Algebra II Summer Assignment Mini Lessons

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A. Writing an Equation of a Line Given a Point and the Slope

GOAL

Use slope and any point on a line to write an equation of the line

VOCABULARY

In the **slope-intercept form** of the equation of a line, $y = mx + b$, m is the slope and b is the y-intercept.

Example 1 **Writing an Equation of a Line**

Write an equation of the line that passes through the point (--2, 5) and has a slope of 3.

SOLUTION

Find the y-intercept.

$y = mx + b$	Write in slope - intercept form.
$5 = 3(-2) + b$	Substitute 3 for m, - 2 for x, and 5 for y.
$5 = -6 + b$	Simplify.
$11 = b$	Solve for b.

The y-intercept is $b = 11$.

Now write an equation of the line, using slope-intercept form.

$y = mx + b$	Write the slope - intercept form.
$y = 3x + 11$	Substitute 3 for m and 11 for b.

Web Enhancement

This site will explain the concept in greater detail.

http://www.sparknotes.com/math/algebra1/writingequations/section1.html

This site gives directions and an example of writing the equation given a slope and a point.

http://www.purplemath.com/modules/strtlneq.htm

This site will give examples to practice with answers to check.

http://www.algebralab.net/practice/practice.aspx?file=Algebra1_5-1.xml

B. Given Two Points, Write the Equation of the Line

GOAL

Write an equation of a line given two points on the line

Example 1 **Writing an Equation Given Two Points**

Write an equation of the line that passes through the points (1, 5) and (2, 3).

SOLUTION

Find the slope of the line. Let $(x_1, y_1) = (1, 5)$ and $(x_2, y_2) = (2, 3)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Write formula for slope.

$m = \frac{3-5}{2-1}$ Substitute.

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

Find the y-intercept. Let m = --2, x = 1, and y = 5 and solve for b. (You could use either point.)

$y = mx + b$ Write the slope - intercept form.

$5 = (-2)(1) + b$ Substitute -2 for m, 1 for x, and 5 for y.

$5 = -2 + b$ Simplify.

$7 = b$ Solve for b.

Write an equation of the line.

$y = mx + b$ Write slope - intercept form.

$y = -2x + 7$ Substitute -2 for m and 7 for b.

Web Enhancement This site will take you step by step through examples.

http://webmath.com/equline1.html

C. Solving Literal Equations

GOAL ***To solve an equation for one variable in terms of other variables.***

Equations with several variables (letters) are called literal equations.

Solving a literal equation means that you solve the equation for one of the variables.

Example 1 Solve $d = rt$ for r.

$$d = rt$$
$$\frac{d}{t} = \frac{rt}{t}$$
$$\frac{d}{t} = r$$

Example 2 Solve $P = 2l + 2w$ for w.

$$P = 2l + 2w$$
$$P - 2l = 2w$$
$$\frac{P - 2l}{2} = \frac{2w}{2}$$
$$\frac{P - 2l}{2} = w$$

Web Enhancement This site will give further examples of solving literal equations.

http://www.purplemath.com/modules/solvelit.htm

D. Changing Equations into Slope Intercept Form

GOAL

Graph a linear equation in slope-intercept form and interpret equations in slope-intercept form.

VOCABULARY

The linear equation $y = mx + b$ is written in **slope-intercept form**. The slope of the line is m. The y-intercept is b.

Example 1 **Writing Equations in Slope-Intercept Form**

Example	Equation	Slope-Intercept Form	Slope	y-Intercept
A	$y = 3x$	$y = 3x + 0$	$m = 3$	$b = 0$
B	$y = \frac{2x - 3}{5}$	$y = \frac{2}{5}x - \frac{3}{5}$	$m = \frac{2}{5}$	$b = -\frac{3}{5}$
C	$4x + 8y = 24$ $8y = 24 - 4x$ $y = 3 - .5x$	$y = -0.5x + 3$	$m = -0.5$	$b = 3$

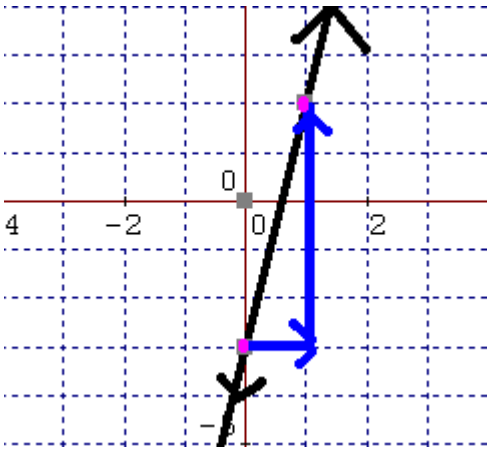
Web Enhancement These videos show you step-by-step how to convert an equation into slope-intercept form.

http://www.mathops.com/free/a1le015.php

http://www.khanacademy.org/video/converting-to-slope-intercept-form?playlist=Algebra%20I%20Worked%20Examples

E. Graphing from Slope-Intercept Form

Example 2 **Graphing Using Slope and y-Intercept**



Graph the equation $5x - y = 3$.

SOLUTION

Write the equation in slope-intercept form:
$y = 5x - 3$

Find the slope and the y-intercept:

m = 5 and b = -3

Plot the point (0, *b*). Draw a slope triangle to locate a second point on the line.

$$m = \frac{5}{1} = \frac{rise}{run}$$

Draw a line through the two points.

Web Enhancement

This video will explain how to graph from slope intercept form.

https://www.khanacademy.org/math/algebra/linear-equations-and-inequalitie/graphing-slope-intercept/v/graphing-a-line-in-slope-intercept-form

F. Graphing Systems of Equations

OBJECTIVE ***Solving a system by graphing***

VOCABULARY

As you solve a system of equations, remember the following ideas.

- Lines that have the same slopes but different y-intercepts are parallel and will never intersect. These systems are **inconsistent.**
- Lines that have both the same slope and the same y-intercept are the same line and will intersect at every point. These systems are **dependent.**
- Lines that have different slopes will intersect, and the system will have one solution. These systems are **independent.**

Example Solve the system of equations by graphing. $\begin{cases} 2x + y = 8 \\ y - x = 2 \end{cases}$

$y = -2x + 8$

$y = x + 2$

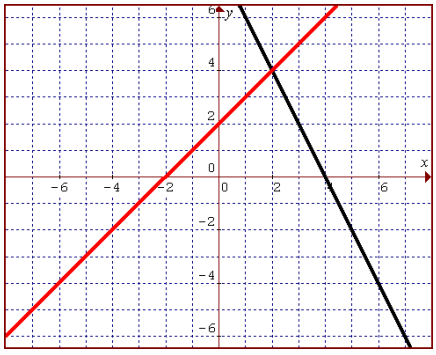
Write both equations in y = mx + b form.

Graph the line $y = 2x + 8$ with one color. Graph the line $y = x + 2$ with another color. Circle the point of intersection.

$x = 2$

$y = 4$

Determine the x- and y-coordinates of the point of intersection.
The solution is the ordered pair (2,4).



$2(2) + 4 = 8$

$4 + 4 = 8$

$8 = 8$

$4 - 2 = 2$

$2 = 2$

Check by substituting the solution into both equations.

Web Enhancement This site shows excellent examples of the cases of the number of solutions.

http://www.purplemath.com/modules/systlin2.htm

G. Solving Systems Using Substitution

OBJECTIVE ***Solving systems of linear equations by substitution***

Example #1 Solve using substitution.

$$-4x + y = -13$$
$$x - 1 = y$$

$y = 4x - 13$
$y = x - 1$

Rewrite each equation in the form $y = mx + b$

$4x - 13 = x - 1$ Since both parts equal *y*, they are equal to each other. Set them equal to each other.

$3x = 12$

Solve for x.

$x = 4$

$y = 4x - 13$

$y = 4(4) - 13$ Substitute 4 for *x* in either equation. Solve for *y*.

$y = 3$

Example #2 Solve using substitution.

$$-4x + y = -13$$
$$x - 1 = y$$

$x - 1 = y$

Solve one equation for one of the variables. In this example solve the second equation for x.

$x = y + 1$

$-4x + y = -13$

$-4(y + 1) + y = -13$

Substitute what x equals in the other equation in place of x.

$-4y - 4 + y = -13$

$-3y = -9$

Distribute and solve for y.

$y = 3$

$x = y + 1$

$x = (3) + 1$ Substitute 3 for *y* in either equation. Solve for *x*.

$x = 4$

Web Enhancement This site shows several examples of using substitution to solve systems of equations.

http://www.purplemath.com/modules/systlin4.htm

H. Solving Systems of Equations by Elimination/Linear Combination

OBJECTIVE ***Using elimination (linear combination) to solve a system of equations***

Instructions Follow these steps when using elimination to solve steps.

Step 1: Arrange the equations with like terms in columns.
Step 2: Circle the like terms for which you want to obtain coefficients that are opposites.
Step 3: Multiply each term of one or both equations by an appropriate number.
Step 4: Add the equations.
Step 5: Solve for the remaining variable.
Step 6: Substitute the value obtained in step 5 into either of the original equations, and solve for the other variable.
Step 7: Check the solution in the other original equation.

Example Solve the system using the elimination method. $\begin{cases} 2x + 5y = 11 \\ 3x - 2y = -12 \end{cases}$

$2x + 5y = 11$
$3x - 2y = -12$ Highlight the terms that you want to make opposite.

$6x + 15y = 33$ Multiply each term of the first equation by 3.
$-6x + 4y = 24$ Multiply each term of the second equation by –2.

$19y = 57$
$y = 3$ Add the equations. Solve for the remaining variable.

$3x - 2(3) = -12$
$x = -2$ Substitute 3 for y to solve for x.

$2(-2) + 5(3) = 11$
$-4 + 15 = 11$
$11 = 11$ Check using the other equation.

The solution is $(-2, 3)$. You can also check the solution by using a graphing calculator.

Web Enhancement This site has examples of solving using linear combination.

http://www.algebra-class.com/systems-of-equations.html

I. Word Problem Applications of Linear Systems

OBJECTIVE ***Writing and solving systems of linear equations***

Instructions As you solve multi-step systems of linear equations, remember these strategies:

- Determine which form each equation is in:
  $Ax + By = C$ or $y = mx + b$
- If the equations are in the form $Ax + By = C$ and a variable can easily be eliminated, use elimination.
- If the equations are in $y = mx + b$ form, use graphing or substitution.

Example Last year, Zach received $469.75 in interest from two investments. The interest rates were 7.5% on one account and 8% on the other. If the total amount invested was $6,000, how much was invested at each rate?

Define the variables; x = investment in first account; y = investment in second account

Relate The total amount invested was $6,000.

Write out the mathematical steps.

$x + y = 6{,}000$

$0.075x + 0.08y = 469.75$

$y = -x + 6{,}000$

Determine the form of each equation: $Ax + By = C$.

Since a variable cannot be easily eliminated, rewrite 1 equation in the form $y = mx + b$.

$0.075x + 0.08(-x + 6{,}000) = 469.75$

Substitute $x + 6{,}000$ for y.

$-0.005x = -10.25$

$x = 2050$

Solve for x.

$2050 + y = 6{,}000$

$y = 3950$

Substitute 2050 for x in the first equation and solve for y.

The amount invested in the first account was $2,050 and in the second account was $3,950.

Web Enhancement

http://www.purplemath.com/modules/systprob.htm

J. Product of Powers Property of Exponents

OBJECTIVE ***Multiplying exponential expressions with the same base***

VOCABULARY

An exponential expression is an expression in the form a^x.

To multiply exponential expressions with the same base, add the exponents: $a^m * a^n = a^{m+n}$.

Example

Simplify $4^6 * 4^3$.

$4^6 * 4^3$ Rewrite as one base with the exponents added.

4^{6+3}

4^9 Add the exponents.

So, $4^6 * 4^3 = 4^9$.

Web Enhancement These website reviews each of the exponent rules including multiplication (covers topics J, K, L, M).

http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut26_exp.htm

http://www.purplemath.com/modules/exponent.htm

K. Power of a Power Property of Exponents

OBJECTIVE ***Using more multiplication properties of exponents***

VOCABULARY

To raise a power to a power, multiply the exponents. $(x^3)^2 = x^6$

Every number and variable inside parenthesis is being raised to the power to the right of the parenthesis. $(4x^3)^2 = (4^2 x^{3(2)}) = 16x^6$

Example #1 Simplify $(4x^3)^2$.

$(4x^3)^2$	Rewrite each number and variable with an exponent.
$(4^1 x^3)^2$	
$4^{2*1} x^{2*3}$	Rewrite, showing the exponents to be multiplied.
$4^2 x^6$	Multiply the exponents.
$16x^6$	Simplify.

Example #2 Simplify $4(x^3)^2$.

$4\left(x^{2*3}\right)$	Rewrite, showing the exponents to be multiplied for the bases that are affected by the exponents.
$4x^6$	Multiply the exponents.

Web Enhancement These website reviews each of the exponent rules including multiplication (covers topics J, K, L, M).

http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut26_exp.htm

http://www.purplemath.com/modules/exponent.htm

L. Quotient of Powers Property of Exponents

OBJECTIVE ***Applying division properties of exponents***

VOCABULARY

To divide powers with the same base, subtract the exponents.

$$\frac{4^5}{4^3} = 4^2$$

Example

Simplify $\frac{5^9}{5^{-6}}$

$\frac{5^9}{5^{-6}} = 5^{9-(-6)} = 5^{9+6} = 5^{15}$ Subtract the exponents from the original equation.

Web Enhancement These website reviews each of the exponent rules including multiplication (covers topics J, K, L, M).

http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut26_exp.htm

http://www.purplemath.com/modules/exponent.htm

M. Zero and Negative Exponents

OBJECTIVE ***Evaluating and simplifying expressions in which zero and negative numbers are used in exponents***

VOCABULARY: When a nonzero number *a* has a zero exponent, then $a^0 = 1$.

For any nonzero number *a* and any integer, *n*, $a^{-n} = \frac{1}{a^n}$

For any nonzero numbers *a* and b and any integer, *n*, $\left(\frac{a}{b}\right)^{-n} = \frac{a^{-n}}{b^{-n}} = \frac{b^n}{a^n}$

Examples Write each expression as an integer or a simple fraction.

Example A	$2.7^0 \rightarrow 1$	Rewrite, using the property of zero as an exponent.
Example B	$5^{-2} \rightarrow \frac{1}{5^2} \rightarrow \frac{1}{25}$	Rewrite as a fraction, using the property of negative exponents. Then simplify.
Example C	$\left(\frac{4}{7}\right)^{-2} \rightarrow \frac{7^2}{4^2} \rightarrow \frac{49}{16}$	Distribute the exponent, switch the placement in the fraction, and simplify.
Example D	$\frac{1}{5^{-2}} \rightarrow 1(5^2) \rightarrow 25$	Move the amount with the negative exponent to the other side of the fraction, make the exponent positive and simplify.

Continued on next page…

Examples Simplify each expression. Use only positive exponents in your final answer.

Example E

$$\frac{(-4)^2}{(-4)^7} = (-4)^{2-7}$$ Quotient of Powers Property

$$= (-4)^{-5}$$ Simplify.

$$= \frac{1}{(-4)^5} = -\frac{1}{1024}$$ Definition of negative exponent

Example F

$$(z^4)^{-3} = z^{4 \cdot (-3)}$$ Power of a Power Property

$$= z^{-12}$$ Simplify.

$$= \frac{1}{z^{12}}$$ Definition of negative exponent

Example G

$$\left(\frac{3d}{2}\right)^4 = \frac{(3d)^4}{2^4}$$ Power of a Quotient Property

$$= \frac{3^4 d^4}{2^4}$$ Power of a Product Property

$$= \frac{81d^4}{16}$$ Simplify.

Example H

$$\left(\frac{2x}{3}\right)^{-5} = \frac{(2x)^{-5}}{3^{-5}}$$ Power of a Quotient Property

$$= \frac{3^5}{(2x)^5}$$ Definition of negative exponent

$$= \frac{3^5}{2^5 x^5}$$ Power of a Product Property

$$= \frac{243}{32x^5}$$ Simplify.

Web Enhancement **This site has a great video showing why the exponents are as they are:**
http://www.homeschoolmath.net/teaching/negative_zero_exponents.php

N. Scientific Notation

OBJECTIVE ***Writing numbers in scientific notation***

VOCABULARY

To write a number in **scientific notation**, follow these steps:

- Move the decimal to the right of the first integer.
- If the original number is greater than 1, multiply by 10^n, where *n* represents the number of places the decimal was moved to the left.
- If the original number is less than 1, multiply by 10^{-n}, where *n* represents the number of places the decimal was moved to the right.

Example

Write each number in scientific notation.

A	9,040,000,000	Standard Form
	9.040000000	Move the decimal to the left nine places.
	$9.04 * 10^9$	Drop all significant 0's. Multiply by the appropriate power of 10.
B	0.0000008	Standard Form
	0000008 .	Move the decimal to the right seven places.
	$8.0 * 10^{-7}$	Multiply by the appropriate power of 10.

Web Enhancement

Practice converting from standard to scientific notation.

http://janus.astro.umd.edu/astro/scinote/

http://www.purplemath.com/modules/exponent3.htm

O. Solving Inequalities

OBJECTIVE ***Solving one variable inequalities and graphing inequalities on a number line***

To solve an inequality, use the techniques used to solve an equation with one difference; when multiplying or dividing each side by a negative number, reverse the inequality. One variable inequalities can be graphed on a number line or a coordinate plane. When graphing on a number line the equal sign in combination with the inequality means a closed circle.

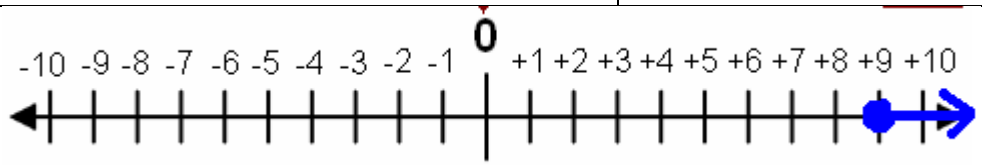
Examples Solve each inequality. Graph the solutions.

a. $2x - 5 \geq 13$ b. $4 + 3(1 - 2x) > 37$

Use the properties of real numbers and the properties of inequalities to rewrite each inequality in an equivalent form.

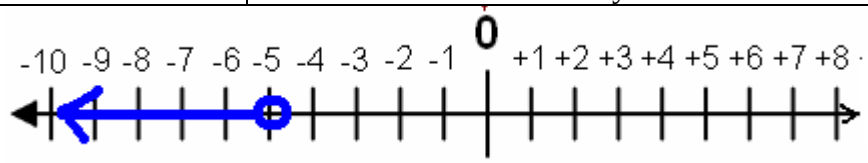
When dividing each side by a positive number, do not reverse the inequality.

$2x - 5 \geq 13$ $2x \geq 18$	Add 5 to each side.
$x \geq 9$	Divide each side by 2.



When dividing (or multiplying) each side by a negative number, reverse the inequality sign.

$4 + 3(1 - 2x) > 37$ $4 + 3 - 6x > 37$	Use the distributive property.
$7 - 6x > 37$	Simplify.
$-6x > 30$	Subtract 7 from each side.
$x < -5$	Divide each side by -6 and reverse the inequality.



Web Enhancement

http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_OneVariableSolvingInequalities.xml

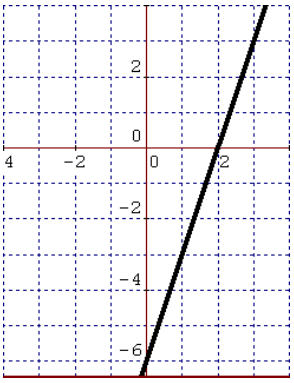
P. Two-Variable Inequalities

OBJECTIVE ***Graphing inequalities with two variables on a coordinate plane***

Examples Graph the inequality $6x - 2y \le 12$.

$6x - 2y \le 12$

$y \ge 3x - 6$

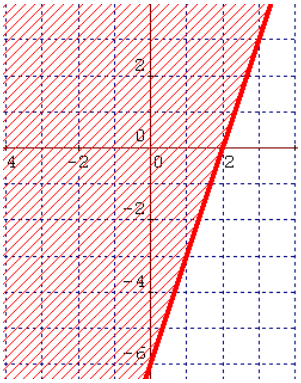


To graph the boundary line, write the inequality in slope-intercept form as if it were an equation.

The boundary line is solid if the inequality contains $\le$ or $\ge$. The boundary line is dashed if the inequality contains < or >. Graph the boundary line $y = 3x - 6$ as a solid line.

$0 \ge 3(0) - 6$

$0 \ge -6$



Since the boundary line does not contain the origin, substitute the point (0,0) into the inequality.
Simplify. The resulting inequality is true.

Use your highlighting marker to shade the region that contains the origin. If the resulting inequality were false, then you would shade the region that does not contain the origin.

Web Enhancement Link for more step by step instructions or watch the video from the second site listed.

http://www.purplemath.com/modules/ineqgrph.htm

http://www.brightstorm.com/math/algebra/solving-and-graphing-inequalities/graphing-2-variable-inequalities/

Q. Adding & Subtracting Polynomials

OBJECTIVE ***Adding and subtracting polynomials***

Vocabulary	**Term**- each part of the polynomial that is being added **Like terms**- terms that contain the same variables raised to the same power; only the numerical coefficients are or may be different.

When adding and subtracting polynomials only like terms can be added or subtracted. In an expression, only like terms can be combined. We combine like terms to shorten and simplify algebraic expressions, so we can work with them more easily. To combine like terms, we add the coefficients and keep the variables the same.

Example Add these polynomials: $(2a^2 + 4a - 6) + (a^2 - 2a + 4)$

$(2a^2 + 4a - 6) + (a^2 - 2a + 4)$ $(2a^2 + a^2) + (4a - 2a) + (-6 + 4)$ $3a^2 + 2a - 2$	Put like terms together and add. Be sure and bring the sign with the term.

Subtract these polynomials: $(4x^2 + 2x - 7) - (-3x^2 - 6x + 2)$

$(4x^2 + 2x - 7) - (-3x^2 - 6x + 2)$ $(4x^2 - (-3x^2)) + (2x - (-6x)) + (-7 - 2)$ $7x^2 + 8x - 9$	Put like terms together and subtract each pair. Be sure and bring the sign with the term.

Web Enhancement The first site describes like terms.
http://www.math.com/school/subject2/lessons/S2U2L4DP.html

This website describes adding and subtracting polynomials.

http://www.purplemath.com/modules/polyadd.htm

R. Multiplying Binomials

OBJECTIVE

Multiplying binomials

Vocabulary : **To multiply two binomials, follow these steps:**

Multiply each term in one binomial by each term of the other binomial. Combine like terms. (FOIL or "sneaky squares")

Example Find the product $(x+7)(x+2)$.

$(x+7)(x+2)$	Identify the first term of the first binomial
x^2+2x	Multiply each term of the second binomial by that first term of the first binomial.
$(x+7)(x+2)$	Identify the second term of the first binomial
$7x+14$	Multiply each term of the second binomial by that second term of the first binomial.
$x^2+2x+7x+14$	Add the two expressions. Combine like terms.
$x^2+9x+14$	Solution

OR you may use "sneaky squares".

	x	7
x	x^2	7x
2	2x	14

$x^2+2x+7x+14$

$x^2+9x+14$

Web Enhancement These sites show binomial multiplication by FOIL.

http://www.freemathhelp.com/using-foil.html

https://www.khanacademy.org/math/algebra/multiplying-factoring-expression/multiplying-binomials/v/multiplying-binomials

S. Function Notation

OBJECTIVE

Apply function notation to evaluate expressions

Function notation replaces *y* with $f(x)$. We can identify which equation was used to find the *y*-value and which input was used as well. Equations are commonly named as $f(x)$, but other letters can be used.

Example Evaluate $f(5)$ for $f(x) = 3x + 4$.

This means that we are finding the *y* value when *x* equals 5. We start by replacing *x* with 5. Then we simplify.

$$f(5) = 3(5) + 4 = 15 + 4 = 19$$

Example Evaluate $g(-3)$ for $g(x) = x^2 - 8$.

It is important to use parentheses when replacing *x* with -3. Also note that $(-3)^2$ is positive 9.

$$g(-3) = (-3)^2 - 8 = 9 - 8 = 1$$

Web Enhancement These sites show more function notation examples.

http://www.purplemath.com/modules/fcnnot.htm

http://www.virtualnerd.com/algebra-1/relations-functions/functions/function-notation/f-of-x-definition

T. Practice with non-calculator computations

Roughly half of the assessments in Algebra 2 are non-calculator. It is important to maintain your computational skills and identify areas where you may need extra practice. These examples let you know the level of computation you should be able to handle without a calculator. If you find that you are struggling after this practice, make sure you get extra help early!

OBJECTIVE **Practice non-calculator computational skills**

Example Subtract the fractions without using your calculator.

$$\frac{7}{8} - \frac{5}{12}$$

$$\frac{7}{8}\cdot\frac{3}{3} - \frac{5}{12}\cdot\frac{2}{2}$$

$$\frac{21}{24} - \frac{10}{24}$$

$$\frac{21-10}{24}$$

$$\frac{11}{24}$$

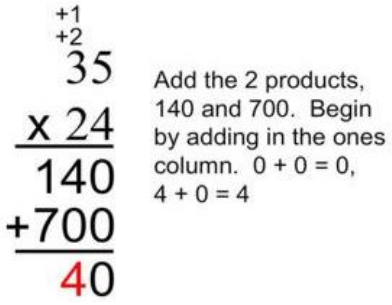
Identify 24 as the least common denomination (LCD).

Multiply the top and bottom of each term by the number that creates the LCD.

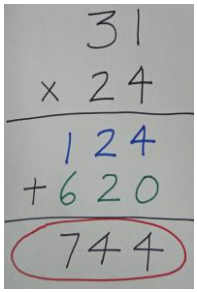
Combine the numerators to make one fraction using the LCD.

Simplify the numerator.

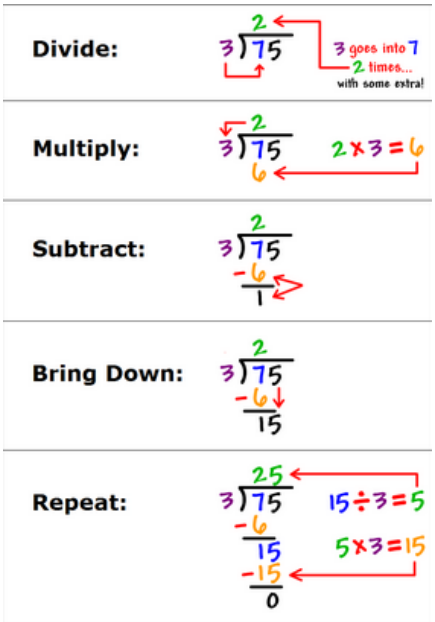
Examples Multiply these numbers without a calculator.

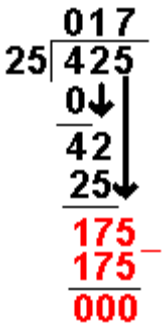


Add the 2 products, 140 and 700. Begin by adding in the ones column. 0 + 0 = 0, 4 + 0 = 4



Examples Long Division.

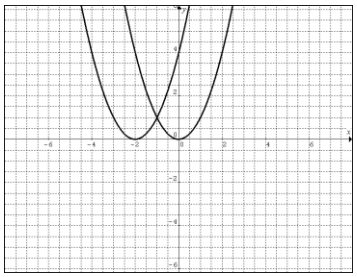




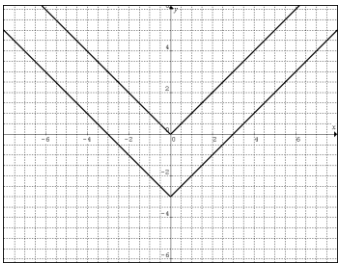
U. Translations of Graphs Review

OBJECTIVE To graph equations by translating parent graphs

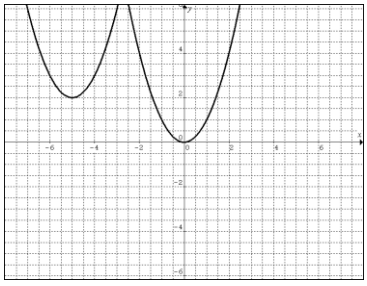
Examples



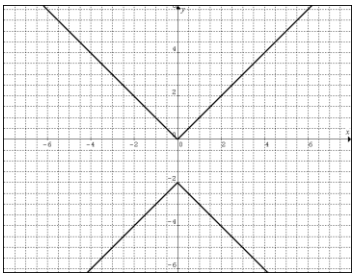
Here is the graph of $y = x^2$ and $y = (x-(-2))^2$.
The parent graph is $y = x^2$ has been translated 2 units to the left by subtracting a negative number from x in the function. This can be written as $y = (x+2)^2$.



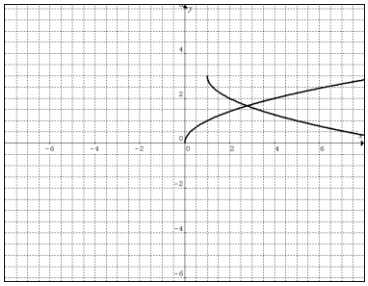
Here is the graph of $y = |x|$ and $y = |x|-3$
The parent graph is $y = |x|$ has been translate 3 units down by adding a negative number to the entire function.



Here is the graph of $y = x^2$ and $y = (x+5)^2+2$
The parent graph is $y = x^2$ has been translate 5 units to the left by subtracting a negative number from x in the function and up 2 units by adding 2 to the entire function.



Here is the graph of $y = |x|$ and $y = -|x|-2$
The parent graph is $y = |x|$ has been reflected over the x axis by changing the sign of the x value and translated 2 units down by adding a negative number to the entire function.



Here is the graph of $y = \sqrt{x}$ and $y = -\sqrt{(x-1)}+3$. The parent graph is $y = \sqrt{x}$ has been reflected over the x axis by changing the sign of the x value and translated 1 unit to the right by adding a negative number to the x value and translated 3 units up by adding a positive number to the entire function. You can create an infinite number of functions by translating a parent graph.

Web Enhancement

http://www.mathsisfun.com/sets/function-transformations.html

V. Solving Absolute Value Equations

OBJECTIVE ***Solving absolute value equations***

Vocabulary For every positive real number, *a,* both *a* and –a satisfy the equation $|x| = a$. To solve an absolute value equation, first rewrite the equation as an equivalent equation with an absolute value expression on the left side by itself. Then rewrite this equation as a compound equality using the rule that if $|x| = a$, then $x = a$ or $x = -a$.

Example 1 Solve the equation $|x + 5| = 10$. Check your solutions.

$\|x + 5\| = 10$	The absolute value expression is already isolated, so I can next rewrite it as a compound equality
$x + 5 = 10$ or $x + 5 = -10$	Rewrite as a compound equality.
$x + 5 = 10$ or $x + 5 = -10$ $x = 5$ or $x = -15$	Solve each equation.

To check for extraneous solutions, substitute each value for *x* in the original absolute value equation. Any value that does not satisfy the original equation must be discarded.

Check

$|5 + 5| = 10$ $\quad$ $|-15 + 5| = 10$

$|10| = 10$ $\quad$ $|-10| = 10$

✓ ✓

Example 2 Solve the equation $2|x - 3| + 1 = 19$. Check your solutions.

$2\|x - 3\| + 1 = 19$ $2\|x - 3\| = 18$	**Our first goal is to isolate the absolute value expression.** Subtract 1 from each side.
$\|x - 3\| = 9$	Divide each side by 2.
$x - 3 = 9$ or $x - 3 = -9$	Rewrite as a compound equality.
$x - 3 = 9$ or $x - 3 = -9$ $x = 12$ or $x = -6$	Solve each equation.

Check

$2|12 - 3| + 1 = 19$ $\quad$ $2|-6 - 3| + 1 = 19$

$2|9| + 1 = 19$ $\quad$ $2|-9| + 1 = 19$

$2 \cdot 9 + 1 = 19$ $\quad$ $2 \cdot 9 + 1 = 19$

$18 + 1 = 19$ $\quad$ $18 + 1 = 19$

✓ ✓

Web Enhancement

http://www.purplemath.com/modules/solveabs.htm

Selected Answers for Algebra II Summer Assignment 2020 – Packet Problems

Section T #1a. translated left 3, translated down 6 $y = (x+3)^2 - 6$

#2a. the parent graph of $y = |x|$ is translated 4 units to the left.

#3a. $y = (x-3)^2$

Section U #1. x = -1 or -6 (Make sure you have **2** solutions and you have confirmed with a check that each value makes the original equation true.)