## Integer Rules

### Addition:
- If the signs are the same, add the numbers and keep the sign.
- If the signs are different, subtract the numbers and keep the sign of the number with the largest absolute value.

### Subtraction: Add the opposite
- Keep—Change—Change
  - Keep the first number the same.
  - Change the subtraction sign to addition.
  - Change the sign of the second number to its opposite sign.

### Multiplication and Division:
- If the signs are the same, the answer is positive.
- If the signs are different, the answer is negative.

## Golden Rule for Solving Equations:
Whatever You Do To One Side of the Equation, You Must Do to the Other Side!

## Distributive Property Examples

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(x+5)</td>
<td>3x + 15</td>
</tr>
<tr>
<td>-2(y – 5)</td>
<td>-2y + 10</td>
</tr>
<tr>
<td>5(2x – 6)</td>
<td>10x – 30</td>
</tr>
</tbody>
</table>

Multiply the 3 times x and 5.  
Multiply –2 times y and –5.  
Multiply 5 times 2x and –6.

## Solving Equations Study Guide

1. Does your equation have fractions?  
   Yes—Multiply every term (on both sides) by the denominator.  
   No—Go to Step 2.

2. Does your equation involve the distributive property?  
   (Do you see parenthesis?)  
   Yes—Rewrite the equation using the distributive property.  
   No—Go to Step 3.

3. On either side, do you have like terms?  
   Yes—Rewrite the equation with like terms together. Then combine like terms.  
   (Don’t forget to take the sign in front of each term!)  
   No—Go to Step 4.

4. Do you have variables on both sides of the equation?  
   Yes—Add or subtract the terms to get all the variables on one side and all the constants on the other side. Then go to step 6.  
   No—Go to Step 5.

5. At this point, you should have a basic two-step equation. If not go back and recheck your steps above.  
   - Use Addition or Subtraction to remove any constants from the variable side of the equation.  
     (Remember the Golden Rule!)

6. Use multiplication or division to remove any coefficients from the variable side of the equation.  
   (Remember the Golden Rule!)

7. Check your answer using substitution!

Congratulations! You are finished the problem!

## Combining Like Terms

Like terms are two or more terms that contain the same variable.

Example: 3x, 8x, 9x are like terms.  
        2y, 9y, 10y are like terms.  
        3x, 3y are NOT like terms because they do NOT have the same variable!
**Slope** = \frac{\text{rise}}{\text{run}}

- Calculate the slope by choosing two points on the line.
- Count the rise (how far up or down to get to the next point?) This is the numerator.
- Count the run (how far left or right to get to the next point?) This is the denominator.
- Write the slope as a fraction.

\[ \text{Slope} = \frac{3}{5} \]

**Graphing Using Slope Intercept Form**

1. Identify the slope and y-intercept in the equation.
   \( y = 3x - 2 \)
   - Slope \( m \) \( = 3 \)
   - Y-intercept \( b \) \( = -2 \)

2. Plot the y-intercept on the graph.

3. From the y-intercept, count the rise and run for the slope. Plot the second point.

4. Draw a line through your two points.

**Slope Intercept Form**

\[ y = mx + b \]

Slope \quad Y-intercept
Writing Equations—Quick Reference

**Slope Intercept Form**

\[ y = mx + b \]

Slope \hspace{1cm} Y-intercept

If you know the slope (or rate) and the y-intercept (or constant), then you can easily write an equation in slope intercept form.

Example: If you have a slope of 3 and y-intercept of -4, the equation can be written as:

\[ y = 3x - 4 \]

**Writing Equations Given Slope and a Point**

If you are given slope and a point, then you are given \( m, x, \) and \( y \) for the equation \( y = mx + b \).

You must have slope (\( m \)) and the y-intercept (\( b \)) in order to write an equation.

**Step 1**: Substitute \( m, x, \) and \( y \) into the equation and solve for \( b \).

**Step 2**: Use \( m \) and \( b \) to write your equation in slope intercept form.

**Example**: Write an equation for the line that passes through (1,6) and (3,-4).

\[
\begin{align*}
m &= \frac{y_2 - y_1}{x_2 - x_1} \\
&= \frac{-4 - 6}{3 - 1} \\
&= -5
\end{align*}
\]

\[
\begin{align*}
y &= mx + b \\
6 &= -5(1) + b \\
6 &= -5 + b \\
6 + 5 &= -5 + b \\
11 &= b
\end{align*}
\]

**Step 3**: \( y = -5x + 11 \)

**Standard Form**

\[ Ax + By = C \]

The trick with standard form is that \( A, B, \) and \( C \) must be integers AND \( A \) must be a positive integer!

**Examples**:

\[
\begin{align*}
-3x + 2y &= 9 \\
3x - 2y &= -9
\end{align*}
\]

Incorrect! -3 must be positive (multiply all terms by -1)

Correct! \( A, B, \) & \( C \) are integers and \( A \) is a positive integer.
Two linear equations form a system of equations. You can solve a system of equations using one of three methods:

1. Graphing
2. Substitution Method
3. Linear Combinations Method

**Graphing Systems of Equations**

\[
y = \frac{2}{3}x + 2
\]
\[
y = 2x - 6
\]

(6, 6) is the point of intersection and the solution.

The solution to this system of equations is (6, 6).

**Substitution Method**

Solve the following system of equations:

\[
\begin{align*}
x - 2y &= -10 \\
y &= 3x
\end{align*}
\]

Since we know \( y = 3x \), substitute 3x for y into the first equation.

\[
\begin{align*}
x - 2(3x) &= -10 \\
x - 6x &= -10
\end{align*}
\]

Simplify: Multiply 2(3x) = 6x.

\[
\begin{align*}
-5x &= -10 \\
-5x &= -10
\end{align*}
\]

Simplify: \( x - 6x = -5x \)

\[
\begin{align*}
-5x &= -10 \\
-5 &= -10
\end{align*}
\]

Solve for x by dividing both sides by -5.

\[
\begin{align*}
x &= 2 \\
y &= 3x
\end{align*}
\]

Since we know that \( x = 2 \), we can substitute 2 for x into \( y = 3x \).

Solution: \((2, 6)\)

The solution!

**Linear Combinations (Addition Method)**

Solve the following system of equations:

\[
\begin{align*}
3x + 2y &= 10 \\
2x + 5y &= 3
\end{align*}
\]

Create opposite terms. I’m creating opposite x terms.

\[
\begin{align*}
-2(3x + 2y &= 10) \\
3(2x + 5y &= 3)
\end{align*}
\]

Multiply to create opposite terms. Then add the like terms.

\[
\begin{align*}
-6x - 4y &= -20 \\
6x + 15y &= 9
\end{align*}
\]

Solve for y by dividing both sides by 11.

\[
\begin{align*}
11y &= -11 \\
y &= -1
\end{align*}
\]

The y coordinate is -1

\[
\begin{align*}
2x + 5y &= 3 \\
2x + 5(-1) &= 3
\end{align*}
\]

Substitute -1 for y into one of the equations.

\[
\begin{align*}
2x - 5 &= 3 \\
2x &= 8
\end{align*}
\]

Solve for x!

\[
\begin{align*}
2 &= 2
\end{align*}
\]

The solution \((4, -1)\)
Inequalities — Quick Reference

Inequality Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>Less Than</td>
</tr>
<tr>
<td>≤</td>
<td>Less Than OR Equal To</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater Than</td>
</tr>
<tr>
<td>≥</td>
<td>Greater Than or Equal To</td>
</tr>
</tbody>
</table>

Graphing Inequalities in One Variable

Graphing Symbols

- **Greater Than** (The open circle indicates that this is NOT Equal to the numeral graphed.)
- **Greater Than or Equal To** (The closed circle indicates that this is Equal to the numeral graphed.)
- **Less Than** (The open circle indicates that this is NOT Equal to the numeral graphed.)
- **Less Than or Equal To** (The closed circle indicates that this is Equal to the numeral graphed.)

1. Graph \( y = -\frac{1}{2}x + 1 \), but dot the line since the symbol is >. The points on the line are not solutions.
2. Pick a point such as (0,0) and substitute it into the inequality. (0,0) is not a solution, therefore, shade the side of the line that does not contain (0,0).

Special Rule - Just for Inequalities

Whenever you multiply or divide by a negative number, you MUST reverse the sign.

**Example**

\[-3x < 9\]

Divide by a negative 3

\[-3x < \frac{9}{-3} \]

Reverse the sign

\[x > -3\]

Graphing Inequalities in Two Variables

Graph for: \( y > -\frac{1}{2}x + 1 \)

1. Graph \( y = -\frac{1}{2}x + 1 \), but dot the line since the symbol is >. The points on the line are not solutions.
2. Pick a point such as (0,0) and substitute it into the inequality. (0,0) is not a solution, therefore, shade the side of the line that does not contain (0,0).

Systems of Inequalities

Graph each inequality as shown above. ONLY the area that is shaded by BOTH inequalities is the solution set (orange section).

Solutions to the system of inequalities (orange area)

\[y \geq \frac{3}{2}x - 1\]

\[y \geq -1\]
Function Notation can be written as:

- \( f(x) = 3x+2 \)  
  this translates to: “f of x” equals 3x+2”
- \( g(x) = 3x-1 \)  
  this translates to: “g of x equals 3x – 1”

### Identifying Functions using the Vertical Line Test

If a graph represents a function, that graph will only intersect with a vertical line one time.

When vertical lines are drawn through this graph, each vertical line touches the graph only one time.

**This graph represents a function.**

When vertical lines are drawn through this graph, each vertical line touches the graph more than once.

**This graph does not represent a function.**

### Evaluating Functions

<table>
<thead>
<tr>
<th><strong>f(x)</strong></th>
<th><strong>f(6)</strong></th>
<th><strong>Original Problem</strong></th>
</tr>
</thead>
</table>
| \( f(x) = 6x - 1 \) | \( f(5) = 29 \) | **Notice how 5 replaces the x in the function notation.**  
**Substitute 5 for x in the original function.**  
**This answer means that if you substitute 5 for x, into this function, you will get an answer of 29! You “used” to write: \( y = 29 \). Now, in place of \( y \), you will use \( f(5) \).** |

**Vertex Formula**

Given the function: \( f(x) = ax^2 + bx + c \)

**Vertex Formula:** \( \frac{-b}{2a} \)  
(The opposite of b divided by 2 times a)
Exponents and Monomials – Quick Reference

**Multiplying Powers with the Same Base**

Property: When multiplying powers with the same base, add the exponents.

\[ y^3 \cdot y^4 = y^7 \]

Since the bases are the same (y), you can add the exponents: 3 + 4 = 7.

**Power of a Power Property**

Property: To find the power of a power, multiply the exponents.

\[ (a^3)^5 = a^{15} \]

Multiply the exponents.

**Power of a Product Property**

Property: To find the power of a product, find the power of each factor and multiply.

Think of it as distributing the exponent to each factor!

\[
(2xy)^3 = 2^3 \cdot x^3 \cdot y^3 = 8 \cdot x^3 \cdot y^3
\]

\[
8 \cdot x^3 \cdot y^3 \text{ cannot be combined because the bases are not the same.}
\]

**Power of a Quotient Property**

Property: To find the power of a quotient, raise the numerator to the power, and the denominator to the power. Then divide.

\[
\left(\frac{2}{3}\right)^2 = \frac{2^2}{3^2} = \frac{4}{9}
\]

**Laws of Exponents**

**Power of a Product Property**

For example:

\[
3x^2 \cdot 3x^2 = (3 \cdot 3) \cdot (x^2 \cdot x^2) = 9x^4
\]

**Power of Quotient Property**

For example:

\[
\frac{9x^2}{3x^2} = \frac{9}{3} \cdot \frac{x^2}{x^2} = \frac{3}{1} \cdot 1 = 3
\]

**Zero Exponents**

Any number (except 0) to the zero power is equal to 1.

\[ 4^0 = 1 \quad 10^0 = 1 \quad 22^0 = 1 \quad y^0 = 1 \]

**The Rule for Negative Exponents**

The expression \(a^{-n}\) is the reciprocal of \(a^n\).

\[ 3x^{-2} = \frac{3}{x^2} \]

**Multiplying Monomials Example**

\[
(3x^2y^3)^2 \cdot (-3xy^4)
\]

**Simplifying Monomials Example**

\[
\frac{2x^2y^3}{3x} \cdot \frac{9x^2y^4}{3x} = \frac{18x^4y^7}{3x^2y^3} = \frac{6x^2y^4}{1x^2y^1} \]

**Scientific Notation**

A number in scientific notation is written as a product of a decimal and a power of 10.

\[ 1.5876 \times 10^5 \]

As many numbers as necessary after the decimal.
## Polynomials — Quick Reference

### What is a Polynomial?
Polynomials can be classified according to the number of terms. Let's take a look!

<table>
<thead>
<tr>
<th>Term Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monomial</td>
<td>$2x$</td>
</tr>
<tr>
<td>Binomial</td>
<td>$2x + 3y$</td>
</tr>
<tr>
<td>Trinomial</td>
<td>$2x^2 + 3x + 5$</td>
</tr>
<tr>
<td>Polynomial</td>
<td>$3x^2 + 2x^2 - 6x + 2$</td>
</tr>
</tbody>
</table>

### What is the Degree of a Polynomial?
Let's take a look at one more definition! The **degree** of a polynomial with one variable is the highest power to which the variable is raised. Take a look!

<table>
<thead>
<tr>
<th>Degree of Polynomials</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st degree (linear)</td>
<td>$2x$</td>
</tr>
<tr>
<td>2nd degree (quadratic)</td>
<td>$2x^2 - 9$</td>
</tr>
<tr>
<td>5th degree (pentagonal)</td>
<td>$-8x^5$</td>
</tr>
</tbody>
</table>

### Adding Polynomials
You must remember that you can only add terms that are **like terms**.

\[
(3a^4 + 2a^3 - 2a^2 + a + 6) + (4a^4 - a^3 + 5a^2 - 2a - 4)
\]

\[
3a^4 + 4a^4 + 2a^3 - a^3 - 2a^2 + 5a^2 - a - 2a + 5 - 4
\]

Rewrite with like terms together.

\[
7a^4 + a^3 + 3a^2 - a + 1
\]

Combine like terms.

**Solution:**

\[
7a^4 + a^3 + 3a^2 - a + 1
\]

### Subtracting Polynomials
You must remember to use Keep Change Change.

If you have a subtraction sign preceding a set of parenthesis, then you must rewrite the problem as an addition problem. We are going to **ADD the OPPOSITE**

\[
(2x - 6) - (3x^2 + 2x - 6)
\]

Rewritten as:

\[
(2x - 6) + (-3x^2 - 2x + 6)
\]

Keep the same. Change to addition Change the sign of every term

\[
(2x - 6) + -3x^2 - 2x + 6
\]

**You must change the sign of every term (do its' opposite sign) inside the set of parenthesis that follows the subtraction sign.**

### Multiplying Polynomials
We must use our laws of exponents in order to multiply polynomials.

\[
2a^2b^2(a^3 + 3ab - b^4)
\]

Original Problem

\[
2a^2b^2(a^3) + 2a^2b^2(3ab) + 2a^2b^2(-b^4)
\]

Distribute $2a^2b^2$ throughout the parenthesis.

\[
2a^2b^2 + 6a^2b^3 - 2a^2b^6
\]

Multiply the coefficients and add the exponents of like bases for each term.

**Solution:**

\[
2a^2b^2 + 6a^2b^3 - 2a^2b^6
\]

### Using FOIL

\[
(3x - 4)(2x + 1)
\]

Original Problem

\[
(3x)(2x) = 6x^2
\]

Multiply the **First** terms:

\[
6x^2
\]

\[
(3x)(1) = 3x
\]

Multiply the **Outside** terms:

\[
6x^2 + 3x
\]

\[
(3x)(-4) = -12x
\]

Multiply the **Inside** terms:

\[
6x^2 - 12x
\]

\[
(3x)(1) = 3x
\]

Multiply the **Last** terms:

\[
-4x
\]

\[
6x^2 + 3x - 12x
\]

Combine like terms:

\[
6x^2 - 8x - 4
\]

**Notice how this step is the same as the 4th step of Exam 1.**

**Solution:**

\[
6x^2 - 8x - 4
\]
# Factoring — Quick Reference

## Finding the GCF

<table>
<thead>
<tr>
<th>Finding the GCF</th>
<th>Factoring by Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1:</strong> Look at the coefficients</td>
<td><strong>Step 1:</strong> Separate the polynomial into 2 or more groups according to common factors. Identify the common factor for each group (In this problem I need to rewrite the problem with common factors side by side.)</td>
</tr>
<tr>
<td><strong>Ask yourself:</strong> Is there a number that I can divide 30, 5, and 25 by evenly? Yes! 5! (30/5 = 6) (5/5 = 1) (-25/5 = -5)</td>
<td><strong>x^2y^3 + 2x^2 + 4xy^3 + 8x^2</strong></td>
</tr>
<tr>
<td><strong>Step 2:</strong> Look at the variable(s).</td>
<td><strong>2x^2 is a common factor</strong></td>
</tr>
<tr>
<td><strong>Ask yourself:</strong> Can I factor out a variable from EVERY term? Yes! Each term has at least one x, therefore, I can factor out x.</td>
<td><strong>x^2y^3 is a common factor</strong></td>
</tr>
<tr>
<td><strong>Step 3:</strong> Identify the GCF:</td>
<td><strong>Step 2:</strong> Divide each term by the common factor.</td>
</tr>
<tr>
<td>The GCF for this polynomial is: 5x. (You can divide every term by 5x evenly (without creating a fraction).)</td>
<td><strong>x^2 + 2x + 4x + 8</strong></td>
</tr>
</tbody>
</table>

## Factoring Using the GCF

<table>
<thead>
<tr>
<th>Factoring Using the GCF</th>
<th>Factoring by Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor the greatest common factor from:</strong></td>
<td><strong>Step 3:</strong> Write appropriately in factored form.</td>
</tr>
<tr>
<td>3x^4y^2 + 12x^3y − 18x^2y^2</td>
<td><strong>x^2(x+4) + 2x(x+4)</strong></td>
</tr>
<tr>
<td><strong>Solution:</strong></td>
<td><strong>Result after dividing</strong></td>
</tr>
<tr>
<td><strong>Step 1:</strong> Look at the coefficients.</td>
<td><strong>Common Factor</strong></td>
</tr>
<tr>
<td>What is the GCF for 3, 12, 18?</td>
<td><strong>Result after dividing</strong></td>
</tr>
<tr>
<td>3x^4y^2 + 12x^3y − 18x^2y^2</td>
<td><strong>x^2y^3(x+4) + 2x^2(x+4)</strong></td>
</tr>
<tr>
<td>(What is the greatest number that can be divided into all evenly?)</td>
<td><strong>Step 4:</strong> Now these two terms have a common factor. The common factor is (x+4). We can factor (x+4) and we are left with:</td>
</tr>
<tr>
<td>3 is the GCF (for the coefficients).</td>
<td>(x+4)(x^2y^3 + 2x^2) <strong>This is the final answer in factored form.</strong></td>
</tr>
<tr>
<td><strong>Step 2:</strong> Look at the variable.</td>
<td><strong>Step 2:</strong> Divide each term by the common factor.</td>
</tr>
<tr>
<td>Can I factor out a variable for EVERY term?</td>
<td><strong>x^2 + 2x + 4x + 8</strong></td>
</tr>
<tr>
<td>Yes! Each term contains at least one x^2 and y.(x^2y)</td>
<td><strong>Step 3:</strong> Write appropriately in factored form.</td>
</tr>
<tr>
<td>3x^4y^2 + 12x^3y − 18x^2y^2</td>
<td><strong>Common Factor</strong></td>
</tr>
<tr>
<td>(Most students do this mentally, but I am going to write it out to show you the process.)</td>
<td><strong>Result after dividing</strong></td>
</tr>
<tr>
<td><strong>Step 3:</strong> Identify the GCF.</td>
<td><strong>x^2(x+4) + 2x(x+4)</strong></td>
</tr>
<tr>
<td>The GCF is 3x^2y. Now we are going to divide EVERY term by 3x^2y. (Most students do this mentally, but I am going to write it out to show you the process.)</td>
<td><strong>Result after dividing</strong></td>
</tr>
<tr>
<td>3x^4y^2 + 12x^3y − 18x^2y^2</td>
<td><strong>x^2(x+4) + 2x(x+4)</strong></td>
</tr>
<tr>
<td>3x^{4y} 3x^3y 3xy^2</td>
<td><strong>Result after dividing</strong></td>
</tr>
<tr>
<td>x^2y^2 + 4x − 6y (the result after dividing)</td>
<td><strong>x^2(x+4) + 2x(x+4)</strong></td>
</tr>
<tr>
<td><strong>Step 4:</strong> Write appropriately in factored form.</td>
<td><strong>Common Factor</strong></td>
</tr>
<tr>
<td>3x^{2y}(x^2y^2 + 4x − 6y)</td>
<td><strong>Result after dividing</strong></td>
</tr>
</tbody>
</table>

## Factoring Trinomials

<table>
<thead>
<tr>
<th>Factoring Trinomials</th>
<th>Factoring by Grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor:</strong> x^2 - 10x + 21</td>
<td><strong>Step 1:</strong> We are going to form two binomials, so write two sets of parenthesis.</td>
</tr>
<tr>
<td><strong>Step 1:</strong> We are going to form two binomials, so write two sets of parenthesis.</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Step 2:</strong> What can we multiply together to get x^2? (The first term of each binomial is multiplied together to get the first term of the trinomial: (x • x = x^2))</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Step 3:</strong> We need to find two numbers that we can add together to get -10 AND multiply together to get 21. (You must remember to take the sign in front of the term with it, therefore, the middle term is -10).</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Step 4:</strong> Complete the binomials.</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Two numbers that we add to get -10 &amp; multiply to get 21.</strong></td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>In order to add two numbers together and get a negative number and then multiply the same two numbers and get a positive number, both numbers must be negative.</strong>*</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Factors of 21</strong></td>
<td><strong>Sum of Factors</strong></td>
</tr>
<tr>
<td>-1 -21 = 21</td>
<td>-1 +(-21) = -22</td>
</tr>
<tr>
<td>-3 -7 = 21</td>
<td>-3 +(-7) = -10</td>
</tr>
<tr>
<td>(There are other factors, but I will stop here since I found the one I am looking for)</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Our last terms need to be -3 and -7 since when multiplied together they equal 21 and when added together the sum is -10.</strong></td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
<tr>
<td><strong>Step 4:</strong> Complete the binomials.</td>
<td><strong>(x−3) (x−7)</strong></td>
</tr>
</tbody>
</table>
## Quadratic Equations – Quick Reference

### What is a Quadratic Equation?

$$ax^2 + bx + c$$

- **coefficients**
- **constant**

$$ax^2 + bx + c = 0$$

- **coefficients**
- **constant**

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

- **a** and **b** are coefficients and **c** is a constant. The one factor that identifies these expressions as quadratic is the exponent 2. The first term must always be $$ax^2$$, and **a** cannot be 0.

### Solving Simple Quadratic Equations

- **Our goal is to get x by itself on the left-hand side of the equation.** We must get rid of the -4 (first) then the exponent 2.
- **Add 4 to both sides of the equation.**
- **Simplify:**
- **Take the square root of both sides.** (Remember to use the ± sign.)
- **There are 2 solutions.** **X** is equal to positive 9 and negative 9.

### Solving Equations by Factoring

- **Solve:**
  $$x^2 - 7x + 2 = -10$$
  - **Our equation is not equal to 0.** Before we can factor, we must set our equation equal to 0:
  $$x^2 - 7x + 12 = 0$$
  - **Now our equation is equal to 0. I can factor:**
  $$x - 4 = 0$$ or $$x - 3 = 0$$
  - **Set both factors equal to 0.** (The zero-factor property)
  - **Check:**
  - **Substitute the two solutions into the original equation.**
  - **4 works!** When I substituted I got an answer of -10.

### The Quadratic Formula

Given any quadratic equation:

$$ax^2 + bx + c = 0$$

We can substitute the values for **a**, **b**, & **c** into the following formula and solve:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### The Pythagorean Theorem

In any right triangle, the sum of the squares of the legs (2 shorter sides) is equal to the square of the hypotenuse (the longest side).

$$a^2 + b^2 = c^2$$

Please Note: This theorem ONLY works for Right Triangles.

### For any quadratic equation in the form:

$$y = ax^2 + bx + c$$

The graph will result in a parabola.

- **This parabola opens up and can be classified as concave up.**
  - All parabolas that open up will have a positive “a” value.
  - The vertex is the lowest point or the minimum point.

- **This parabola opens down and can be classified as concave down.**
  - All parabolas that open down will have a negative “a” value.
  - The vertex is the highest point or the maximum point.