Algebra II

Chapter 2.1 Relations and Functions

Objectives:
• Analyze and graph relations.
• Find functional values.

We are familiar with a number line. A number line enables us to locate points, denoted by numbers, and find distances between these points.

The distance between the points 10 and (-5) is equal to $10 - (-5) = 15$.
There are 15 units between 10 and -5.

The Coordinate Plane or coordinate system is two number lines that lie perpendicular to each other. This plane system is known as the Cartesian coordinate plane, named after the mathematician and philosopher, Rene Descartes. The two number lines are known as the $x$-axis (horizontal) and the $y$-axis (vertical).

When the two number lines are place on a plane, a gridded map is formed. Underwater archaeologists use a grid system when investigating a ship wreck. On land, a third number line, the $z$-axis, can be used to give a three dimensional map.
Algebra II

Chapter 2.1 Relations and Functions

Objectives:
• Analyze and graph relations.
• Find functional values.

Each intersection of the number lines creates a location point. These intersections are designated by the coordinates of each number line.

The coordinates of a point of intersection is denoted by the number on the number line in order of, x-coordinate, y-coordinate, z-coordinate. We will not be using the z-axis at this time.

Much like a city map being broken into north, south, east, and west quadrants, the coordinate plane can be broken into quadrants.

The quadrants of the coordinate plane move in a counter clockwise direction, I, II, III, and IV starting from the upper right. Notice the positive and negative values of each quadrant.
An ordered pair is given as (x-coordinate, y-coordinate). For example, a point Q, can be designated as (6, 7). Every point on the plane is denoted by an ordered pair of coordinates.

A relation is a set of ordered pairs, where the set of x-coordinates is known as the domain and the set of y-coordinates is known as the range. A relation can be represented as a set of ordered pairs, a table, a graph, or by mapping.
A function is a relation in which each element of the domain is paired with exactly one element of the range. An easier definition is, for each $x$-value, there is only one $y$-value.

A one-to-one function is where one element of the range is paired with only one element of the domain.

A tool used to test for functionality is the vertical line test. The vertical line test states that if a vertical line intersects the graph in only one place, then the graph is a function.

Equations that are functions can be written in the form called functional notation.

Given the equation $y = 2x + 5$, the functional notation can be written as $f(x) = 2x + 5$.

To find the value of the range that corresponds to the domain element -2, then it is written as $f(-2)$, and read as “$f$ of -2”. The value is found by substituting -2 for all x’s in the equation. The ‘f’ is the name of the function and is not a variable. Other letters may also be used, e.g. $g(x)=2x - 3$.

When an equation represents a function, the variable representing the domain, is called the independent variable. The other variable is called the dependent variable.

Bookwork: page 60; problems 17-53.
Chapter 2.2 thru 2.4 Linear Equations

Objectives:
- Identify linear functions.
- Write and graph linear functions.

A linear equation has no operations other than addition, subtraction, and multiplication. The variables may not be multiplied together or appear in a denominator. A linear equation does not have exponents other than 1.

How many of you have heard the expression, “the shortest distance between two points is a straight line”?

To graph a line, we must have two points. Knowing two points on the line, allows us to calculate the slope of the line.

Do we remember how to calculate slope?

We can calculate the slope as \( \frac{\text{rise}}{\text{run}} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{\Delta y}{\Delta x} \). It does not matter which point we call 1 or call 2, as long as the coordinates are kept in the correct order AND rise is over run, not run over rise.

Slope is also referred to as the rate of change. \( \frac{\Delta y}{\Delta x} = \frac{\text{miles}}{\text{hour}} \). Change of one variable vs. a second variable.
We need to introduce a new variable for slope, $m$. Rather than writing \( \frac{\text{rise}}{\text{run}} \) or \( \frac{y_1 - y_2}{x_1 - x_2} \) or \( \frac{y_2 - y_1}{x_2 - x_1} \) or \( \frac{\Delta y}{\Delta x} \), we can shorten this by writing $m$ for slope.

What do we recall about the sign and value of slope?

- **Positive Slope** where $m > 0$
- **Negative Slope** where $m < 0$
- **No Slope** where $m = 0$
- **Undefined Slope** where $m$ is undefined

Notice how the x-coordinates and the y-coordinates change for each slope.
By definition then, slope = \( m = \frac{y_2 - y_1}{x_2 - x_1} \)

If we multiply both sides by \((x_2 - x_1)\), then \( m(x_2 - x_1) = (y_2 - y_1) \),

This linear equation form, \( m(x_2 - x_1) = (y_2 - y_1) \), is known as **Point-Slope Form**.

If we substitute one point from the line into the \( x_1 \) and \( y_1 \) positions, we have a linear equation for the line.

Write the point-slope form equation for a line that passes through the point \((-1, 5)\) with slope of -3.

\[
-3(x + 1) = y - 5
\]

Please resist the temptation to distribute the -3 to \((x + 1)\). If you do this, the equation is not point-slope form but another form we have not discussed.

Worksheet: Point-Slope Form
What is the y-intercept? It is the point where \( x = 0 \) and \( y = \) the coordinate where the line intersects the y-axis.

Starting with the point-slope form

\[
(y_2 - y) = m(x_2 - x)
\]

Then substituting the y-intercept \((0, b)\) for the point \((x, y)\);

\[
y - b = m(x - 0)
\]

Distributing the slope;

\[
y - b = mx
\]

Adding \( b \) to both sides;

\[
y = mx + b
\]

This is the **slope-intercept** form, \( y = mx + b \); where \( m \) = slope and \( b \) = y-intercept or y-coordinate.
Given points (-4, 4) and (2, 1), then slope = \( m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{2 - (-4)} = -\frac{1}{2} \)

Point-slope form shows us: \((y_2 - y) = m (x_2 - x_1)\)

\((y_2 - 4) = -\frac{1}{2} (x_2 - (-4))\)

\(y - 4 = -\frac{1}{2} x - 2\)

\(y = -\frac{1}{2} x + 2\)

This form of a line shows us the slope and the y-intercept. Graph the points.
Given points (-4, 4) and (2, 1), then slope = \( m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{2 - (-4)} = -\frac{1}{2} \)

Point-slope form shows us:

\[
(y_2 - y) = m (x_2 - x_1)
\]

\[
(y_2 - 1) = -\frac{1}{2} (x_2 - 2)
\]

\[
y - 1 = -\frac{1}{2}x + 1
\]

\[
y = -\frac{1}{2}x + 2
\]

Yes, any point on the line will yield the same equation.

Worksheet: Slope-Intercept Form and graph the solutions.
Given points (-4, 4) and (2, 1), then slope = \[ m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{2 - (-4)} = -\frac{1}{2} \]

Point-slope form shows us: \[ (y_2 - y) = m (x_2 - x_1) \]
\[ (y_2 - 1) = -\frac{1}{2} (x_2 - 2) \]
\[ y - 1 = -\frac{1}{2} x + 1 \]
Multiply every term by 2
\[ 2y - 2 = -1x + 2 \]
Add 1x to both sides.
\[ 1x + 2y - 2 = 2 \]
Add 2 to both sides.
\[ 1x + 2y = 4 \]
This looks like \( Ax + By = C \)

\( Ax + By = C \), is the **standard form** of a line; where A, B, and C are integers with a greatest common factor of 1; A and B not both equal to zero; and \( A > 0 \).
Given the equation $Ax + By = C$; if $x = 0$ and we solve for $y$, what point have we found?

The y-intercept

Given the equation $Ax + By = C$; if $y = 0$ and we solve for $x$, what point have we found?

The x-intercept

This is why I like to call this form the Intercept Form. We can find two points very easily using the intercept form and graph the line quickly using these intercepts.

Is the equation $4x - 8y = 12$, in standard form? No, $A$, $B$, and $C$ have a common factor of 4.

The best use of lines in standard form is solving linear equalities and linear inequalities. We will tackle these in the next chapter.

Bookwork: page 66, problems 27-50
Objectives:
• Identify linear functions.
• Write and graph linear functions.

On page 80, exercise problems 55 and 56, the book introduces a second form of the intercept form of a line.

Standard Form: \( Ax + By = C \)

If we divide both sides by \( C \): \( \frac{A}{C} x + \frac{B}{C} y = 1 \)

If we rewrite this as: \( \frac{x}{\frac{A}{C}} + \frac{y}{\frac{B}{C}} = 1 \)

If we rename \( \frac{C}{A} \) as \( a \) and \( \frac{C}{B} \) as \( b \); then \( \frac{x}{a} + \frac{y}{b} = 1 \) is intercept form where \( a \) is the \( x \)-intercept and \( b \) is the \( y \)-intercept.

Let us prove this is true.
Given the equation $3x + 4y = 12$:

By letting $x = 0$, the $y$-intercept is 3. By letting $y = 0$, the $x$-intercept is 4.

If $3x + 4y = 12$, then dividing both sides by 12 yields:

$$\frac{3}{12}x + \frac{4}{12}y = 1,$$

by moving each coefficient into the denominator:

$$\frac{x}{12} + \frac{y}{12} = 1 \quad \text{or} \quad \frac{x}{4} + \frac{y}{3} = 1$$

So it does give the correct information; however, I do not like this equation because $a$ and $b$ could be fraction. Do we like working with fractions?

I show you this equation to give you additional information and become familiar with all possible equations for a line.
What does parallel mean to you?

Two lines are parallel if the lines do not intersect. What are the slopes of two parallel lines?

**Definition:** Two non-vertical lines are parallel if they have the same slope.

What does perpendicular mean to you?

Two lines are perpendicular if the lines intersect at 90 degrees. What are the slopes of two perpendicular lines?

**Definition:** Two lines are perpendicular if their slopes are negative reciprocals of each other and their product is equal to (-1). This does not mean perpendicular lines have negative slopes, it means they have opposite signs.

**Note:** it is accepted that all vertical lines are considered parallel to each other. Obviously then, all horizontal lines are parallel to each other. All vertical lines are perpendicular to horizontal lines.
Given the slope of one line and a point of a second line, linear equations can be written to express a parallel or a perpendicular line.

Write an equation of a line that is parallel to the graph \( y = -4x + 8 \) and passes through the point \((1, 3)\).

**Method One**

\[
\begin{align*}
y - y_1 &= m(x - x_1) \\
y - 3 &= -4(x - 1) \\
y - 3 &= -4x + 4 \\
y - 3 + 3 &= -4x + 4 + 3 \\
y &= -4x + 7
\end{align*}
\]

**Method Two**

\[
\begin{align*}
y &= mx + b \\
3 &= -4 \cdot 1 + b \\
3 &= -4 + b \\
3 + 4 &= -4 + 4 + b \\
7 &= b ; y = -4x + 7
\end{align*}
\]

Looking at the y-intercepts for both of these lines, which line is above the other?

\[ b = 8 \]
Algebra II

Chapter 2.2 thru 2.4 Linear Equations

Objectives:
• Identify linear functions.
• Write and graph linear functions.

Write an equation of a line that is perpendicular to the graph \( y = -4x + 8 \) and passes through the point \((1, 3)\).

Method One
\[
\begin{align*}
y - y_1 &= m(x - x_1) \\
y - 3 &= \frac{1}{4}(x - 1) \\
y - 3 &= \frac{1}{4}x - \frac{1}{4} \\
y - 3 + 3 &= \frac{1}{4}x - \frac{1}{4} + 3 \\
1 &= \frac{1}{4}x + \frac{11}{4}
\end{align*}
\]

Worksheet: Parallel and Perpendicular worksheet.

Method Two
\[
\begin{align*}
y &= mx + b \\
3 &= \frac{1}{4} \cdot 1 + b \\
3 &= \frac{1}{4} + b \\
3 - \frac{1}{4} &= \frac{1}{4} - \frac{1}{4} + b \\
\frac{11}{4} &= b; y = \frac{1}{4}x + \frac{11}{4}
\end{align*}
\]
Objectives:
- Use lines to describe real-world situations

In science we learn that to convert degrees Celsius to Fahrenheit, the following formula can be used:

\[ F = \frac{9}{5} C + 32 \]

Notice this formula looks very much like \( y = mx + b \).

This equation can be graphed. Lets graph this equation on the calculator.

Notice, what is the y-intercept? It is the freezing point of water in Fahrenheit.

The boiling point of water in Celsius is 100 Degrees. What is it in Fahrenheit?
Linear Equations

Chapter 2.5 Lines used in the Real World

Objectives:
- Use lines to describe real-world situations

We now have two points of a line, (0, 32) and (100, 212).

**Interpolation** is the process of obtaining values within known parameters.

Between the known parameters, (0, 32) and (100, 212), if the room temperature is considered 25 degrees Celsius, what is room temperature in Fahrenheit?

Using the calculator, we can interpolate the temperature to be 77 degrees F.

**Extrapolation** is the process of estimating values outside the known parameters.

The air we breathe is composed of 78% Nitrogen and 21% Oxygen. What are the boiling points of nitrogen and oxygen in Fahrenheit if the Celsius boiling points are -196 degrees Celsius and -183 degrees Celsius, respectively.

Again, we can use the calculator or extend the graph of the line and determine they are -321 F and -297 F.

Why do you think extrapolation is estimating while interpolation is not?
A set of points in the real-world may not always lie on a perfect line.

By graphing a set of points from a table, given x-coordinates and y-coordinates, we can determine if there is a linear correlation. This data is called bivariate.

**Scatter Plots**
Objectives:
• Define and use a scatter plot
• Write equations that describe scatter plots

If we determine a linear correlation of a scatter plot, we can draw a line through the points. This is called a \textit{line of fit}. The equation written is also called a \textit{prediction equation}.

Given the same set of data, do you think that I would draw the same line as you?

No, you might choose a different set of points to draw the line than I might choose.

The idea is to draw a line that best represents the data. This may mean, draw a line through the middle of the data or draw a line that intersects the most points.

Is your line drawn better, or more correct, than my line drawn?

Bookwork: page 84; problems 6-20

Please understand, these problems are just a few examples of what might be seen in the real world.
Objectives:
• Define and use a median-fit line.

What is a median? Yes, the median is the middle value of a group of data points.

A median-fit line uses median values to find points of interest to write an equation.

Let's look at page 86, problems 25-30
Linear Equations

Chapter 2.5 Linear Regression

Objectives:
- Define and use linear regression.

When we are given a table of data and plot the data in a scatter plot, we must use inductive reasoning to determine if the data has linear tendencies.

How do we know how well the data fits a linear pattern?

Three Regression Models can be used to represent a data set; Linear Regression, Quadratic Regression, and Exponential Regression.

Linear Regression can give us a very good idea if the data fits a line or not.

There are many models that can be used for linear regression. I will give an explanation of the Least Squares Fit regression model.

Linear Regression minimizes the sum of squared vertical distances between the observed responses in the dataset and the responses predicted by the linear approximation.

Alright, how many of you are going to do this method on your own?

Fortunately, your calculator will do this for you. Let's look at an example.
Objectives:

- Define and use linear regression.

The owners of an ice cream stand record the number of ice cream cones sold and the outside temperature for several days.

<table>
<thead>
<tr>
<th>Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. (°F)</td>
<td>78</td>
<td>82</td>
<td>84</td>
<td>86</td>
<td>80</td>
<td>75</td>
<td>72</td>
<td>77</td>
<td>90</td>
</tr>
<tr>
<td>Cones Sold</td>
<td>131</td>
<td>133</td>
<td>152</td>
<td>150</td>
<td>149</td>
<td>137</td>
<td>122</td>
<td>144</td>
<td>158</td>
</tr>
</tbody>
</table>

Get your calculators, go to STAT EDIT and clear your L1 and L2 columns.

Enter the L1 values from the temperature. This represents the x-values.

Enter the L2 values from the cones sold. This represents the y-values.

Go to STAT CALC LinReg(ax+b). This is linear regression in the form of \( y = mx + b \).

Xlist should be L1. Ylist should be L2. Arrow down to Store Reg and key in VARS, Y- Vars, 1, then Y1. Enter Calculate.
Chapter 2.5 Linear Regression

Objectives:
• Define and use linear regression.

“a” represents the slope of the line. “b” represents the y-intercept.

What does the “r” and “r^2” represent?

“r” is known as the correlation coefficient. The correlation coefficient is a number from −1 to 1. The closer the number is to −1 or 1, the better the data fits a line. A positive number represents a positive correlation, or positive slope, while a negative number represents a negative correlation, or negative slope. The closer a number is to zero the more the data does not represent a line.

“r^2” is used for parabolas which we will discuss later in the year. What this information tells you is whether the data fits a line or parabola more closely.

Addendum – Real World Linear Equations

Objectives:
• Show that the slope is a rate of change
• Show the y-intercept determines where a set of data starts

If the slope of a line is defined as \( \frac{\Delta y}{\Delta x} \), is this change constant over the entire line?

Is the x or y variable the independent variable? Then the y must be the dependent variable.

Rate of change, then, means that the dependent variable must change as the independent variable changes.

This change in the dependent variable is constant throughout the entire line.

Let's look at some examples.
Addendum – Real World Linear Equations

Objectives:
• Show that the slope is a rate of change
• Show the y-intercept determines where a set of data starts

If Mr. Carson travels thirty-five miles in thirty minutes and three-hundred fifty miles in five hours, what is Mr. Carson’s rate of speed in miles per hour?

Is speed a rate of change?  Yes, per a unit of time, our distance has changed.

What is the independent variable?  Time  This is our x-variable
What units do we want time in?  Hours
Do we need to make any conversions?  Yes, thirty minutes to hours
What is the dependent variable?  Distance traveled  This is our y-variable
What units do we want distance in?  Miles
Do we need to make any conversions?  No, not for distance. If feet or yards were used, then we would need to convert.

How fast is Mr. Carson travelling?  70 miles per hour.  Verify using the calculator.
Linear Equations
Addendum – Real World Linear Equations

Objectives:
• Show that the slope is a rate of change
• Show the y-intercept determines where a set of data starts

A swimming pool has 648,000 gallons of water in it when it is full. Due to winter quickly approaching, the pool needs to be drained. Two-hundred hours later, the pool has 248,000 gallons of water in it.

What is the slope of the line created? \(-2000\)
What does this slope represent? The rate at which the pool is draining.
Does the negative slope make sense? The negative slope shows the volume is decreasing.

How much water is in the pool after 300 hours? 48000 gallons
How much water is in the pool after 400 hours? Zero gallons

Write an equation for this real world problem as \(y = mx + b\)
What is the slope? \(-2000\) What is the y-intercept? 648,000
Therefore; \(y = -2000x + 648,000\)
Linear Equations

Addendum – Real World Linear Equations

Objectives:
• Show that the slope is a rate of change
• Show the y-intercept determines where a set of data starts

Use Math in Focus, page 175, to show question and graph.

Work the questions in class.

Worksheet Hand-out
Objectives:
• Identify and graph step, constant, and identity functions
• Identify and graph absolute value and piecewise functions

When you park at an airport, you are not charged a flat rate per minute parked, you are charged a rate that stays the same for a period of time then it will increase.

<table>
<thead>
<tr>
<th>Start Time</th>
<th>Ending Time</th>
<th>Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 minutes</td>
<td>Less than 30 minutes</td>
<td>$1.00</td>
</tr>
<tr>
<td>30 minutes</td>
<td>Less than one hour</td>
<td>$3.00</td>
</tr>
<tr>
<td>1 hour</td>
<td>Less than 2 hours</td>
<td>$5.00</td>
</tr>
<tr>
<td>2 hour</td>
<td>Less than 5 hours</td>
<td>$10.00</td>
</tr>
<tr>
<td>5 hours</td>
<td>Less than 12 hours</td>
<td>$20.00</td>
</tr>
</tbody>
</table>

Is this a linear function? No, it is known as a step function  
See example 1, pg 89
Algebra II

Chapter 2.6 Special Functions

Objectives:
• Identify and graph step, constant, and identity functions
• Identify and graph absolute value and piecewise functions

We know the $y = mx + b$ or $f(x) = mx + b$. When $m = 0$, $f(x) = b$.

$f(x) = b$ is a horizontal line known as a **constant function** because $y$ does not change. $f(x) = 0$ is called the zero function.

When $m = 1$ and $b = 0$, $y = x$ and we have the **identity function**.

Another special function is the **absolute value function**, $f(x) = |x|

Let’s graph $f(x) = x$ Where is the $y$-intercept? Zero, because $f(x) = 1x + 0$

However, $y$ has negative values.

Let’s graph $f(x) = |x|$ Where is the $y$-intercept? Still zero, isn’t it.

However, there are no negative $y$ values.
Objectives:
- Identify and graph step, constant, and identity functions
- Identify and graph absolute value and piecewise functions

Look what happens when we graph \( f(x) = |x| + 2 \)  
Look at \( f(x) = |x| - 4 \)

Notice how the parent function \( f(x) = |x| \) is being translated
This translation is due to our ‘b’ value changing in \( y = mx + b \)

Look what happens when we graph \( f(x) = 2|x| \)  
Look at \( f(x) = 5|x| \)

This is known as a dilation, \( f(x) \) is being stretched.
This dilation is due to our ‘m’ value changing in \( y = mx + b \)
What will happen if ‘m’ is a negative number?  
Graph \( f(x) = -3|x| \)
Objectives:
• Identify and graph step, constant, and identity functions
• Identify and graph absolute value and piecewise functions

Recall that absolute value functions can be written as $f(x) = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$

When a function is written using two or more expression, the function is called a piecewise function.

Graph $f(x) = \begin{cases} x - 4 & \text{if } x < 2 \\ 1 & \text{if } x \geq 2 \end{cases}$

We have two functions:
\[
\begin{align*}
    f(x) &= x - 4 \text{ if } x < 2 \\
    f(x) &= 1 \text{ if } x \geq 2
\end{align*}
\]

One last function uses a symbol you may not have seen. The greatest integer function is written $f(x) = \lfloor x \rfloor$. The $\lfloor x \rfloor$ symbol means, the greatest integer less than or equal to $x$.

\[
\begin{align*}
    \lfloor 7.3 \rfloor &= 7 \text{ and } \lfloor -1.5 \rfloor = -2. This is like the truncate function, isn’t it.\n\end{align*}
\]
Objectives:
• Identify and graph step, constant, and identity functions
• Identify and graph absolute value and piecewise functions

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x) = \lfloor x \rfloor$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-3 \leq x &lt; -2$</td>
<td>$-3$</td>
</tr>
<tr>
<td>$-2 \leq x &lt; -1$</td>
<td>$-2$</td>
</tr>
<tr>
<td>$-1 \leq x &lt; 0$</td>
<td>$-1$</td>
</tr>
<tr>
<td>$0 \leq x &lt; 1$</td>
<td>$0$</td>
</tr>
<tr>
<td>$1 \leq x &lt; 2$</td>
<td>$1$</td>
</tr>
<tr>
<td>$2 \leq x &lt; 3$</td>
<td>$2$</td>
</tr>
<tr>
<td>$3 \leq x &lt; 4$</td>
<td>$3$</td>
</tr>
</tbody>
</table>

What is the domain for this function? All values of $x$.

What is the range for this function? All integers of $y$. 
Chapter 2.6 Special Functions

Objectives:
• Identify and graph step, constant, and identity functions
• Identify and graph absolute value and piecewise functions

Bookwork:

page 93-94, problems 15-20 all, and 24-44 even

page 98, problems 14-44 even

page 104, problems 43-54
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Chapter 2.7 Graphing Inequalities

Objectives:
• Graph linear inequalities.
• Graph absolute value inequalities.

A linear inequality resembles a linear equation with an inequality rather than an equal sign.

Given the linear equation \( y = 2x + 1 \); an inequality would look like \( y \leq 2x + 1 \).

The graph of \( y = 2x + 1 \) is the boundary of the inequality.

The inequality states that the solution is all \( y \) values less than or equal to the line.

Graph an inequality by these steps:

**Step 1**: Determine if the boundary should be solid or dashed. Then graph the boundary.

**Step 2**: Choose a point not on the boundary and test the inequality, e.g. (0, 0)

**Step 3**: If a true inequality exists, shade the area of the point; if false, shade the other area.
Objectives:
• Graph linear inequalities.
• Graph absolute value inequalities.

Graphing absolute value inequalities is similar to graphing linear inequalities. The inequality symbol determines the boundary and a test point can be used to determine the shaded region.

Graph $y < |x| + 1$

**Step 1:** Is the boundary solid or dashed?

**Step 2:** Does the point $(0, 0)$ satisfy the inequality?

**Step 3:** If step 2 is true, shade the region of point $(0, 0)$; else, shade the other region.