents	Multiply	Divide	Add	Subtract

Evaluate $x - 2xy + y^2$ for $x = 4$ and $y = 6$.

$4 - 2(4)(6) + (6)^2$	*Substitute 4 for x and 6 for y.*
$4 - 2(4)(6) + 36$	*Evaluate exponents:* $6^2 = 36$.
$4 - 48 + 36$	*Multiply from left to right.*
-8	*Add and subtract from left to right.*

Add or subtract the coefficients of like terms to simplify an algebraic expression.

Like terms

$3x^2 + 5xy + 4x^2 - xy + 2$

Constant term

Like terms

Like Terms: $3x^2$ and $4x^2$

$5xy$ and $-xy$

Coefficients of x^2 : 3 and 4
Coefficients of xy : 5 and -1

$3x^2 + 5xy + 4x^2 - xy + 2$	
$3x^2 + 4x^2 + 5xy - xy + 2$	*Group like terms.*
$7x^2 + 4xy + 2$	*Add or subtract like terms.*

Think: $3x^2 + 4x^2 = 7x^2$
$5xy - 1xy = 4xy$

You can use the Distributive Property to simplify an algebraic expression.

$-2(a^2 - ab) + 6ab + 2a^2$	
$-2a^2 + 2ab + 6ab + 2a^2$	*Distribute.*
$-2a^2 + 2a^2 + 2ab + 6ab$	*Group like terms.*
$8ab$	*Add or subtract like terms.*

$-2(a^2 - ab) = -2(a^2) - 2(-ab)$
$= -2a^2 + 2ab$

Think: $-2a^2 + 2a^2 = 0$

Practice Problems—**Simplifying Algebraic Expressions**

Write an algebraic expression to represent each situation.

1. the measure of the complement of an angle with measure w 90 - W
2. the number of eggs in d cartons that each hold 1 dozen eggs 12d

Evaluate each expression for the given values of the variables.

3. $4t - 3s^2 + s^3$ for $t = -2$ and $s = -3$

   -62

4. $\frac{5wp + 2w}{3wp^2}$ for $w = 4$ and $p = -1$

   -1

Simplify each expression.

5. $-(4r - 3t) + 6r - t$

   2r + 2t

6. $5(a + b) - 6(2a + 3b)$

   -7a - 13b

Simplify each expression. Then evaluate the expression for the given values of the variables.

7. $-2(d - 3c) + 4d + c$ for $d = 0$ and $c = -2$

   -14

8. $-3f(2 - 3f + 4g) + g$ for $f = -1$ and $g = 1$

   28

Solve.

9. Marco delivers newspapers on the weekend. He delivers s newspapers on Saturday and $4s$ newspapers on Sunday. He earns \$0.15 for each paper he delivers.
   a. Write an expression for the total amount of money Marco earns each weekend. 0.15(5s)
   b. Evaluate your expression for $s = 50$. \$37.50
   c. Write an expression for the amount of money Marco earns in a year if he delivers the same number of papers every weekend. 0.15(260s)

10. A tank holds 500 gallons of water. It starts out full, then 10 gallons are released every minute.
    a. Write an expression for the number of gallons in the tank after m minutes. 500 - 10m
    b. Write an expression for the number of gallons in the tank after m minutes if 2 gallons are *also* added every minute. 500 - 8m

Properties of Exponents

Targets: I can…simplify expressions involving exponents.
use scientific notation.

Write		Read
Expanded Form	**Exponent Form**	
$a \cdot a$	a^2	a squared
$a \cdot a \cdot a$	a^3	a cubed
$a \cdot a \cdot a \cdot a$	a^4	a to the fourth power
$a \cdot a \cdot \ldots \cdot a$	a^n	a to the *n*th power

$-4x^5 = -4(x \cdot x \cdot x \cdot x \cdot x)$

$-(4x^5) = -(4x)(4x)(4x)(4x)(4x)$

$(-4x)^5 = (-4x)(-4x)(-4x)(-4x)(-4x)$

$4x^3(y+6)^2 = 4(x)(x)(x)(y+6)(y+6)$

List the factors to expand exponential expressions.

Zero Exponent Property: $a^0 = 1$; *a* is not zero $38^0 = 1$

Negative Exponent Property: $a^{-n} = \frac{1}{a^n}$ and $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$; *a* is not zero.

$$3^{-4} = \frac{1}{3^4} = \frac{1}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{1}{81}$$

$$\left(\frac{2}{5}\right)^{-3} = \left(\frac{5}{2}\right)^3 = \frac{5}{2} \cdot \frac{5}{2} \cdot \frac{5}{2} = \frac{125}{8}$$

Properties of Exponents (*m* and *n* are integers; *a* and *b* are nonzero real numbers.)

Same Base: $a^m \cdot a^n = a^{m+n}$ — To multiply, add exponents.

$\frac{a^m}{a^n} = a^{m-n}$ — To divide, subtract exponents.

$(a^m)^n = a^{m \cdot n}$ — To raise to a power, multiply exponents.

Different Bases: $(ab)^m = a^m b^m$ — Distribute the exponent.

$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Combine properties of exponents to simplify expressions with exponents.

$(2x^5)^4$	
$2^4(x^5)^4$	*Distribute the exponent.*
$2^4x^{5\cdot4}$	*Multiply exponents.*
2^4x^{20}	*Simplify.*
$16x^{20}$	

$c^4d(c^{-3}d^2)$	
$c^4c^{-3}dd^2$	*Group like variables.*
$c^{4-3}d^{1+2}$	*Add exponents.*
cd^3	*Simplify.*

$\frac{3rs^5}{r^4s^3}$	
$3r^{1-4}s^{5-3}$	*Subtract exponents.*
$3r^{-3}s^2$	*Simplify.*
$\frac{3s^2}{r^3}$	*Record answer with positive exponents.*

Practice Problems—**Properties of Exponents**

Fill in the blanks to expand each expression.

1. $4^3 = 4 \cdot 4 \cdot 4$

2. $a^5 = \cdot\ a \cdot a \cdot a \cdot a \cdot a$

3. $(3d)^4 = (3d)(3d)(3d)(3d)$

4. $\left(\frac{x}{7}\right)^3 = \left(\frac{x}{7}\right)\left(\frac{x}{7}\right)\left(\frac{x}{7}\right)$

Fill in the blanks to evaluate each expression.

5. $3^{-3} = \left(\frac{1}{3}\right)^3 = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{27}$

6. $\left(\frac{-5}{6}\right)^{-2} = \left(\frac{6}{-5}\right)^2 = \frac{6}{-5} \cdot \frac{6}{-5} = \frac{36}{25}$

Simplify each expression. Use the multiplication properties of exponents.

	7. $3r^2(-3r^3)$	8. $(4f^5g)^2(2fg^3)$
Multiply a power of a power	no power of a power	$(16f^{10}g^2)(2fg^3)$
Add exponents with same base	$3r^5(-3)$	$(16f^{11}g^5)(2)$
Multiply whole numbers	$-9r^5$	$32f^{11}g^5$

Simplify each expression. Use the division properties of exponents.

	9. $\frac{9k^3m^8}{3k^5m^2}$	10. $\frac{16p^{-2}q^{-3}}{2p^{-5}q^{-4}}$
Substitute reciprocals	no negative exponents	$\frac{16p^5q^4}{2p^2q^3}$
Subtract exponents with same base	$9m^6/3k^2$	$16p^3q/2$
Divide whole numbers	$3m^6/k^2$	$8p^3q$

Evaluate each expression. Write the answer in scientific notation.

11. $(4.2 \times 10^3)(2.0 \times 10^2)$

8.4×10^5

12. $\frac{1.4 \times 10^6}{7.0 \times 10^2}$

2.0×10^3

13. $\frac{4.5 \times 10^4}{9.0 \times 10^7}$

5.0×10^{-4}

14. $(3.5 \times 10^{-3})(5.8 \times 10^5)$

2.03×10^3

Write each expression in expanded form.

1. $-3x^5$

$-3 \cdot x \cdot x \cdot x \cdot x \cdot x$

2. $(j-3k)^3$

$(j-3k)(j-3k)(j-3k)$

3. $7t^2(-4r)^4$

$7 \cdot t \cdot t(-4r)(-4r)(-4r)$

Evaluate each expression.

4. $-(-2)^{-4}$

$-1/16$

5. $\left(\frac{5}{8}\right)^{-2}$

$64/25$

6. $\left(-\frac{3}{2}\right)^{-3}$

$-8/27$

Simplify each expression. Assume all variables are nonzero.

7. $\frac{68f^5g^{-3}}{4f^{-3}g^6}$

$\frac{17f^8}{g^9}$

8. $(-4a^3b^7)^{-2}$

$\frac{1}{16a^6b^{14}}$

9. $6m^4n^9(-3m^2n^3)^{-2}$

$\frac{2n^3}{3}$

Evaluate each expression. Write the answer in scientific notation.

10. $(7.2 \times 10^{-5})(4.5 \times 10^3)$

3.24×10^{-1}

11. $\frac{1.7 \times 10^5}{3.4 \times 10^9}$

$.50 \times 10^{-5}$

12. $(7.8 \times 10^8)(2.8 \times 10^{11})$

2.184×10^{20}

Solve.

13. The A-1 Moving and Storage Company sells crates that measure x^2y units wide, x units long, and y^2 units tall. Find the volume of the crate.

x^3y^3 cubic units

14. The average lifespan for an adult living today is about 82 years. Some scientists believe that people born in the early part of this century may live up to 150 years. Calculate the number of minutes an 82-year-old and a 150-year-old could live. Round to the nearest million. Record the difference in scientific notation.

43 millions 79 million, 3.6×10^7

15. A movie made $\$6.7 \times 10^7$. It took 250 hours to film it. How much money was earned for each hour of filming? Write your answer in scientific notation.

2.68×10^5

Solving Linear Equations and Inequalities

Targets: I can…solve linear equations using a variety of methods.
solve linear inequalities.

Use the Distributive Property to solve equations.

$$8(y-6)=64$$
$$8y-48=64$$
$$+48+48$$
$$8y=112$$
$$\frac{8y}{8}=\frac{112}{8}$$
$$y=14$$

Distribute the 8 to both terms. Think:

Add 48 to both sides.

Divide both sides by 8.

Combine like terms to solve equations.

$$4x+18-3=3x-45+5x$$
$$4x+15=8x-45$$
$$-4x \quad -4x$$
$$15=4x-45$$
$$+45 \quad +45$$
$$60=4x$$
$$\frac{60}{4}=\frac{4x}{4}$$
$$15=x$$

3*x* and 5*x* are like terms.

Subtract 4*x* from both sides.

Add 45 to both sides.

Divide both sides by 4.

Reverse the inequality symbol if you multiply or divide both sides by a negative number.

Combine like terms.

$$x - 3 \le 5x + 9$$
$$-5x \qquad -5x$$

x and 5*x* are like terms.
3 and 9 are like terms.

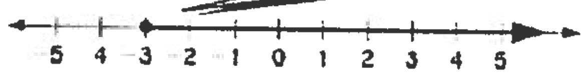
$$-4x - 3 \le 9$$
$$+3 \quad +3$$
$$-4x \le 12$$
$$\frac{-4x}{-4} \ge \frac{12}{-4}$$

Divide by –4. Reverse the inequality symbol.

$$x \ge -3$$

Graph the solution: $x \ge -3$

The ≥ symbol means that –3 is included in the graph.



Substitute test values into the original inequality to check:

Pick a value that should be a solution.	Pick a value that should NOT be a solution.
Try $x = 0$. $0 - 3 \le 5(0) + 9$? $-3 \le 9$ True	Try $x = -4$. $-4 - 3 \le 5(-4) + 9$? $-7 \le -11$ False

Practice Problems—**Solving Linear Equations and Inequalities**

Solve.

1. $2(x-3)=-4$

   x = 1

2. $12-3(w+7)=15$

   w = -8

3. $4(8-p)-(7-p)=22$

   p = 1

4. $18-4y=-2(6+2y)$

   y ≠ ∅

5. $7t+6-2\left(5+\frac{3t}{2}\right)=5t-11$

   t = 7

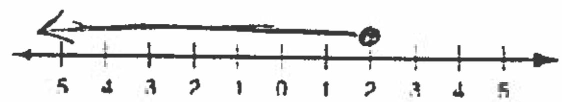
6. $32+4(c-1)=-(4c+5)$

   c = -4 1/8

Solve and graph.

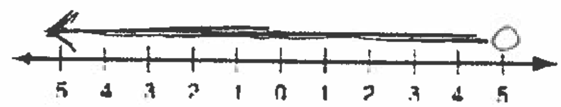
7. $-5x+7\geq-3$

   $x \leq 2$



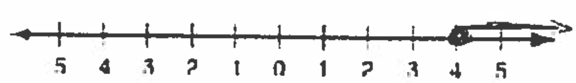
8. $4-(-7-k)>2(k+3)$

   $k<5$



9. $-18d+5(8+3d)\leq 7(3d-8)$

   $d \geq 4$



Solve.

10. Yvonne's cell phone plan gives her a maximum of 200 minutes each month.

    a. Suppose Yvonne's calls average 7 minutes. What is the maximum number of calls she can make each month?

    28

    b. Yvonne knows she has used 61 minutes during the first week of this month. If she limits her calls to 15 per week for the remaining 3 weeks this month, what is the maximum length of time rounded to the nearest minute that she can use for each call?

    3 minutes

11. Blair wants to spend less than $50 at the grocery store. He already has $37 worth of groceries in his shopping cart and is going to buy some fresh vegetables for $0.75 each. What numbers of vegetables *v* can he buy and stay under his spending limit?

    $v \leq 17$

Proportional Reasoning

Targets: I can… apply proportional relationships to rates, similarity, and scale.

Set cross products equal to solve a proportion.

$$\frac{5}{48} = \frac{12.5}{y}$$

5 · *y* is a cross product.

48 · 12.5 is a cross product.

$$5 \cdot y = 48 \cdot 12.5$$

$5y = 600$ *Simplify cross products.*

$\frac{5y}{5} = \frac{600}{5}$ *Solve for y. Divide both sides by 5.*

$y = 120$

A proportion can be used to solve percent problems: $\frac{\text{percent}}{100} = \frac{\text{part}}{\text{whole}}$.

Find 35.5% of 4800.

$\frac{35.5}{100} = \frac{x}{4800}$ *Write a proportion.*

$100x = 35.5 \cdot 4800$ *Find cross products.*

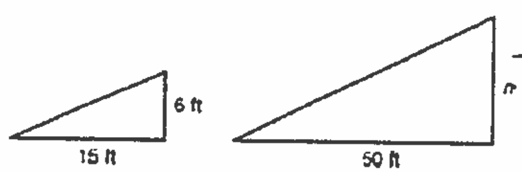
$\frac{100x}{100} = \frac{35.5 \cdot 4800}{100}$ *Solve for x. Divide both sides by 100.*

$x = 1704$

A proportion can be used to solve problems about indirect measurement.

Jake is 6 feet tall and casts a shadow 15 feet long. At the same time, a tree casts a shadow 50 feet long. How tall is the tree?

Draw and label a diagram.



The objects and their shadows form similar triangles.

Use the diagram to write a proportion.

$$\frac{\text{Jake's height}}{\text{Jake's shadow}} = \frac{\text{tree's height}}{\text{tree's shadow}}$$

Notice that like things are related in a proportion. Both numerators are height. Both denominators are shadows.

$$\frac{6}{15} = \frac{h}{50}$$

$15h = 50 \cdot 6$ *Set cross products equal.*

$15h = 300$

$\frac{15h}{15} = \frac{300}{15}$ *Solve for h. Divide both sides by 15.*

$h = 20$ The tree is 20 feet tall.

Practice Problems—**Proportional Reasoning**

Solve each proportion.

1. $\frac{28}{36} = \frac{g}{81}$ g=63

2. $\frac{z}{1.75} = \frac{64}{21}$ z = 16/3

3. $\frac{3}{0.6} = \frac{1.05}{n}$ n=.21

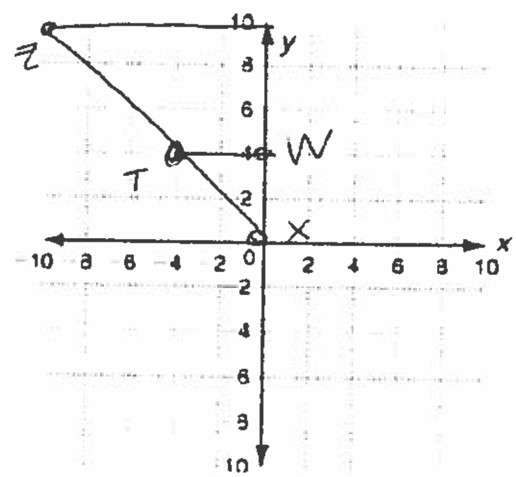
4. $\frac{5}{8} = \frac{f-1}{56}$ f=36

5. $\frac{2.4}{1.8} = \frac{0.004}{y}$ y=0.003

6. $\frac{5}{v+6} = \frac{4}{12}$ v=9

Solve.

7. $\triangle XYZ$ has vertices $X(0, 0)$, $Y(0, 10)$, and $Z(-10, 10)$. $\triangle XWT$ is similar to $\triangle XYZ$ and has a vertex at $W(0, 4)$. Graph $\triangle XYZ$ and $\triangle XWT$ on the same grid.



8. Dan works as a house painter. He knows that it is safe to place the base of his 10-foot ladder 3 feet from the base of a house. Today he has to use a 25-foot ladder. Dan wants to keep the same ratios in order to be safe. How far should Dan place the base of his 25-foot ladder from the base of the house?

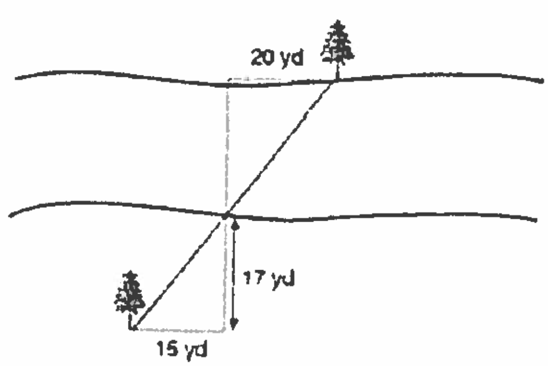
7.5 ft

9. The school newspaper took a survey. Of the students polled, 15% said they did not have too much homework. Sixty students were polled for the survey. How many students said they did not have too much homework?

9 students

10. Cheryl wants to measure the distance across a stream. She took some measurements and drew a diagram. How wide is the stream?

22 2/3 yds



Graphing Linear Functions

Targets: I can...determine whether a function is linear.
graph a linear function given two points, a table, an equation, or a point and a slope.

Use the slope and the *y*-intercept to graph a linear function.

To write $2y + x = 6$ in slope-intercept form, solve for *y*.

$$2y + x = 6$$
$$-x \quad -x$$

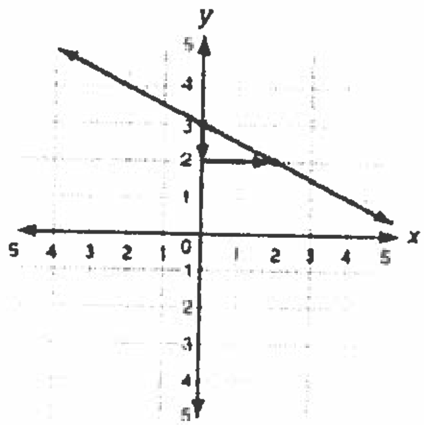
$$2y = -x + 6$$
$$\frac{2y}{2} = -\frac{x}{2} + \frac{6}{2}$$
$$y = -\frac{1}{2}x + 3$$

$y = mx + b$ is the slope-intercept form.
m represents the slope and
b represents the *y*-intercept.

Compare $y = -\frac{1}{2}x + 3$ to $y = mx + b$.

$m = -\frac{1}{2}$, so the slope is $-\frac{1}{2}$.

$b = 3$, so the *y*-intercept is 3.



Use intercepts to sketch the graph of the function $3x + 6y = 12$.

The *x*-intercept is where the graph crosses the *x*-axis. To find the *x*-intercept, set $y = 0$ and solve for *x*.

$$3x + 6y = 12$$
$$3x + 6(0) = 12$$
$$3x = 12$$
$$x = 4$$

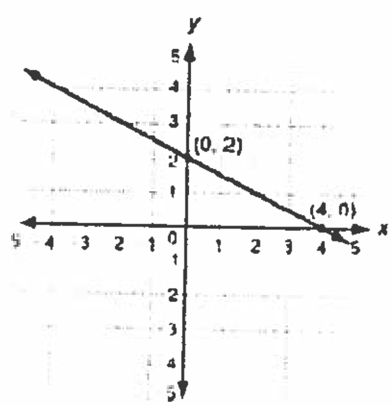
The *x*-intercept occurs at the point (4, 0).

The *y*-intercept is where the graph crosses the *y*-axis. To find the *y*-intercept, set $x = 0$ and solve for *y*.

$$3x + 6y = 12$$
$$3(0) + 6y = 12$$
$$6y = 12$$
$$y = 2$$

The *y*-intercept occurs at the point (0, 2).

Plot the points (4, 0) and (0, 2). Draw a line connecting the points.



Practice Problems—**Graphing Linear Functions**

Determine whether each data set could represent a linear function.

1.

x	9	7	5	3
f(*x*)	2	5	10	15

non-linear

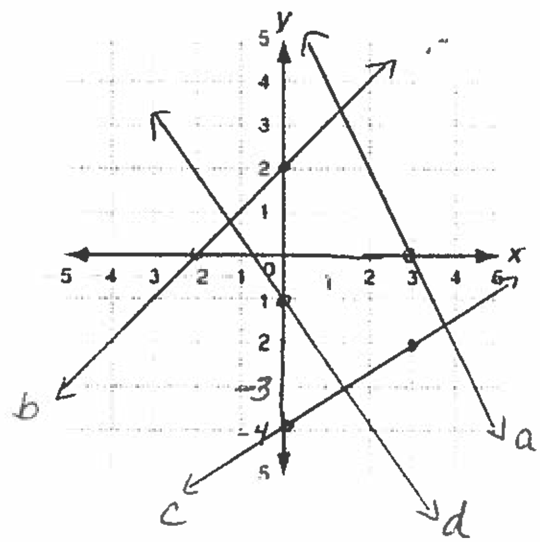
2.

x	0.5	1	1.5	2
f(*x*)	9	6	3	0

linear

Use the coordinate plane at right to graph and label each line.

3. Line *a* has a slope of –2 and passes through (1, 4).
4. Line *b* has a slope of 1 and passes through (–4, –2).
5. Line *c* has a slope of $\frac{2}{3}$ and passes through (3, –2).
6. Line *d* has a slope of $\frac{-5}{4}$ and passes through (–1, 0).



Find the intercepts of each line and graph and label the line.

7. line *e*: $5x + y = -5$

(–1, 0), (0, –5)

8. line *f*: $6x + 2y = 6$

(1, 0), (0, 3)

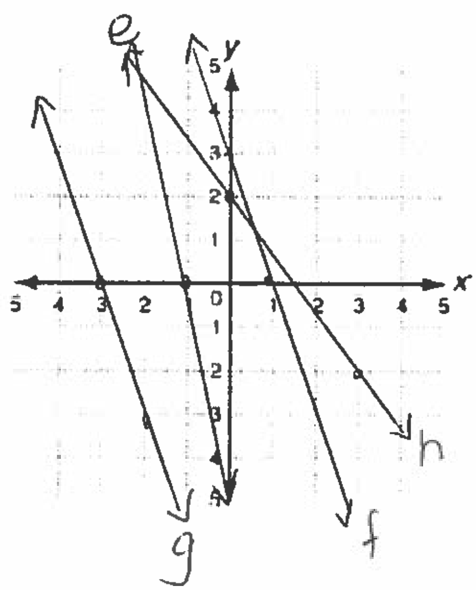
Write each function in slope-intercept form. Then graph and label the function.

9. line *g*: $-3x - y = 9$

$y = -3x - 9$

10. line *h*: $4x + 3y = 6$

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



Determine whether each line is vertical or horizontal.

11. $x = -5$

vertical

12. $y = \frac{8}{3}$

horizontal

13. $x = 4.6$

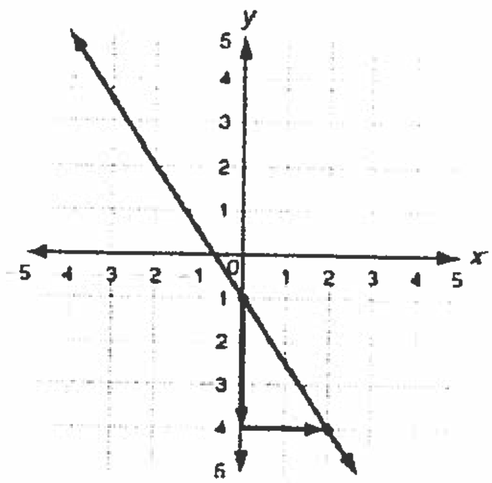
vertical

Writing Linear Functions

Targets: I can…use slope-intercept form and point-slope form to write linear functions.
write linear functions to solve problems.

Write the equation of the line shown in the graph in slope-intercept form.

Slope-intercept form: $y = mx + b$

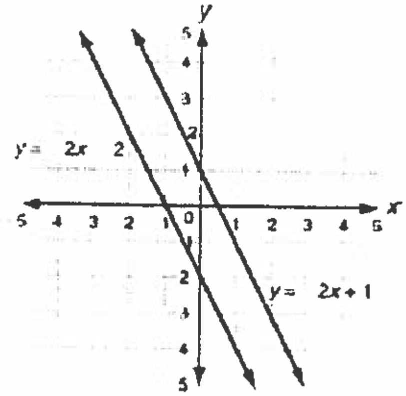
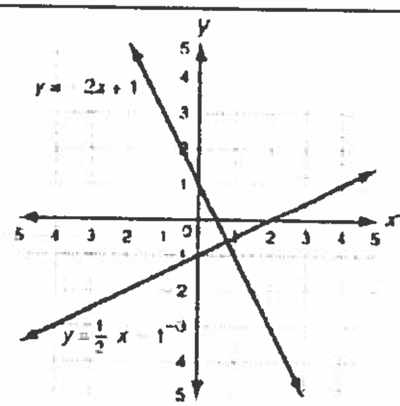


The point (2, –4) lies on the line.

From (0, –1), move 3 units down, or a rise of –3 units, and 2 units right, or a run of 2 units, to (2, –4).	$m = \frac{\text{rise}}{\text{run}} = \frac{-3}{2} = -\frac{3}{2}$	Note that when the rise is a drop the slope is negative.

Substitute $m = -\frac{3}{2}$ and $b = -1$ into $y = mx + b$ to get the equation $y = -\frac{3}{2}x - 1$.

The slopes of parallel and perpendicular lines have a special relationship.

The slopes of **parallel** lines are **equal**. $y = -2x + 1$ and $y = -2x - 2$ are parallel lines since both equations have a slope of -2. Note: The slopes of parallel vertical lines are undefined.	
The slopes of **perpendicular** lines are **negative reciprocals**. Their product is -1. $y = -2x + 1$ and $y = \frac{1}{2}x - 1$ are perpendicular since $-2 \cdot \frac{1}{2} = -1$.	

The point-slope form of the equation of a line is $y - y_1 = m(x - x_1)$.
The line has slope m and passes through the point (x_1, y_1).

Write the equation of the line perpendicular to $y = \frac{1}{3}x + 2$ through (2, 5).

Substitute values for m and (x_1, y_1) in $y - y_1 = m(x - x_1)$.

$(x_1, y_1) = (2, 5)$, so $x_1 = 2$, $y_1 = 5$, and $m = -3$

$$y - y_1 = m(x - x_1) \rightarrow y - 5 = -3(x - 2)$$

$$y - 5 = -3x + 6$$

$$y = -3x + 11$$

The negative reciprocal of $\frac{1}{3}$ is -3 because $\frac{1}{3} \cdot (-3) = -1$.

Practice Problems—**Writing Linear Functions**

Find the slope of each line.

1.

x	−5	1	4	9
y	−9	3	9	19

2

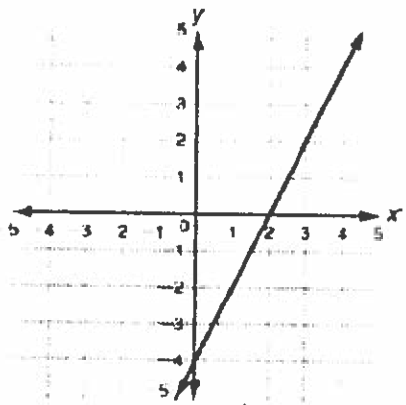
2.

x	−7	−2	6	13
y	−0.5	2	6	9.5

1/2

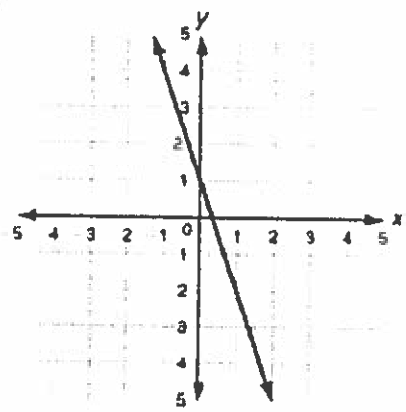
Write the equation of each line in slope-intercept form.

3.



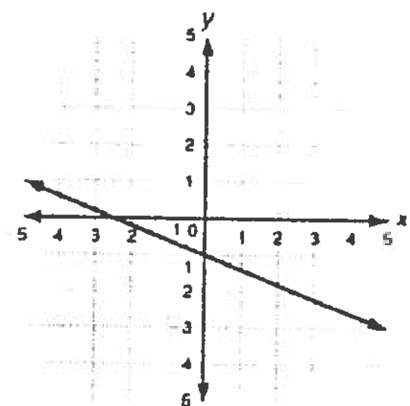
$y = 2x - 4$

4.



$y = -3x + 1$

5.



$y = \frac{-2}{5}x - 1$

6. line passing through (−3, −4) with a slope of $\frac{1}{5}$

$y = \frac{1}{5}x - \frac{17}{5}$

7.

x	−2	3	8	11
y	−1	1.5	4	5.5

$y = \frac{1}{2}x$

8. line parallel to $y = -\frac{3}{2}x + 4$ and through (1, 5)

$y = \frac{-3}{2}x + \frac{13}{2}$

9. line perpendicular to $y = -2x + 11$ and through (4, −2)

$y = \frac{1}{2}x - 4$

Solve.

10. The pool at the Barnes Community Center is heated. The table shows the temperature of the water at various time intervals after the heater is turned on.

Swimming Pool Heater	
Time (*h*)	**Temperature (*T*)**
0	56°F
3	62°F
5	66°F
9	74°F

a. Express the temperature of the water as a function of time.

$T = 2t + 56$

b. Find the temperature of the water after 12 hours.

80°F

Linear Inequalities in Two Variables

Targets: I can…graph linear inequalities on the coordinate plane.
solve problems using linear inequalities.

Graphing a linear inequality is similar to graphing a linear function.

Graph $y \le \frac{2}{3}x + 1$ using the slope-intercept form.

Step 1 Write the corresponding equation. Then identify the slope and the *y*-intercept.

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

$m = \frac{2}{3}$ and $b = 1$

Step 2 Draw the graph of $y = \frac{2}{3}x + 1$.

Draw a solid boundary line for ≤ or ≥.

Draw a dashed boundary line for < or >.

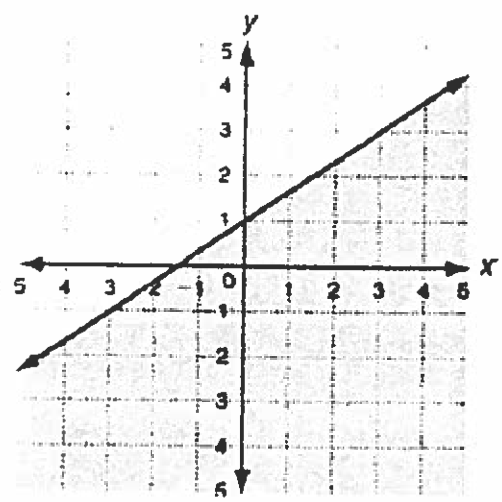
Step 3 Shade the half-plane below the line for < or ≤. Shade the half-plane above the line for > or ≥.

Step 4 Check using a point in the shaded region. Use (0, 0).

$y \le \frac{2}{3}x + 1$

$0 \overset{?}{\le} \frac{2}{3}(0) + 1$

$0 \overset{?}{\le} 1$ ✓



The intercepts can be used to graph a linear inequality.

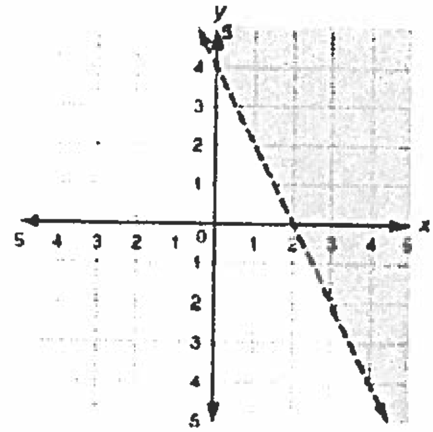
Graph $2x + y > 4$ using the intercepts.

Step 1 Write the corresponding equation. Then identify the x-intercept and the y-intercept.

$2x + y = 4$

When $y = 0$, $x = 2$; plot (2, 0).

When $x = 0$, $y = 4$; plot (0, 4).



Step 2 Draw the graph of $2x + y = 4$ using a dashed line.

Step 3 Choose a point to check which half-plane to shade. Use (0, 0).

$2x + y > 4$

$2(0) + (0) \overset{?}{>} 4$

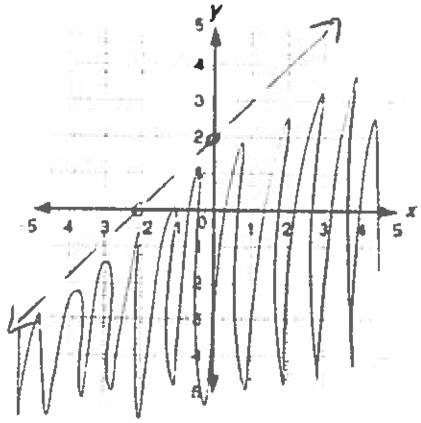
$0 \overset{?}{>} 4$ ×

Step 4 The inequality is false, so shade the half-plane above the line.

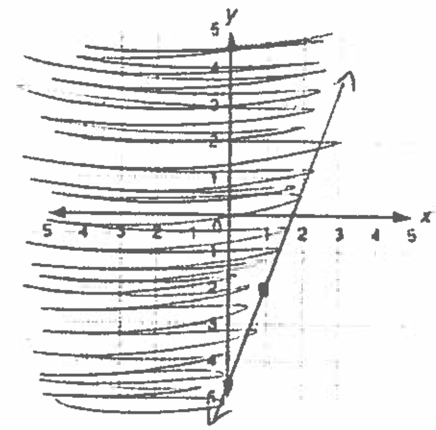
Practice Problems—**Linear Inequalities in Two Variables**

Graph each inequality.

1. $y < x + 2$

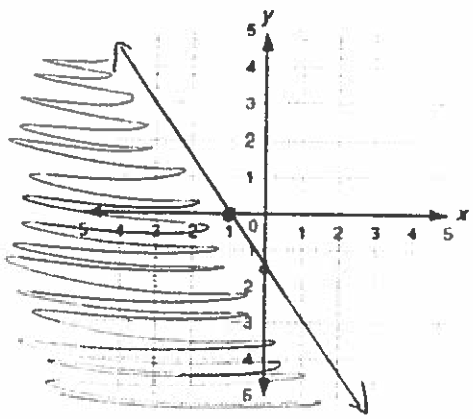


2. $y \geq 3x - 5$

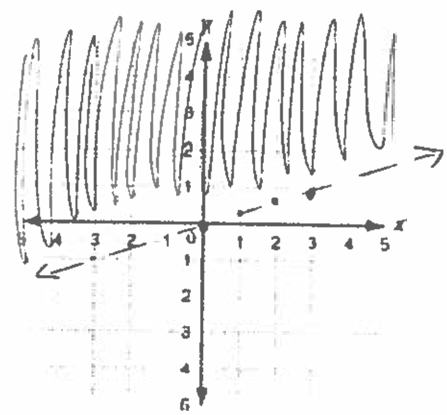


Solve each inequality for *y*. Graph the solution.

3. $-2(3x + 2y - 3) \geq 12$



4. $\frac{-x}{5} + \frac{2y}{3} > 0$ $y > \frac{3}{10}x$



Solve.

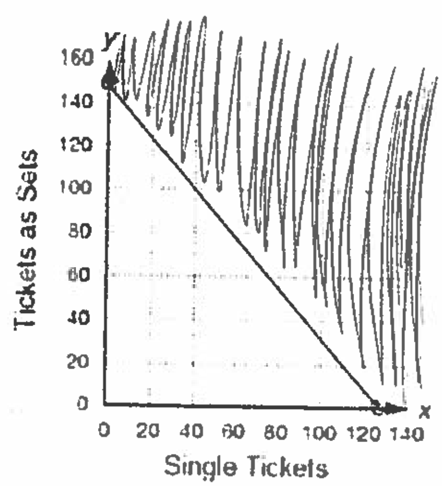
5. Marcus volunteers to work at a carnival booth selling raffle tickets. The tickets cost $2 each or 3 for $5. His goal is to have at least $250 in sales during his shift.

   a. Let *x* be the number of tickets sold for $2 each. Let *y* be the number of tickets sold in sets of 3 for $5. Write and graph an inequality for the total number of tickets Marcus must sell to meet his goal.

   $2x + 5y/3 \geq 250$

   b. If Marcus sells 75 tickets for $2 each, what is the least number of tickets he must sell in sets of 3 to meet his goal?

   60 tickets



Using Graphs and Tables to Solve Linear Systems

Targets: I can…solve linear systems by graphing.
classify linear systems.

A **linear system** of equations is a set of two or more linear equations. To **solve a linear system**, find all the ordered pairs (x, y) that make both equations true. Use a table and a graph to solve a system of equations.

$\begin{cases} y + x = 2 \\ y - 2x = 5 \end{cases}$ Solve each equation for y. → $\begin{cases} y = -x + 2 \\ y = 2x + 5 \end{cases}$

Make a table of values for each equation.

$y = -x + 2$	
x	y
−2	4
−1	3
0	2
1	1

↔

$y = 2x + 5$	
x	y
−2	1
−1	3
0	5
1	7

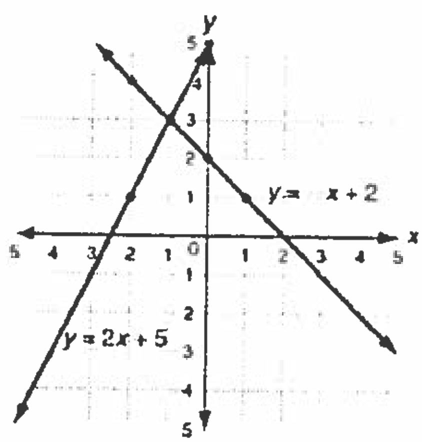
When $x = -1$, $y = 3$ for both equations.

On a graph, the point where the lines intersect is the solution.
Use the table to draw the graph of each equation.
The lines appear to intersect at (−1, 3).
Substitute (−1, 3) into the original equations to check.

$y + x = 2 \qquad y - 2x = 5$

$3 + (-1) \stackrel{?}{=} 2 \qquad 3 - 2(1) \stackrel{?}{=} 5$

$2 = 2 ✓ \qquad 5 = 5 ✓$



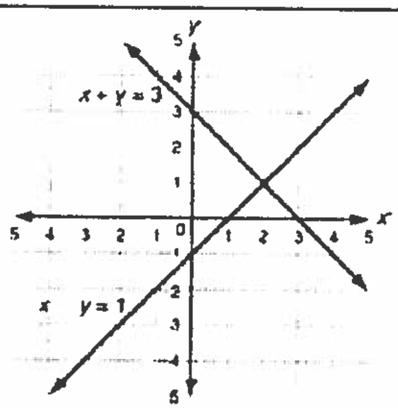
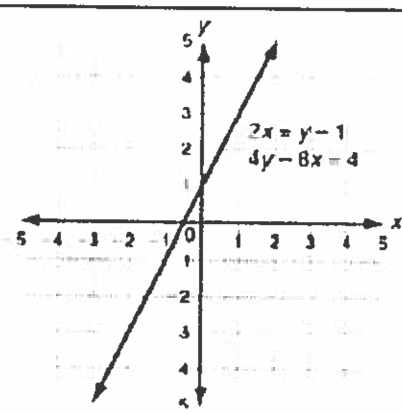
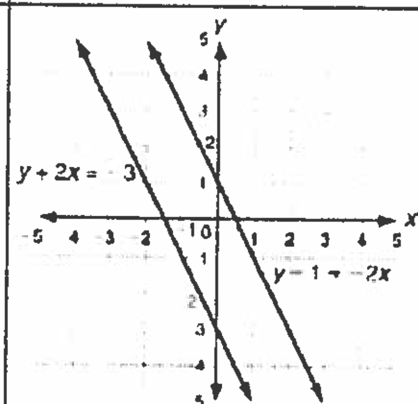
To classify a linear system:

Step 1 Write each equation in the form $y = mx + b$.

Step 2 Compare the slopes and y-intercepts.

Step 3 Classify by the number of solutions of the system.

> Remember: m = slope and b = y-intercept.

Exactly One Solution **Independent**	**Infinitely Many Solutions** **Dependent**	**No Solution** **Inconsistent**
The lines have **different slopes** and intersect at one point.	The lines have the **same slope and y-intercept.** Their graph is the same line.	The lines have the **same slope and different y-intercepts.** The lines are parallel.
$\begin{cases} x+y=3 \\ x-y=1 \end{cases}$ Solve each equation for y. $\begin{cases} y=-x+3;\ m=-1 \\ y=x-1;\ m=1 \end{cases}$ The slopes are different. The system has one solution and is independent.	$\begin{cases} 2x=y-1 \\ 4y-8x=4 \end{cases}$ Solve each equation for y. $\begin{cases} y=2x+1;\ m=2, b=1 \\ y=2x+1;\ m=2, b=1 \end{cases}$ The slopes and the y-intercepts are the same. The system has infinitely many solutions and is dependent.	$\begin{cases} y+2x=-3 \\ y-1=-2x \end{cases}$ Solve each equation for y. $\begin{cases} y=-2x-3;\ m=-2, b=-3 \\ y=-2x+1;\ m=-2, b=1 \end{cases}$ The slopes are the same but the y-intercepts are different. The system has no solution and is inconsistent.
		

Practice Problems—**Using Graphs and Tables to Solve Linear Systems**

Classify each system, and determine the number of solutions.

1. $\begin{cases} y = -4x + 7 \\ 12x + 3y = 21 \end{cases}$

   consistent dependendent, infinitely many solutions

2. $\begin{cases} 5y = x - 10 \\ y = \dfrac{x}{5} + 3 \end{cases}$

   inconsistent, no solutions

3. $\begin{cases} x + 6y = -2 \\ 12x - 6y = 0 \end{cases}$

   consistent, independe[nt], one solution

Use substitution to determine if the given ordered pair is an element of the solution set for the system of equations. If it is not, give the correct solution.

4. $(-4, 8)\begin{cases} y = -2x \\ 3x + y = -4 \end{cases}$ yes it is

5. $(11, 3)\begin{cases} y = x - 8 \\ x + 4y = -2 \end{cases}$ (6, -2)

6. $(4, 1)\begin{cases} y = 5x - 1 \\ 8 = 4x + y \end{cases}$ (1, 4)

7. $(5, -5)\begin{cases} x + y = 10 \\ x - y = 0 \end{cases}$ (5, 5)

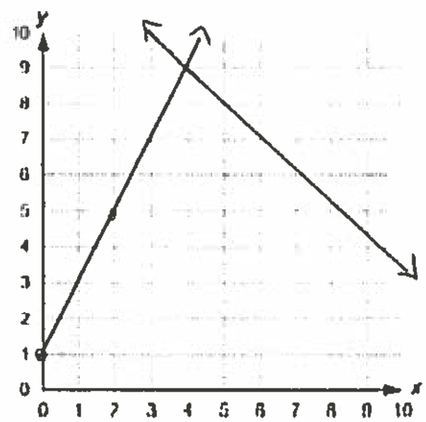
8. $(2, -1)\begin{cases} 2x + 3y = -8 \\ 3x - 4y = 5 \end{cases}$ (-1, -2)

9. $(0, 3)\begin{cases} 3x + 5y = 15 \\ x - y = -3 \end{cases}$ yes it is!

Solve by graphing a system of equations.

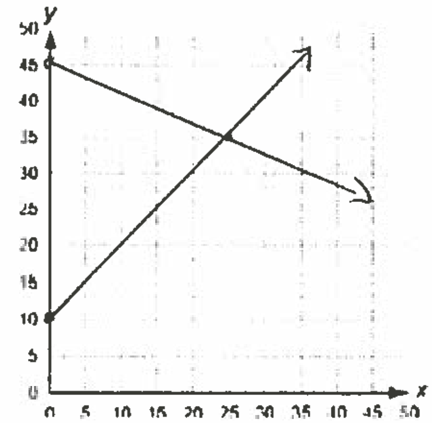
10. A puppy pen is 1 foot longer than twice its width. John wants to increase the length and width by 5 feet each to enlarge the area by 90 square feet. What will be the area of the new pen?

    126 sq ft



11. Keesha has 10 more quarters than dimes, which, together, total \$11.25. How many coins does she have in quarters and dimes?

    35 quarters
    25 dimes → 60 coins



Using Algebraic Methods to Solve Linear Systems

Targets: I can…solve linear systems by substitution.
solve linear systems by elimination.

To use the **substitution method** to solve a system of linear equations:

1. Solve one equation for one variable.
2. Substitute this expression into the other equation.
3. Solve for the other variable.
4. Substitute the value of the known variable in the equation in Step 1.
5. Solve for the other variable.
6. Check the values in both equations.

Use this equation. It is solved for y.

$$\begin{cases} y = x + 2 \\ 2x + y = 17 \end{cases}$$

Use the substitution method when the coefficient of one of the variables is 1 or −1.

$2x + y = 17$

$2x + (x + 2) = 17$ *Substitute $x + 2$ for y.*

$3x + 2 = 17$ *Simplify and solve for x.*

$3x = 15$

$x = 5$

Substitute $x = 5$ into $y = x + 2$ and solve for y: $y = x + 2$

$y = 5 + 2$

$y = 7$

The solution of the system is the ordered pair (5, 7).

Check using both equations: $y = x + 2$; $7 \stackrel{?}{=} (5) + 2$; $7 = 7$✓

$2x + y = 17$; $2(5) + 7 \stackrel{?}{=} 17$; $17 = 17$✓

To use the **elimination method** to solve a system of linear equations:

1. Add or subtract the equations to eliminate one variable.
2. Solve the resulting equation for the other variable.
3. Substitute the value for the known variable into one of the original equations.
4. Solve for the other variable.
5. Check the values in both equations.

$$\begin{cases} 3x + 2y = 7 \\ 5x - 2y = 1 \end{cases}$$

Use the elimination method when the coefficients of one of the variables are the same or opposite.

The y terms have opposite coefficients, so add.

$$\begin{array}{r} 3x + 2y = 7 \\ + 5x - 2y = 1 \\ \hline \end{array}$$

Add the equations.

$$8x = 8$$

Solve for x.

$$x = 1$$

Substitute $x = 1$ into $3x + 2y = 7$ and solve for y: $3x + 2y = 7$

$$3(1) + 2y = 7$$

$$2y = 4$$

$$y = 2$$

The solution to the system is the ordered pair (1, 2).

Check using both equations:

$3x + 2y = 7$	$5x - 2y = 1$
$3(1) + 2(2) \stackrel{?}{=} 7$	$5(1) - 2(2) \stackrel{?}{=} 1$
$7 = 7$ ✓	$1 = 1$ ✓

Practice Problems—**Using Algebraic Methods to Solve Linear Systems**

Use substitution to solve each system of equations.

1. $\begin{cases} x = 7y - 4 \\ 2x - 3y = 14 \end{cases}$

(10, 2)

2. $\begin{cases} y - 3x = 5 \\ 2x = 3y + 6 \end{cases}$

(-3, -4)

3. $\begin{cases} 3x - 4y = 20 \\ y - 2x = 0 \end{cases}$

(-4, -8)

Use elimination to solve each system of equations.

4. $\begin{cases} x + 6y = 1 \\ 3x + 5y = -10 \end{cases}$

(-5, 1)

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

(6, -3)

6. $\begin{cases} 3x - 5y = 1 \\ 2x + 3y = -12 \end{cases}$

(-3, -2)

Use substitution or elimination to solve each system of equations.

7. $\begin{cases} x + y = 13 \\ 2x - 3y = 1 \end{cases}$

(8, 5)

8. $\begin{cases} 9x + 2y = 5 \\ 3x - y = -10 \end{cases}$

(-1, 7)

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

(2, -3)

10. $\begin{cases} x = -8y \\ x + y = 14 \end{cases}$

(16, -2)

11. $\begin{cases} 2x + 4y = 12 \\ -3x + 3y = 63 \end{cases}$

(-12, 9)

12. $\begin{cases} 5x - 2y = -1 \\ 3x - y = -2 \end{cases}$

(-3, -7)

Solve.

13. Bill leaves his house for Makayla's house riding his bicycle at 8 miles per hour. At the same time, Makayla leaves her house heading toward Bill's house walking at 3 miles per hour.

a. Write a system of equations to represent the distance, *d*, each is from Makayla's house in *h* hours. They live 8.25 miles apart.

$\begin{cases} d = 8.25 - 8h \\ d = 3h \end{cases}$

b. Solve the system to determine how long they travel before meeting.

.75h or 45 minutes

Solving Systems of Linear Inequalities

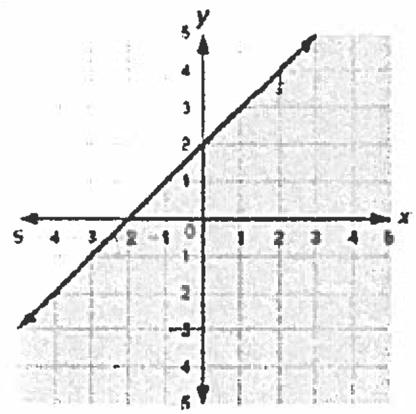
Targets: I can...graph systems of linear inequalities.

To use graphs to find the solution to a system of inequalities:

1. Draw the graph of the boundary for the first inequality. Remember to use a solid line for ≤ or ≥ and a dashed line for < or >.
2. Shade the region above or below the boundary line that is a solution of the inequality.
3. Draw the graph of the boundary for the second inequality.
4. Shade the region above or below the boundary line that is a solution of the inequality using a different pattern.
5. The region where the shadings overlap is the solution region.

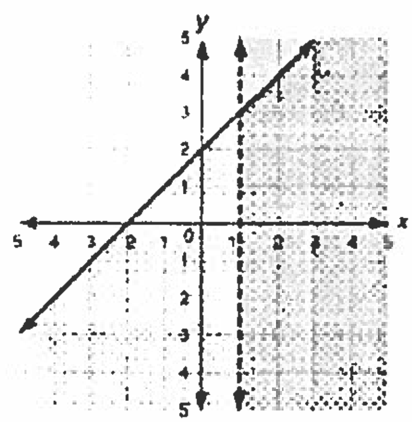
Graph $\begin{cases} y \le x + 2 \\ x > 1 \end{cases}$ Graph $y \le x + 2$.

Graph $y = x + 2$.
Use a solid line for the boundary.
Shade the region below the line.



On the same plane, graph $x > 1$.

Graph $x = 1$.
Use a dashed line for the boundary.
Shade the region to the right of the line.



Check: Test a point in the solution region in both inequalities.
Try (2, 2).

$y \le x + 2$ $\qquad$ $x > 1$

$2 \overset{?}{\le} 2 + 2$ $\qquad$ $2 > 1$ ✓

$2 \le 4$ ✓

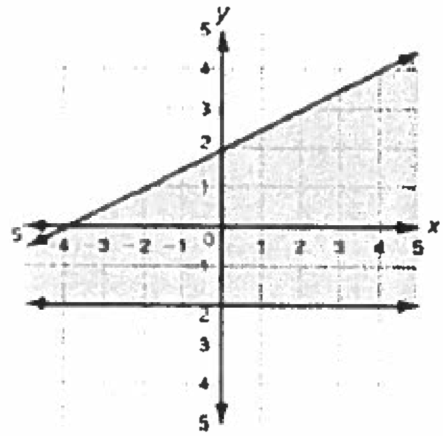
The solution of a system of inequalities may create a geometric figure.

Graph $\begin{cases} y \le \frac{1}{2}x + 2 \\ y \ge -2 \\ x \le 3 \\ x \ge -2 \end{cases}$

> The graph of $y = -2$ is a horizontal line.
> The graphs of $x = 3$ and $x = -2$ are vertical lines.

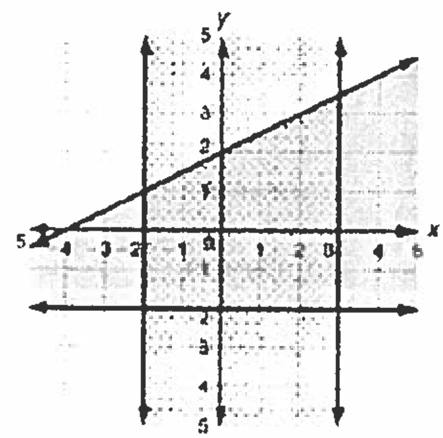
Graph $y \le \frac{1}{2}x + 2$ and $y \le -2$.

> Use solid boundary lines.
>
> Shade the region below $y \le \frac{1}{2}x + 2$ and above $y \le -2$.



On the same plane, graph $x \le 3$ and $x \ge -2$.

> Use solid boundary lines.
> Shade the region to the left of $x \le 3$ and to the right of $x \ge -2$.

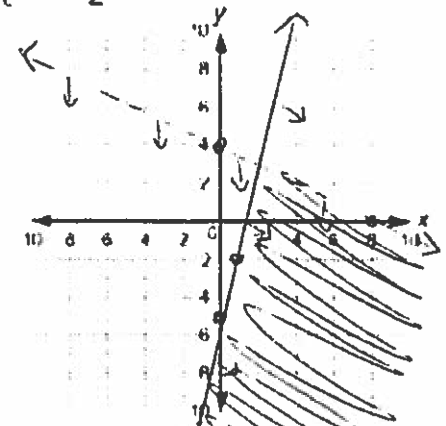


The figure created by the overlapping pattern is a quadrilateral with one pair of parallel sides. The figure is a trapezoid.

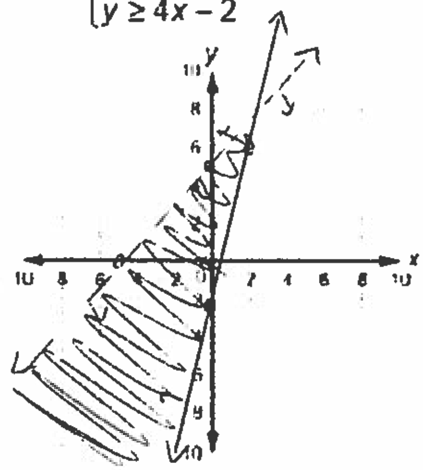
Practice Problems—**Solving Systems of Linear Inequalities**

Graph each system of inequalities.

1. $\begin{cases} y \le 3x - 5 \\ y < -\dfrac{1}{2}x + 4 \end{cases}$

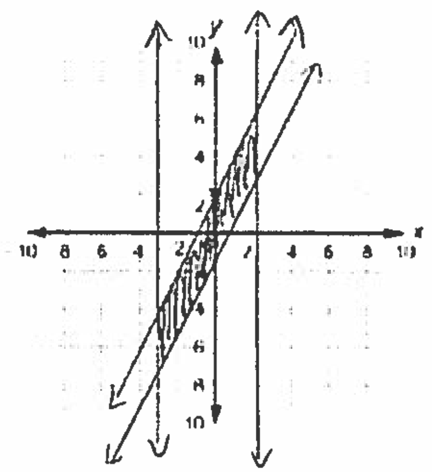


2. $\begin{cases} y < x + 5 \\ y \ge 4x - 2 \end{cases}$

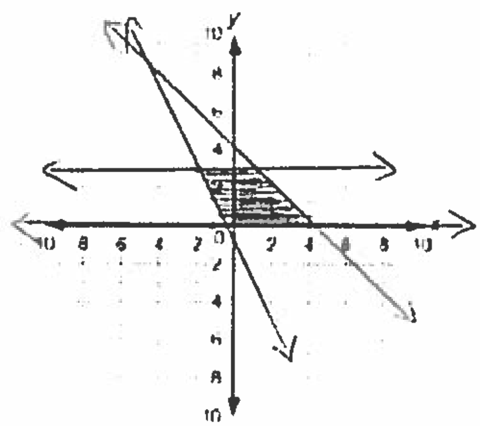


Graph the system of inequalities, and classify the figure created by the solution region.

3. $\begin{cases} x \le 2 \\ x \ge -3 \\ y \le 2x + 2 \\ y \ge 2x - 1 \end{cases}$ parallelogram



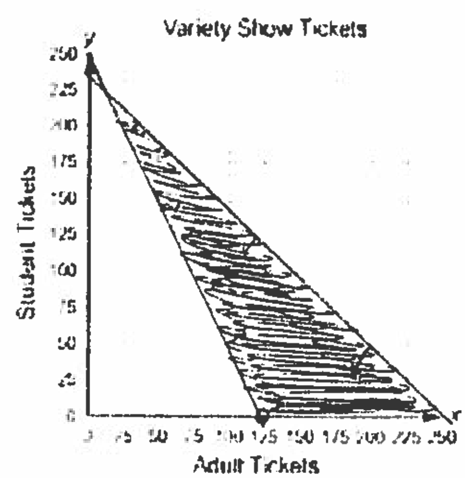
4. $\begin{cases} y \le -x + 4 \\ y \le 3 \\ y \ge 0 \\ y \ge -2x - 1 \end{cases}$ trapezoid



Solve.

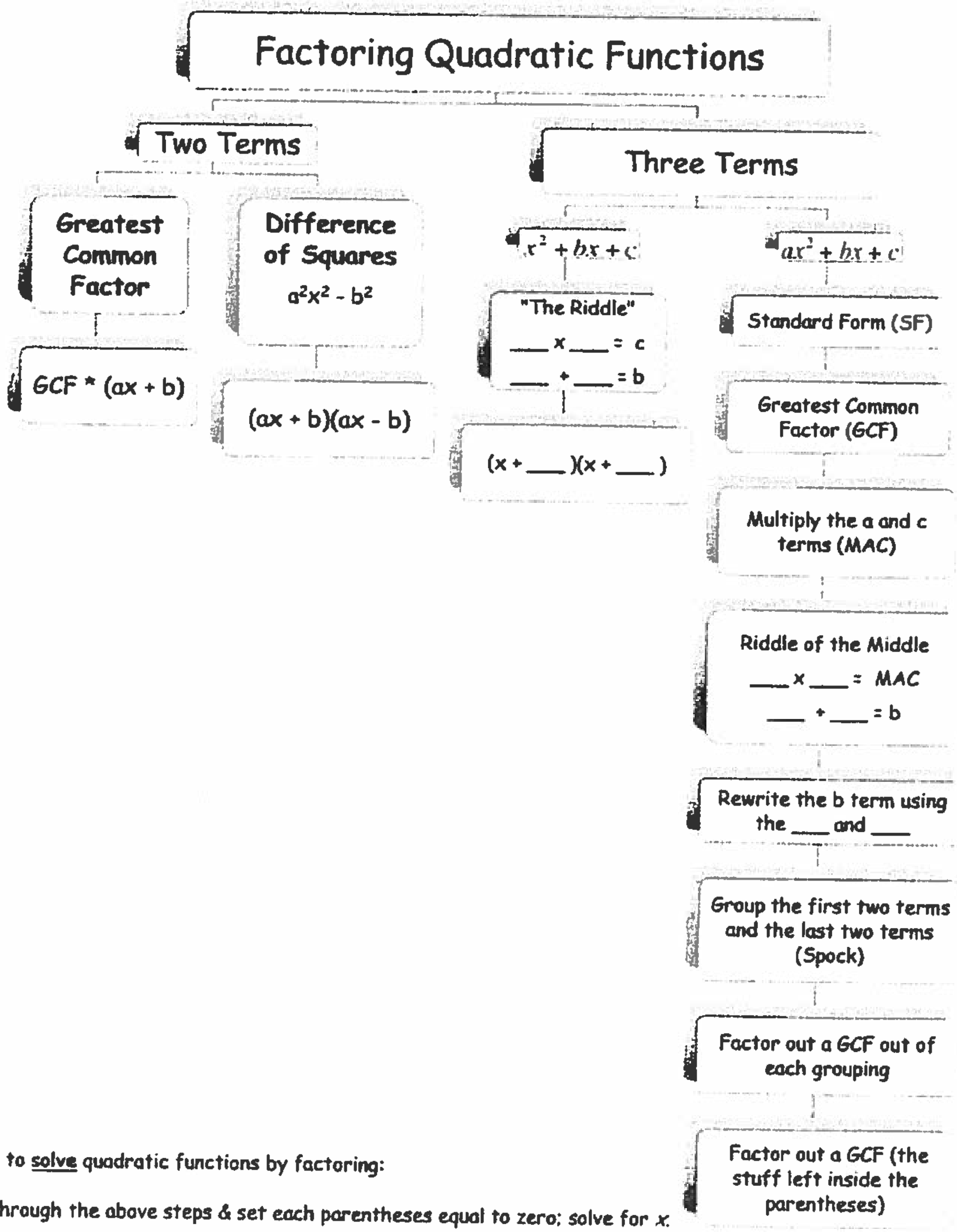
5. The Thespian Club is selling tickets to its annual variety show. Prices are \$8 for an adult ticket and \$4 for a student ticket. The club needs to raise \$1000 to pay for costumes and stage sets. The auditorium has a seating capacity of 240. Write and graph a system of inequalities that can be used to determine how many tickets have to be sold for the club to meet its goal.

$\begin{cases} 8x + 4y \ge 1000 \\ x + y \le 240 \end{cases}$



Factoring Quadratic Functions and Solving by Factoring

Targets: I can…factor quadratic functions with two or three terms.
solve quadratic equations by factoring.



How to solve quadratic functions by factoring:

Go through the above steps & set each parentheses equal to zero; solve for *x*.

Factoring Quadratic Functions – Examples by type

GCF	Difference of Squares	x^2+bx+c	ax^2+bx+c
ex. $3x^2-6x$	ex. $9x^2-4$	ex. x^2-3x+2	ex. $2x^2+7x+3$
↓	↓	↓	↓
$3x(x+2)$	$(3x+2)(3x-2)$	$\underline{\ } \times \underline{\ } = 2$ $\underline{\ } + \underline{\ } = 3$ ↓ $(x+2)(x+1)$	$a \neq 1$ ↓ No GCF ✓ ↓ MAC: $2(3)=6$ ↓ Multiply: $6 \times 1 = 6$ Add to middle: $6 + 1 = 7$ ↓ Rewrite: $2x^2+6x+1x+3$ ↓ Group in pairs: $(2x^2+6x)(+1x+3)$ ↓ GCF: $2x(x+3)+1(x+3)$ ↓ GCF: $(x+3)(2x+1)$

To solve each, look below :)

$3x(x+2)=0$	$(3x+2)(3x-2)=0$	$(x+2)(x+1)=0$	$(x+3)(2x+1)=0$
$\frac{3x}{3}=\frac{0}{3}$ $x+2=0$, -2 -2	$3x+2=0$, -2 -2 $3x-2=0$, $+2$ $+2$	$x+2=0$, -2 -2 $x+1=0$	$x+3=0$, -3 -3 $2x+1=0$, -1 -1
$x=0$ & $x=-2$	$\frac{3x}{3}=\frac{-2}{3}$ $\frac{3x}{3}=\frac{2}{3}$	$x=-2$ & $x=-1$	$\frac{2x}{2}=\frac{-1}{2}$
	$x=-\frac{2}{3}$ & $\frac{2}{3}$		$x=-3$ & $x=-\frac{1}{2}$

Practice Problems—**Factoring Quadratic Functions and Solving by Factoring**

Factor.

1. $x^2 - 16$ $(x+4)(x-4)$

2. $y^2 - 49$ $(y+7)(y-7)$

3. $4x^2 - 1$ $(2x+1)(2x-1)$

4. $81x^2 - 4$ $(9x+2)(9x-2)$

5. $16x^2 - 121$ $(4x+11)(4x-11)$

6. $49x^2 - 36$ $(7x+6)(7x-6)$

7. $1 - 9x^2$ $(1+3x)(1-3x)$

8. $16 - 81x^2$ $(4+9x)(4-9x)$

9. $x^2y^2 - 100$ $(xy+10)(xy-10)$

10. $x^2y^2 - 25$ $(xy+5)(xy-5)$

Factor.

1. $x^2 - 8x + 16$ $(x-4)^2$

2. $x^2 - 12x + 20$ $(x-10)(x-2)$

3. $x^2 - 12x + 11$ $(x-11)(x-1)$

4. $c^2 + c - 20$ $(c+5)(c-4)$

5. $x^2 + 12x + 36$ $(x+6)^2$

6. $x^2 - x - 6$ $(x-3)(x+2$

7. $x^2 + 12x + 35$ $(x+7)(x+5)$

8. $x^2 - 9x + 18$ $(x-6)(x-3)$

9. $y^2 - 13y + 42$ $(y-6)(y-7)$

10. $x^2 + 6x - 40$ $(x+10)(x-4)$

Factor.

1. $5x^2 - 10x - 15$ $5(x-3)(x+1)$

2. $6x^2 - 15x - 21$ $3(2x-7)(x+1)$

3. $3x^2 - 10x + 7$ $(3x-7)(x-1)$

4. $2x^2 - 11x - 21$ $(2x+3)(x-7)$

5. $4x^2 + 2x - 20$ $2(2x+5)(x-2)$

6. $3x^2 - 5x - 12$ $(3x+4)(x-3)$

7. $7x^2 - 26x - 8$ $(7x+2)(x-4)$

8. $12x^2 - 6x - 18$ $6(2x-3)(x+1)$

9. $6x^2 - 13x + 6$ $(3x-2)(2x-3)$

10. $2x^2 + 9x + 10$ $(2x+5)(x+2)$

Solve by factoring.

1. $x^2 - 4x = 0$ $x = 0, 4$
2. $a^2 - 36 = 0$ $a = \pm 6$
3. $y^2 + 9y = 0$ $y = 0, -9$
4. $y^2 + 49y = 0$ $y = 0, -49$
5. $y^2 + 5y - 6 = 0$ $y = 1, -6$
6. $y^2 - y - 6 = 0$ $y = -2, 3$
7. $3u^2 - 12u + 9 = 0$ $u = 1, 3$
8. $6x^2 + 12x = 0$ $x = -2, 0$
9. $x^2 + 7x = 0$ $x = 0, -7$
10. $x + 8 = x(x + 3)$ $x = 2, -4$
11. $y^2 - 8x + 12 = 0$ $y = 6, 2$
12. $a^2 - 7a = -12$ $a = 4, 3$
13. $y^2 + 15 = 8y$ $y = 5, 3$
14. $2x^2 + x = 6$ $x = 3/2, -2$
15. $5a^2 + 25a = 0$ $a = 0, -5$
16. $x^2 - 6x + 5 = 0$ $x = 5, 1$
17. $x - 6 = x(x - 4)$ $x = 3, 2$
18. $4x^2 + 16x = 0$ $x = 0, -4$
19. $3x^2 - 9x = 0$ $x = 0, 3$
20. $x - 25 = x(x - 9)$ $x = +5$

The Quadratic Formula

Targets: I can...apply the quadratic formula to solve quadratic functions

The Quadratic Formula is another way to find the roots of a quadratic equation or the zeros of a quadratic function.

Find the zeros of $f(x) = x^2 - 6x - 11$.

Step 1 Set $f(x) = 0$. $x^2 - 6x - 11 = 0$

Step 2 Write the Quadratic Formula. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Step 3 Substitute values for a, b, and c into the Quadratic Formula.

$a = 1$, $b = -6$, $c = -11$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-11)}}{2(1)}$$

Step 4 Simplify.

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-11)}}{2(1)} = \frac{6 \pm \sqrt{36 + 44}}{2} = \frac{6 \pm \sqrt{80}}{2}$$

Step 5 Write in simplest form.

$$x = \frac{6 \pm \sqrt{80}}{2} = 3 \pm \frac{\sqrt{80}}{2} = 3 \pm \frac{\sqrt{(16)(5)}}{2} = 3 \pm \frac{4\sqrt{5}}{2} = 3 \pm 2\sqrt{5}$$

Remember to divide both terms of the numerator by 2 to simplify.

Find the zeros of each function by using the Quadratic Formula.

1. $f(x) = x^2 + 10x + 9$

$-9, -1$

2. $g(x) = 2x^2 + 4x - 12$

$-1 \pm \sqrt{7}$

3. $h(x) = 3x^2 - 3x + \frac{3}{4}$

$\frac{1}{2}$

4. $f(x) = x^2 + 2x - 3$

$-3, 1$

5. $g(x) = 2x^2 + 3x + 1$

$-1, -\frac{1}{2}$

6. $g(x) = x^2 + 5x + -3$

$\frac{-5 \pm \sqrt{37}}{2}$

CONGRATULATIONS!!! YOU MADE IT THROUGH THE PACKET ☺
Hope you didn't use that calculator!! #mathswag