Algebra Cheat Sheets

Algebra Cheat Sheets provide you with a tool for teaching your students note-taking, problem-solving, and organizational skills in the context of algebra lessons. These sheets teach the concepts as they are presented in the Algebra Class Software.

Algebra Cheat Sheets

Algebra Cheat Sheet 1

Adding Integers

- **Adding means combining**

1. If the signs are the same, then add and use the same sign.	$8 + 4 = 12$ $-8 + -4 = -12$
2. If the signs are different, then subtract and use the sign of the larger number.	$-8 + 4 = -4$ $8 + -4 = 4$

Adding Integers – Examples

Algebra Cheat Sheet 2

Subtracting Integers

Subtracting is the opposite of adding.

Change the sign of the second term and add.

$8 - (+4) = 8 - 4 = 4$

$-8 - (+4) = -8 - 4 = -12$

$8 - (-4) = 8 + 4 = 12$

$-8 - (-4) = -8 + 4 = -4$

Subtracting Integers – Examples

Algebra Cheat Sheet 3

Multiplying Integers

Multiply integers as you would whole numbers, then apply the sign rules to the answer.

1. If the signs are the same, the product is positive.	(8) (4) = 32 (– 8) (– 4) = 32
2. If the signs are different, the product is negative.	(– 8) (4) = – 32 (8) (– 4) = – 32

Multiplying Integers – Examples

Algebra Cheat Sheet 4

Dividing Integers

Divide integers as you would whole numbers, then apply the sign rules to the answer.

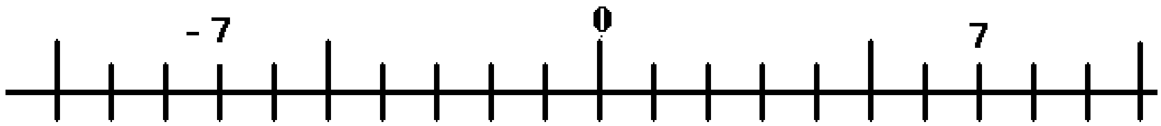
1. If the signs are the same, the quotient is positive.	$32 \div 8 = 4$ $-32 \div -8 = 4$
2. If the signs are different, the quotient is negative.	$32 \div -8 = -4$ $-32 \div 8 = -4$

Dividing Integers – Examples

Algebra Cheat Sheet 5

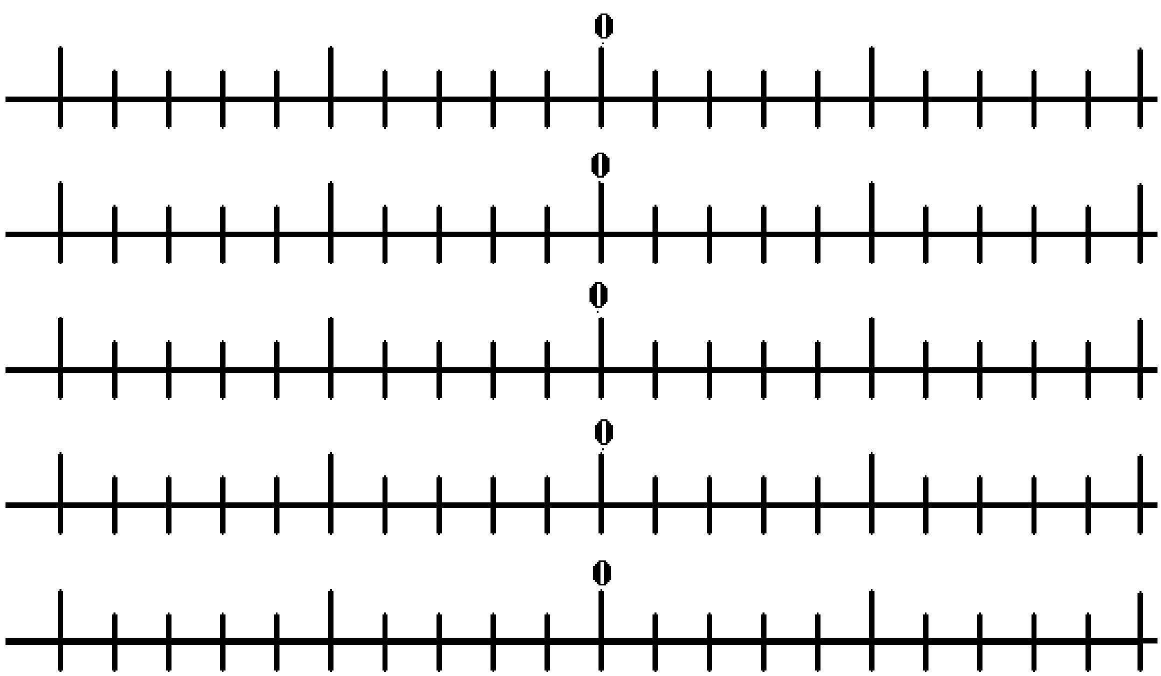
Absolute Value

The absolute value of a number is the distance a number is from '0' on the number line.



The absolute values of '7' and '-7' are 7 since both numbers have a distance of 7 units from '0.'

Absolute Value – Examples



Algebra Cheat Sheet 6

Combining Like Terms

To combine terms, the variables must be identical.

1. Put the terms in alphabetical order.
2. Combine each set of like terms.
3. Put the answers together.

Combining Like Terms – Examples

$$3a + 4b + 2c + 5a - 6c - 2b$$

1. Put the terms in alphabetical order:

$$3a + 5a + 4b - 2b + 2c - 6c$$

2. Combine each set of like terms:

- $3a + 5a = 8a$
- $4b - 2b = 2b$
- $2c - 6c = -4c$

3. Put the answer together:

$$8a + 2b - 4c$$

Algebra Cheat Sheet 6

Combining Like Terms

To combine terms, the variables must be identical.

1. Put the terms in alphabetical order.
2. Combine each set of like terms.
3. Put the answers together.

Combining Like Terms – Examples

Algebra Cheat Sheet 7

Distributive Property I

Multiply each term inside the parenthesis by the term on the outside of the parenthesis.

- **$c(a + b) = ca + cb$**
- **$c(a - b) = ca - cb$**

Distributive Property – Examples

$3b\,(a + 4) =$

$3b\,(a) + 3b\,(4) =$

$3ab + 12b$

Algebra Cheat Sheet 7	***Distributive Property I***

Multiply each term inside the parenthesis by the term on the outside of the parenthesis.

- **c(a + b) = ca + cb**
- **c(a - b) = ca - cb**

Distributive Property – Examples

Algebra Cheat Sheet 8

Adding Expressions

1. Set the problem up vertically.

2. Combine the terms.

Adding Expressions – Examples

Write the problem vertically:	
$8c + 2d - 4g$ $\underline{-7c + 4d - 8g}$	
1. Combine the c's:	$8c - 7c = c$
2. Combine the d's:	$2d + 4d = 6d$
3. Combine the g's:	$-4g - 8g = -12g$
4. The answer is:	$c + 6d - 12g$

Algebra Cheat Sheet 8

Adding Expressions

1. Set the problem up vertically.

2. Combine the terms.

Adding Expressions – Examples

Algebra Cheat Sheet 9

Subtracting Expressions

3. Set the problem up vertically.

4. Change the signs of each term on the bottom line.

5. Combine the terms.

Subtracting Expressions – Examples

Change the bottom signs:	Combine the terms:
8c + 2d - 4g - 7c - 4d + 8g	8c + 2d - 4g -7c + 4d - 8g
1. Combine the c's:	8c - 7c = c
2. Combine the d's:	2d + 4d = 6d
3. Combine the g's:	-4g - 8g = -12g
4. The answer is:	c + 6d - 12g

Algebra Cheat Sheet 9

Subtracting Expressions

1. Set the problem up vertically.

2. Change the signs of each term on the bottom line.

3. Combine the terms.

Subtracting Expressions – Examples

Algebra Cheat Sheet 10

Writing Expressions

Look for 'clue' words:

1. **For the clue words, '*<u>the product of</u>*' place the constant before the variable. Do not use a sign.**
2. **The clue words '*<u>more than</u>*' and '*<u>less than</u>*' indicate inverted order.**
3. **If there are no clue words, write the expression in the order that the words appear.**

Writing Expressions – Examples

1. The product of 4 and ***x*** The product of ***y*** and 5	4x 5y
2. ***x*** more than three thirteen less than ***y***	3 + x y – 13
3. the sum of ten and ***x*** the difference between ***y*** and 4	10 + x y – 4

Algebra Cheat Sheet 10

Writing Expressions

Look for 'clue' words:

1. **For the clue words, '_the product of_' place the constant before the variable. Do not use a sign.**
2. **The clue words '_more than_' and '_less than_' indicate inverted order.**
3. **If there are no clue words, write the expression in the order that the words appear.**

Writing Expressions – Examples

Algebra Cheat Sheet 11

Evaluating Expressions

Step 1. **Replace the variable with parentheses.**

Step 2. **Place the value of the variable inside the parentheses.**

Step 3. **Calculate the answer.**

Evaluating Expressions – Examples

Evaluate $10x + 7$, when $x = 5$.

Step 1. $10(\quad) + 7$

Step 2. $10(5) + 7$

Step 3. $50 + 7 = 57$

Algebra Cheat Sheet 11

Evaluating Expressions

Step 1. Replace the variable with parentheses.

Step 2. Place the value of the variable inside the parentheses.

Step 3. Calculate the answer.

Evaluating Expressions – Examples

Algebra Cheat Sheet 12

Solving Equations

Step 1. Get all the variables on the left and all the numbers on the right of the equal sign by adding opposites.

Step 2. Divide by the coefficient of the variable to determine its value.

Solving Equations – Examples

$$2d + 3 = -7$$

1. $$-3 = -3$$

$$2d = -10$$

2. $$d = -5$$

Algebra Cheat Sheet 12

Solving Equations

Step 1. Get all the variables on the left and all the numbers on the right of the equal sign by adding opposites.

Step 2. Divide by the coefficient of the variable to determine its value.

Solving Equations – Examples

Algebra Cheat Sheet 13

Solving Inequalities

Step 3. Get all the variables on the left and all the numbers on the right of the sign by adding opposites.

Step 4. Divide by the positive value of the variable's coefficient.

Step 5. If the variable is negative, divide by –1 and reverse the sign.

Solving Inequalities – Examples

$$-2d + 3 < -7$$

1. $$\underline{\qquad -3 = -3}$$

$$-2d < -10$$

2. $$-d < -5$$

3. $$d > 5$$

Algebra Cheat Sheet 13

Solving Inequalities

Step 1. Get all the variables on the left and all the numbers on the right of the sign by adding opposites.

Step 2. Divide by the positive value of the variable's coefficient.

Step 3. If the variable is negative, divide by –1 and reverse the sign.

Solving Inequalities – Examples

Algebra Cheat Sheet 14

Writing Equations

Look for 'clue' words:

1. **For the clue words, '*<u>the product of</u>*' place the constant before the variable. Do not use a sign.**
2. **The clue words '*<u>more than</u>*' and '*<u>less than</u>*' indicate inverted order.**
3. **If there are no clue words, write the equation in the order that the words appear.**
4. **The equal sign is used in place of the word '*<u>is</u>*.'**

Writing Equations – Examples

1. The product of 4 and ***x*** is 12. The product of ***y*** and 5 is 10.	$4x = 12$ $5y = 10$
2. ***x*** more than three is 12. Thirteen less than ***y*** is – 3.	$3 + x = 12$ $y - 13 = 3$
3. The sum of ten and ***x*** is 12. The difference between ***y*** and 4 is – 2.	$10 + x = 12$ $y - 4 = -2$

Algebra Cheat Sheet 14

Writing Equations

Look for 'clue' words:

1. **For the clue words, '*the product of*' place the constant before the variable. Do not use a sign.**
2. **The clue words '*more than*' and '*less than*' indicate inverted order.**
3. **If there are no clue words, write the equation in the order that the words appear.**
4. **The equal sign is used in place of the word '*is*.'**

Writing Equations – Examples

Algebra Cheat Sheet 15

Writing Inequalities

Look for 'clue' words:

1. **For the clue words, '*the product of*' place the constant before the variable. Do not use a sign.**
2. **The clue words '*more than*' and '*less than*' indicate inverted order.**
3. **If there are no clue words, write the equation in the order that the words appear.**
4. **The $<$ is used in place of '*is less than*.'**
5. **The $>$ is used in place of '*is greater than*.'**

Writing Inequalities – Examples

1. The product of 4 and ***x*** is greater than 12.	$4x > 12$
2. ***x*** more than three is less than 12.	$3 + x < 12$
3. The difference between ***y*** and 4 is greater than – 2.	$y - 4 > -2$

Algebra Cheat Sheet 15

Writing Inequalities

Look for 'clue' words:

1. **For the clue words, '*__the product of__*' place the constant before the variable. Do not use a sign.**
2. **The clue words '*__more than__*' and '*__less than__*' indicate inverted order.**
3. **If there are no clue words, write the equation in the order that the words appear.**
4. **The $<$ is used in place of '*__is less than__*.'**
5. **The $>$ is used in place of '*__is greater than__*.'**

Writing Inequalities – Examples

Algebra Cheat Sheet 16

Solving Literal Equations

Step 1. Get the desired variable on the left and all the others on the right of the equal sign by adding opposites.

Step 2. Divide both sides by the positive value of any other variable on the left.

Solving Literal Equations – Example

Solve for l (length) $A = lw$

1. $lw = A$

Divide by w

2. $l = \dfrac{A}{w}$

Algebra Cheat Sheet 16

Solving Literal Equations

Step 1. Get the desired variable on the left and all the others on the right of the equal sign by adding opposites.

Step 2. Divide both sides by the positive value of any other variable on the left.

Solving Literal Equations – Example

Algebra Cheat Sheet 17

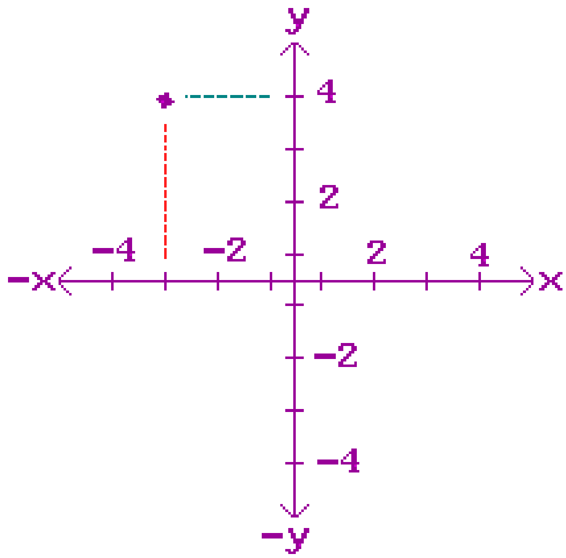
Points on the Coordinate Plane

Locating Points:

Step 1. Find the location on the x-axis. It is –3.

Step 2. Find the location on the y-axis. It is 4.

Step 3. Write the location in this form (x, y). The point is (–3, 4).



Plotting points:

Plot the point (5, –3) on the coordinate plane.

Step 1. Begin at point (0, 0). Move 5 to the right (on the x-axis) since 5 is positive.

Step 2. Move 3 down since –3 is negative.

Step 3. Plot the point.

Notes – Points on the Coordinate Plane

- Use graph paper.
- Begin by marking the x-axis and y-axis as shown in the diagram above.

Algebra Cheat Sheet 18

Graphing – Using Slope and Intercept

- The y-intercept is the constant in the equation. It is the value of y when x = 0.
- A line with a positive slope goes up and to the right.
- A line with a negative slope goes down and to the right.

To graph the equation: $y = 5x - 3$

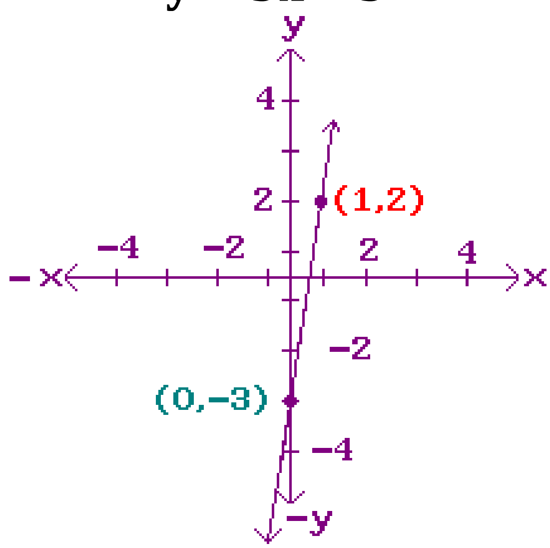
Step 1. The y-intercept is –3. Plot the point (0, –3).

Step 2. The slope is 5. Move 1 to the right and 5 up from the first point. Plot the second point at (1, 2).

Step 3. Draw the line connecting the two points.

Graphing - Using the Slope and y-intercept

y = 5x – 3



Algebra Cheat Sheet 18

Graphing – Using Slope and Intercept

- ♦ The y-intercept is the constant in the equation. It is the value of y when $x = 0$.
- ♦ A line with a positive slope goes up and to the right.
- ♦ A line with a negative slope goes down and to the right.

To graph the equation: $y = 5x – 3$

Step 1. The y-intercept is –3. Plot the point (0, –3).

Step 2. The slope is 5. Move 1 to the right and 5 up from the first point. Plot the second point at (1, 2).

Step 3. Draw the line connecting the two points.

Graphing - Using the Slope and y-intercept

Algebra Cheat Sheet 19	***Graphing – Using Function Tables***

Step 1. Substitute '0' for x, and calculate the value of y. Enter both on the first line of the function table.

Step 2. Substitute '1' for x, then calculate the value of y. Enter both numbers on the second line of the function table.

Step 3. Plot the two points, and draw a line between them.

Graphing - Using Function Tables

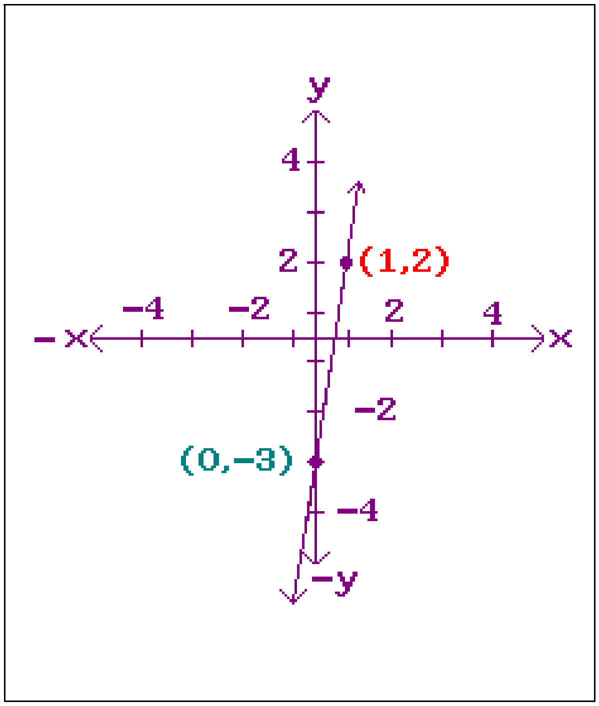
y = 5x – 3

x	y
0	–3
1	2

Step 1. Substitute '0' for x; y = -3. Enter x and y on the first line.

Step 2. Substitute '1' for x; y = 2. Enter these numbers on the second.

Step 3. Plot the two points, (0, -3) and (1, 2) then draw a line between them.



Algebra Cheat Sheet 19

Graphing – Using Function Tables

Step 1. Substitute ‘0’ for x, and calculate the value of y. Enter both on the first line of the function table.

Step 2. Substitute ‘1’ for x, then calculate the value of y. Enter both numbers on the second line of the function table.

Step 3. Plot the two points, and draw a line between them.

Graphing - Using Function Tables

Algebra Cheat Sheet 20

Find the Slope of a Line from Two Points

Step 1. Make a function table, entering the x and y values of the two points.

Step 2. Subtract: $y_1 - y_2$ = Rise

Step 3. Subtract: $x_1 - x_2$ = Run

Step 4. Slope = $\frac{\text{Rise}}{\text{Run}} = \frac{y_1 - y_2}{x_1 - x_2}$

Slope of a Line from Two Points

Find the slope of the line which includes points (-2, -2) and (1, 6).

Step 1. Enter the x and y values for the two points.

Step 2. The rise is (-2) – (5) or –7.

Step 3. The run is (-2) – (1) or –1

x	y
– 2	– 2
1	6
– 2	– 8
Run	**Rise**

Step 4. The slope is 4.

$$\frac{\text{Rise}}{\text{Run}} = \frac{-8}{-2}$$

Algebra Cheat Sheet 20

Find the Slope of a Line from Two Points

Step 1. Make a function table, entering the x and y values of the two points.

Step 2. Subtract: $y_1 - y_2 = \text{Rise}$

Step 3. Subtract: $x_1 - x_2 = \text{Run}$

Step 4. Slope = $\dfrac{\text{Rise}}{\text{Run}} = \dfrac{y_1 - y_2}{x_1 - x_2}$

Slope of a Line from Two Points

Algebra Cheat Sheet 21

Equation of a Line

To find the equation of a line shown on a graph.

Step 1. Determine the y-intercept. Find the point where x = 0. Substitute this value in the equation in place of 'b.'

Step 2. Find the value of y when x = 1.

Step 3. Subtract the value found in Step 1 from the value found in Step 2. This is the slope. Substitute this value in the equation in place of 'm.'

Equation of a Line – Example

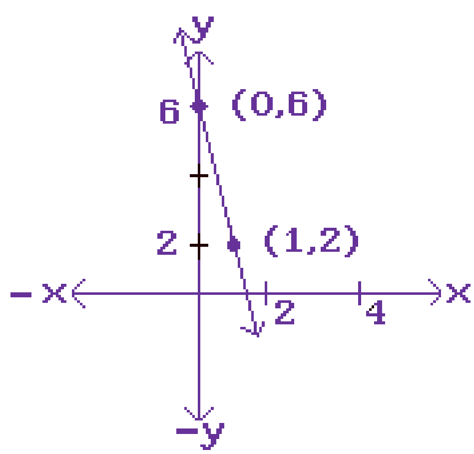
Step 1. The y-intercept is 6. $y = mx + 6$.

Step 2. When x = 1, y = 2.

Step 3. The slope (m) is 2 – 6 or –4.

The equation of the line is:

$y = -4x + y$



Algebra Cheat Sheet 21

Equation of a Line

To find the equation of a line shown on a graph.

Step 1. Determine the y-intercept. Find the point where $x = 0$. Substitute this value in the equation in place of 'b.'

Step 2. Find the value of y when $x = 1$.

Step 3. Subtract the value found in Step 1 from the value found in Step 2. This is the slope. Substitute this value in the equation in place of 'm.'

Equation of a Line – Example

Algebra Cheat Sheet 22

Graphing Inequalities

Step 1. Plot the y-intercept.

Step 2. Use the slope as the rise, and 1 as the run. Count the rise and run to find another point.

Step 3. Determine what kind of a line will connect the points. (Use a dotted line for < or >; use a solid line for ≤ or ≥ .)

Step 4. Shade above the line for greater than (>), and below the line for less than (<).

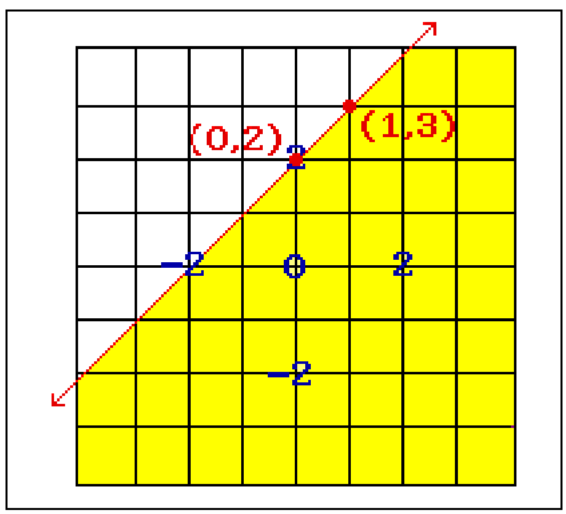
Example – Graphing Inequalities

$$y \le x + 2$$

Step 1. Substitute '0' for x; y = 2. Enter x and y on the first line.

Step 2. Substitute '1' for x; y = 3. Enter these numbers on the second.

Step 3. Plot the two points, (0, 2) and (1, 3) then draw a solid line between them.



Step 4. Shade below the line because the sign is ≤.

Algebra Cheat Sheet 22

Graphing Inequalities

Step 1. Plot the y-intercept.

Step 2. Use the slope as the rise, and 1 as the run. Count the rise and run to find another point.

Step 3. Determine what kind of a line will connect the points. (Use a dotted line for $<$ or $>$; use a solid line for $\leq$ or $\geq$.)

Step 4. Shade above the line for greater than ($>$), and below the line for less than ($<$).

Example – Graphing Inequalities

Algebra Cheat Sheet 23	***Forms of Linear Equations***
Slope–intercept form	$y = mx + b$
Standard form	$Ax + by = C$

Forms of Linear Equations – Examples

Change the slope-intercept equation to standard form.

$$y = \frac{2}{3}x - 3 \quad \text{slope-intercept form}$$

$$5y = 2x - 15 \quad \text{Multiply each side by 5.}$$

$$-2x + 5y = -15 \quad \text{Subtract 2x from each side.}$$

Change the standard form equation to slope-intercept form.

$$3x + 2y = 6 \quad \text{Standard form equation}$$

$$2y = -3x + 6 \quad \text{Subtract 3x from each side.}$$

$$y = \frac{-3}{2}x + 3 \quad \text{Slope-intercept form}$$

Algebra Cheat Sheet 23

Forms of Linear Equations

Slope–intercept form	y = mx + b
Standard form	Ax + by = C

Forms of Linear Equations – Examples

Algebra Cheat Sheet 24

Solving Equations II

Step 1. Get all the variables on the left and all the numbers on the right of the equal sign by adding opposites.

Step 2. Combine like terms.

Step 3. Divide by the coefficient of the variable to determine its value.

Solving Equations II – Example

$$4x + 4 = 2x - 6$$

1. $4x - 2x = -6 - 4$

2. $2x = -10$

3. $x = -5$

Algebra Cheat Sheet 24

Solving Equations II

Step 1. Get all the variables on the left and all the numbers on the right of the equal sign by adding opposites.

Step 2. Combine like terms

Step 3. Divide by the coefficient of the variable to determine its value.

Solving Equations II – Examples

Algebra Cheat Sheet 25	***Multiplying Monomials***

- To multiply monomials, add the exponents of the same variables.

Example – Multiplying Monomials

$$(a^3 b^5 c^8)(a^2 b^7 c^1)$$

Step 1. Multiply the a's	$(a^3)(a^2) = a^5$
Step 2. Multiply the b's	$(b^5)(b^7) = b^{12}$
Step 3. Multiply the c's	$(c^8)(c^1) = c^9$
Step 4. Put them together: $(a^3 b^5 c^8)(a^2 b^7 c^1) = a^5\ b^{12}\ c^9$	

Algebra Cheat Sheet 25

Multiplying Monomials

- To multiply monomials, add the exponents of the same variables.

Examples – Multiplying Monomials

Algebra Cheat Sheet 26

Dividing Monomials

- To divide monomials, subtract the exponents of the same variables.

Example – Dividing Monomials

$$\frac{(a^4\ b^7\ c^8)}{(a^3\ b^2\ c^6)}$$

Step 1. Divide the a's	$\frac{a^4}{a^3} = a^{4-3} = a$
Step 2. Divide the b's	$\frac{b^7}{b^2} = b^{7-2} = b^5$
Step 3. Divide the c's	$\frac{c^8}{c^6} = c^{8-6} = c^2$

Step 4. Put them together:

$$\frac{(a^4\ b^7\ c^8)}{(a^3\ b^2\ c^6)} = a\,b^5\,c^2$$

Algebra Cheat Sheet 26

Dividing Monomials

- To divide monomials, subtract the exponents of the same variables.

Examples – Dividing Monomials

Algebra Cheat Sheet 27

Raising Monomials to a Power

- To raise monomials to a power, multiply the exponent of each variable by the power.

Example – Raising Monomials to a Power

$$(a\,b^4\,c^2)^2$$

Step 1. Square the a's	$(a)(a) = a^2$
Step 2. Square the b's	$(b^4)(b^4) = b^8$
Step 3. Square the c's	$(c^2)(c^2) = c^4$
Step 4. Put them together: $(a\,b^4\,c^2)^2 = a^2\,b^8\,c^4$	

Algebra Cheat Sheet 27

Raising Monomials to a Power

- To raise monomials to a power, multiply the exponent of each variable by the power.

Examples – Raising Monomials to a Power

Algebra Cheat Sheet 28

Negative Powers of Monomials

- To multiply, divide or raise monomials to negative powers, use the rules for integers.

Example – Raising Monomials to a Power

$$(m^5 n^6 p^3)(m^{-2} n^{-1} p^3)$$

Step 1. Multiply the m's	$(m^5)(m^{-2}) = m^3$
Step 2. Multiply the n's	$(n^6)(n^{-1}) = n^5$
Step 3. Multiply the p's	$(p^3)(p^3) = p^6$
Step 4. Put them together: $(m^5 n^6 p^3)(m^{-2} n^{-1} p^3) = m^3 n^5 p^6$	

Algebra Cheat Sheet 28

Negative Powers of Monomials

- To multiply, divide or raise monomials to negative powers, use the rules for integers.

Examples – Raising Monomials to a Power

Algebra Cheat Sheet 29

Dividing by a Monomial

To divide by a monomial, separate the given expression into the sum of two fractions and divide.

Dividing by a Monomial – Example

$$\frac{12x^2 - 8x}{4x}$$

$$\frac{12x^2}{4x} + \frac{-8x}{4x} = -\,3x - 2$$

Algebra Cheat Sheet 29

Dividing by a Monomial

To divide by a monomial, separate the given expression into the sum of two fractions and divide.

Dividing by a Monomial – Example

Algebra Cheat Sheet 30

Greatest Common Factor

The greatest common factor (GCF) is the greatest number that is a factor of two or more given numbers.

In algebra, the GCF consists of the GCF of the coefficients multiplied by the GCF of the variables.

Greatest Common Factor – Example

$$-6x^2y + 3xy^2$$

- The **GCF** of the coefficients, ***– 6*** and ***3***, is ***3***.
- The **GCF** of the variables, x^2y and xy^2 is xy
- The product is $3xy$; this is the **GCF**.

Algebra Cheat Sheet 30

Greatest Common Factor

The greatest common factor (GCF) is the greatest number that is a factor of two or more given numbers.

In algebra, the GCF consists of the GCF of the coefficients multiplied by the GCF of the variables.

Greatest Common Factor – Examples

Algebra Cheat Sheet 31

Combining Like Terms II

Step 1. Arrange the terms in descending order of exponents.

Step 2. Combine the terms with like exponents and variables.

Example – Combining Like Terms II

$$-3y^8 + 6y^9 - 4y^9 + 8y + 7y^8 - 2y$$

Step 1. $6y^9 - 4y^9 - 3y^8 + 7y^8 + 8y - 2y$

Step 2. $2y^9 + 4y^8 + 6y$

Algebra Cheat Sheet 31

Combining Like Terms II

Step 1. Arrange the terms in descending order of exponents.

Step 2. Combine the terms with like exponents and variables.

Examples – Combining Like Terms II

Algebra Cheat Sheet 32

Adding Polynomials

Step 1. Set up the problem vertically in descending order of exponents.

Step 2. Add the like terms.

Example – Adding Polynomials

$$-3y^8 + 6y^9 - 4y^9 + 8y + 7y^8 - 2y$$

Step 1. $6y^9 - 4y^9 - 3y^8 + 7y^8 + 8y - 2y$

Step 2. $2y^9 + 4y^8 + 6y$

Algebra Cheat Sheet 32

Adding Polynomials

Step 1. Set up the problem vertically in descending order of exponents.

Step 2. Add the like terms.

Examples – Adding Polynomials

Algebra Cheat Sheet 33

Subtracting Polynomials

Step 1. Set up the problem vertically in descending order of exponents.

Step 2. Change the signs of all the bottom terms. (the ones to be subtracted)

Step 3. Combine the like terms.

A short way of saying this is:

Change the bottom signs and add.

Example – Subtracting Polynomials

$(-20x^2 + 30x^3 + 3 + 10x) - (30x^2 + 10x^3 + 2 - 20x)$

Step 1.	$30x^3 - 20x^2 + 10x + 3.$ $- \underline{(10x^3 + 30x^2 - 20x + 2)}$
Step 2.	$30x^3 - 20x^2 + 10x + 3$ $\underline{- 10x^3 - 30x^2 + 20x - 2}$
Step 3.	$20x^3 - 50x^2 + 30x + 1$

Algebra Cheat Sheet 33

Subtracting Polynomials

Step 1. Set up the problem vertically in descending order of exponents.

Step 2. Change the signs of all the bottom terms. (the ones to be subtracted)

Step 3. Combine the like terms.

A short way of saying this is:

Change the bottom signs and add.

Examples – Subtracting Polynomials

Algebra Cheat Sheet 34

Missing Factors

If $(a)(b) = c$ then $\frac{c}{a} = b$ and $\frac{c}{b} = a$.

Missing Factor problems can be set up as multiplication problems with one factor blank, or as a division problem. In either case, the answer is always the same.

Missing Factors – Example

Here are the two ways a problem can be written:

$(3x - 2)(\,?\,) = -3x^2 + 2x$ $a = (3x - 2)$ $b = (\,?\,)$ $c = -3x^2 + 2x$	$\frac{c}{a} = b = \frac{-3x^2 + 2x}{(3x - 2)} = ?$

The missing factor is $\boldsymbol{x}$.

Algebra Cheat Sheet 34

Missing Factors

If $(a)(b) = c$ then $\frac{c}{a} = b$ and $\frac{c}{b} = a$.

Missing Factor problems can be set up as multiplication problems with one factor blank, or as a division problem. In either case, the answer is always the same.

Missing Factors – Examples

Algebra Cheat Sheet 35

Degree of a Polynomial

♦ The degree of a polynomial is highest degree (exponent) of any of its terms after it has been simplified.

Example – Degree of a Polynomial

$$40x^3 + 10x^2 + 5x + 4$$

- **3** is the largest exponent
- this is a third degree polynomial

Algebra Cheat Sheet 35

Degree of a Polynomial

♦ The degree of a polynomial is highest degree (exponent) of any of its terms after it has been simplified.

Examples – Degree of a Polynomial

Algebra Cheat Sheet 36

Multiplying Polynomials by -1

To multiply a polynomial by –1, change the sign of each term of the polynomial.

$$-1\,(3a + 4b - 2c) = -3a - 4b + 2c$$

Multiplying Polynomials by –1 – Examples

Algebra Cheat Sheet 37

Multiply a Polynomial by a Variable

Step 1. Multiply each term of the polynomial by the variable.

Step 2. Combine the results.

Example – Multiply Polynomials by Monomials

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

Step 1.	$\mathbf{x(2x^2) = 2x^3}$ $\mathbf{x(3x) = 3x^2}$ $\mathbf{x(-4) = -4x}$
Step 2.	$\mathbf{2x^3 + 3x^2 - 4x}$
Therefore:	$\mathbf{x(2x^2 + 3x - 4) = 2x^3 + 3x^2 - 4x}$

Algebra Cheat Sheet 37

Multiply a Polynomial by a Variable

Step 1. Multiply each term of the polynomial by the variable.

Step 2. Combine the results.

Examples – Multiply Polynomials by Monomials

Algebra Cheat Sheet 38

Multiply a Polynomial by an Integer

Step 1. Multiply each term of the polynomial by the integer.

Step 2. Combine the results.

Example – Multiply a Polynomial by an Integer

$-2\ (2x^2 + 3x - 4)$

Step 1.	$-2\ (2x^2) = 4x^2$ $-2\ (3x) = -6x$ $-2\ (-4) = 8$
Step 2.	$4x^2 - 6x + 8$
Therefore:	$-2\ (2x^2 + 3x - 4) = 4x^2 - 6x + 8$

Algebra Cheat Sheet 38

Multiply a Polynomial by an Integer

Step 1. Multiply each term of the polynomial by the integer.

Step 2. Combine the results.

Examples – Multiply a Polynomial by an Integer

Algebra Cheat Sheet 39

Multiply a Polynomial by a Monomial

Step 1. Multiply each term of the polynomial by the monomial.

Step 2. Combine the results.

Example–Multiply Polynomials by Monomials

$-2x\ (2x^2 + 3x - 4)$

Step 1.	$\mathbf{-2x\ (2x^2) = -4x^3}$ $\mathbf{-2x\ (3x) = -6x^2}$ $\mathbf{-2x\ (-4) = 8x}$
Step 2.	$\mathbf{-4x^3 - 6x^2 + 8x}$
Therefore:	$\mathbf{-2x(2x^2 + 3x - 4) = -4x^3 - 6x^2 + 8x}$

Algebra Cheat Sheet 39

Multiply a Polynomial by a Monomial

Step 1. Multiply each term of the polynomial by the monomial.

Step 2. Combine the results.

Examples – Multiply Polynomials by Monomials

Algebra Cheat Sheet 40

Multiplying Two Binomials

- The product of 2 binomials has 4 terms. To find these 4 terms, multiply each term in the 1st binomial with each term in the 2nd binomial. This process is called the FOIL method.
- The formula is: **$(a + b)(c + d) = ac + ad + bc + bd$**

F = (ac) is the product of the ***FIRST*** terms

O = (ad) is the product of the ***OUTSIDE*** terms

I = (bc) is the product of the ***INSIDE*** terms

L = (bd) is the product of the **LAST** terms

Example – Multiplying Two Binomials

$(m + 3)(m + 4)$

Step 1. Multiply first terms:	**$(m)(m) = m^2$**
Step 2. Multiply outside terms:	**$(m)(4) = 4m$**
Step 3. Multiply inside terms:	**$(3)(m) = 3m$**
Step 4. Multiply last terms	**$(4)(3) = 12$**
Step 5. Combine like terms:	**$m^2 + 4m + 3m + 12$** **$m^2 + 7m + 12$**

Algebra Cheat Sheet 40

Multiplying Two Binomials

- The product of 2 binomials has 4 terms. To find these 4 terms, multiply each term in the 1st binomial with each term in the 2nd binomial. This process is called the FOIL method.
- The formula is: **(a + b) (c + d) = ac + ad + bc + bd**

F = (ac) is the product of the ***FIRST*** terms

O = (ad) is the product of the ***OUTSIDE*** terms

I = (bc) is the product of the ***INSIDE*** terms

L = (bd) is the product of the **LAST** terms

Examples – Multiplying Two Binomials