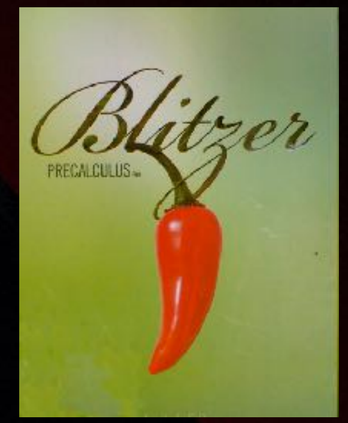
Chapter 1

Functions and Graphs



1.1 Graphs and Graphing Utilities

Chapter 1

Homework

1.1 p143 13, 21, 23, 27, 43, 45,
51, 53, 57, 75-78, 79, 81

Chapter 1.1

Learning Target

A-REI.3.1
Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context. CA

Chapter 1.1

Success Criteria

- I can plot points in the rectangular coordinate system.
  I can graph equations in the rectangular coordinate system.
  I can use a graph to determine intercepts.
  I can interpret information given by graphs.

Chapter 1.1

I can plot points in the rectangular coordinate system.

The Cartesian (Coordinate) Plane

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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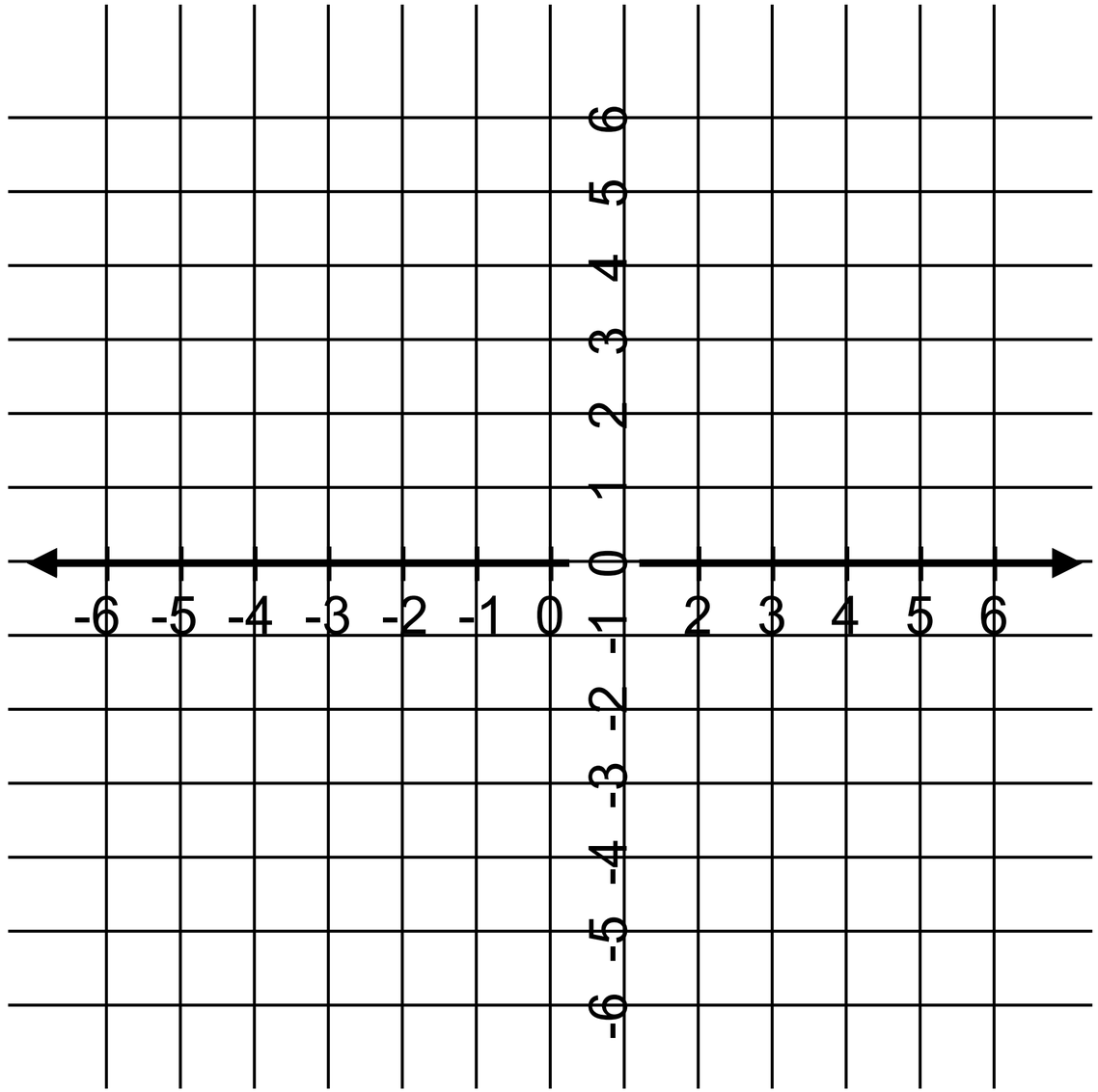
To identify location on a plane Renee DesCartes came up with a simple system consisting of perpendicular number lines.

Add a grid, and you have the familiar coordinate plane.



The Rectangular Coordinate System

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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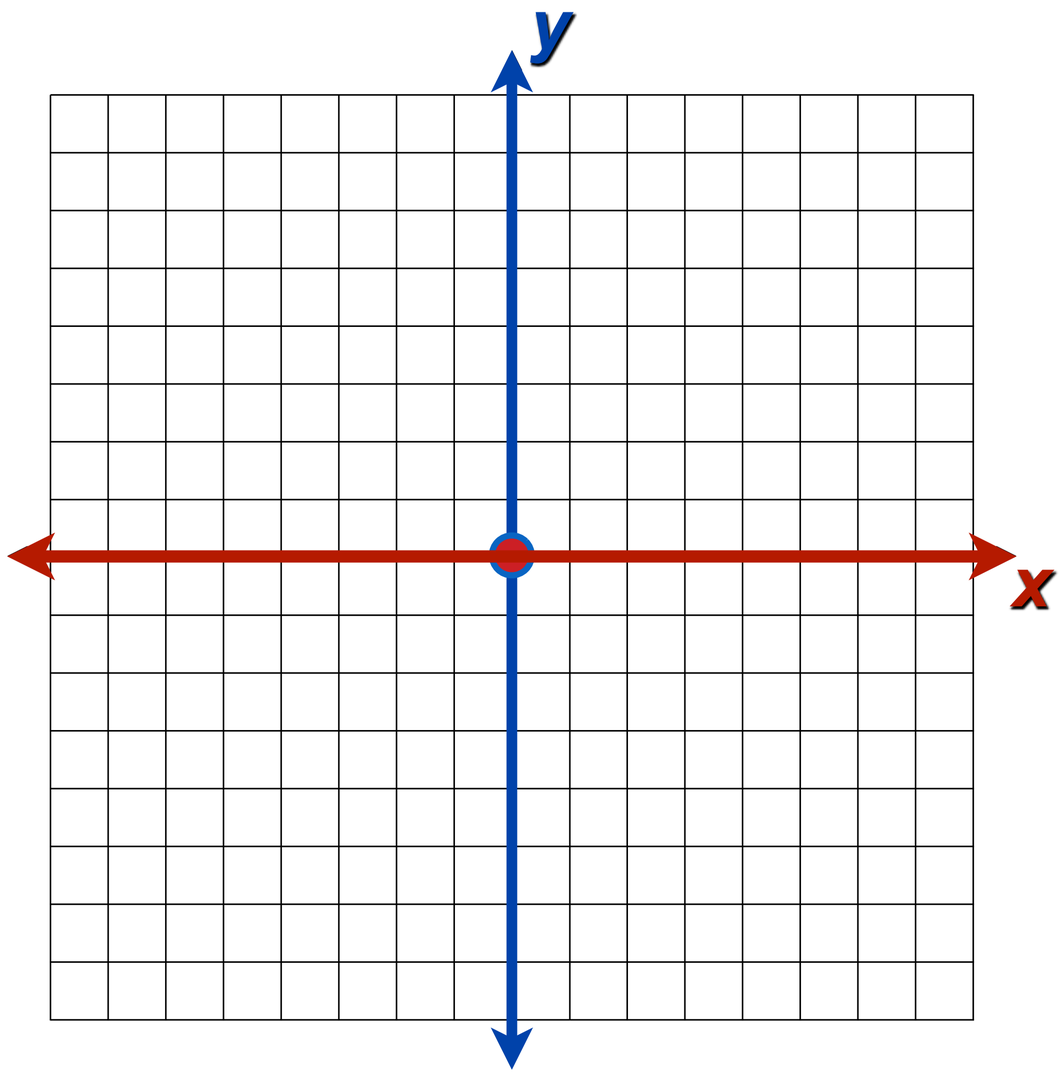
The coordinate plane (Cartesian Plane) provides identification (location) for every **point** on a plane.

The horizontal line is the ***x*-axis**.

The vertical line is the ***y*-axis**.

The point of intersection for these axes is the point (0, 0), known as the **origin**.



The Rectangular Coordinate System

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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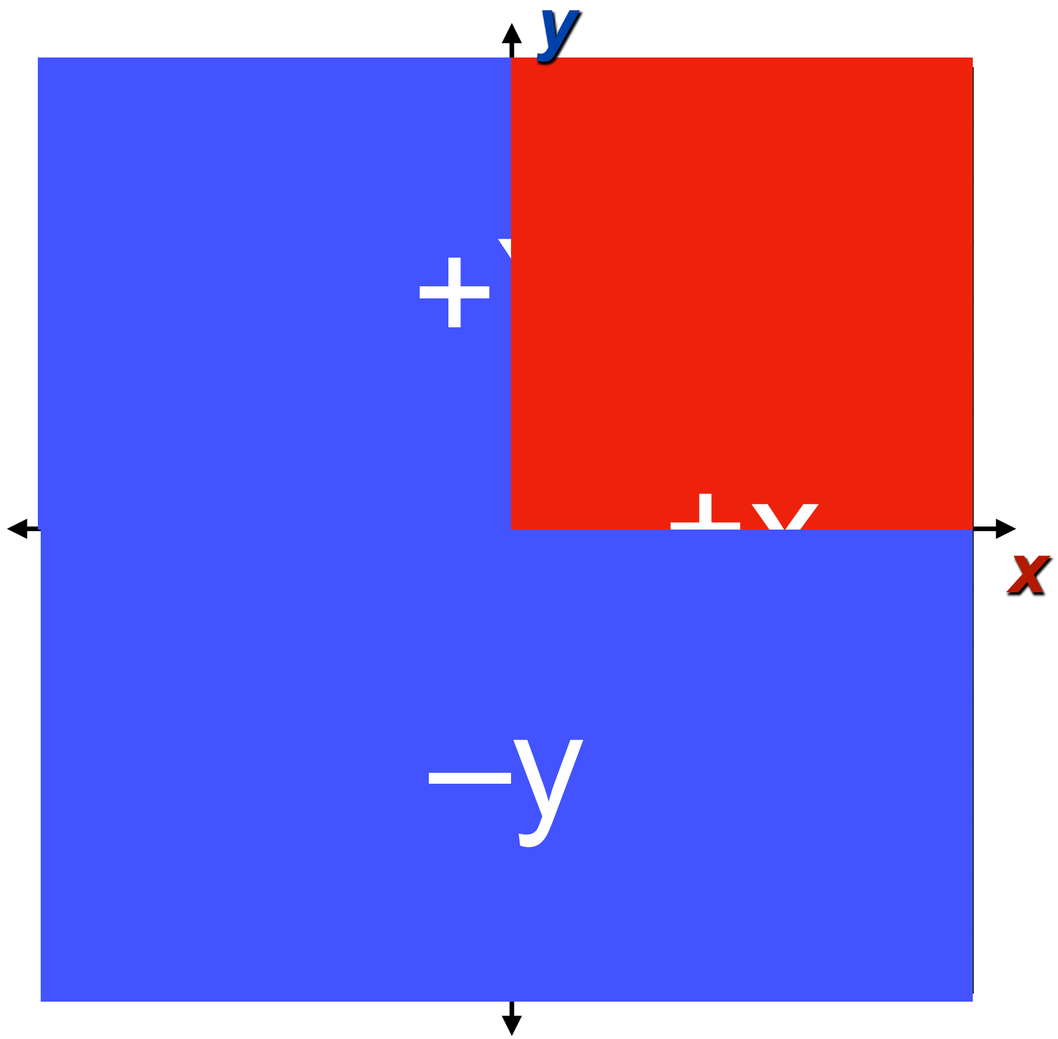
I can interpret information given by graphs.

Positive coordinates are shown to the right (**x-values**) of the origin and above (**y-values**) the origin.

Negative coordinates are shown to the left (**x-values**) of the origin and below (**y-values**) the origin.



Plotting Points in the Rectangular Coordinate System

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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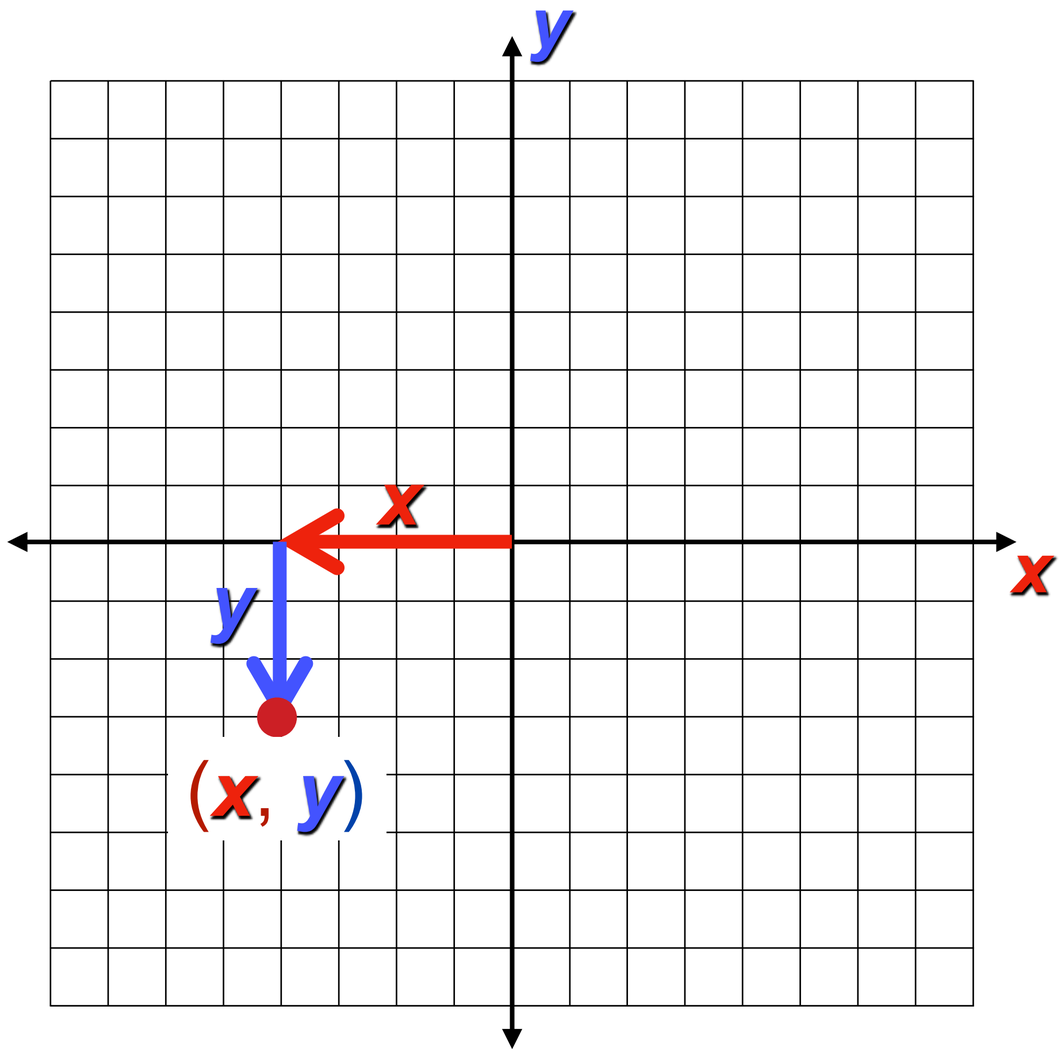
Every point on the plane is identified by an ordered pair (***x***, ***y***)

The first number in each pair, called the ***x*-coordinate**, denotes the distance and direction from the origin along the ***x*-axis**.

The second number in each pair, called the ***y*-coordinate**, denotes the vertical distance and direction from the origin along the ***y*-axis**.



Plotting Points in the Rectangular Coordinate System

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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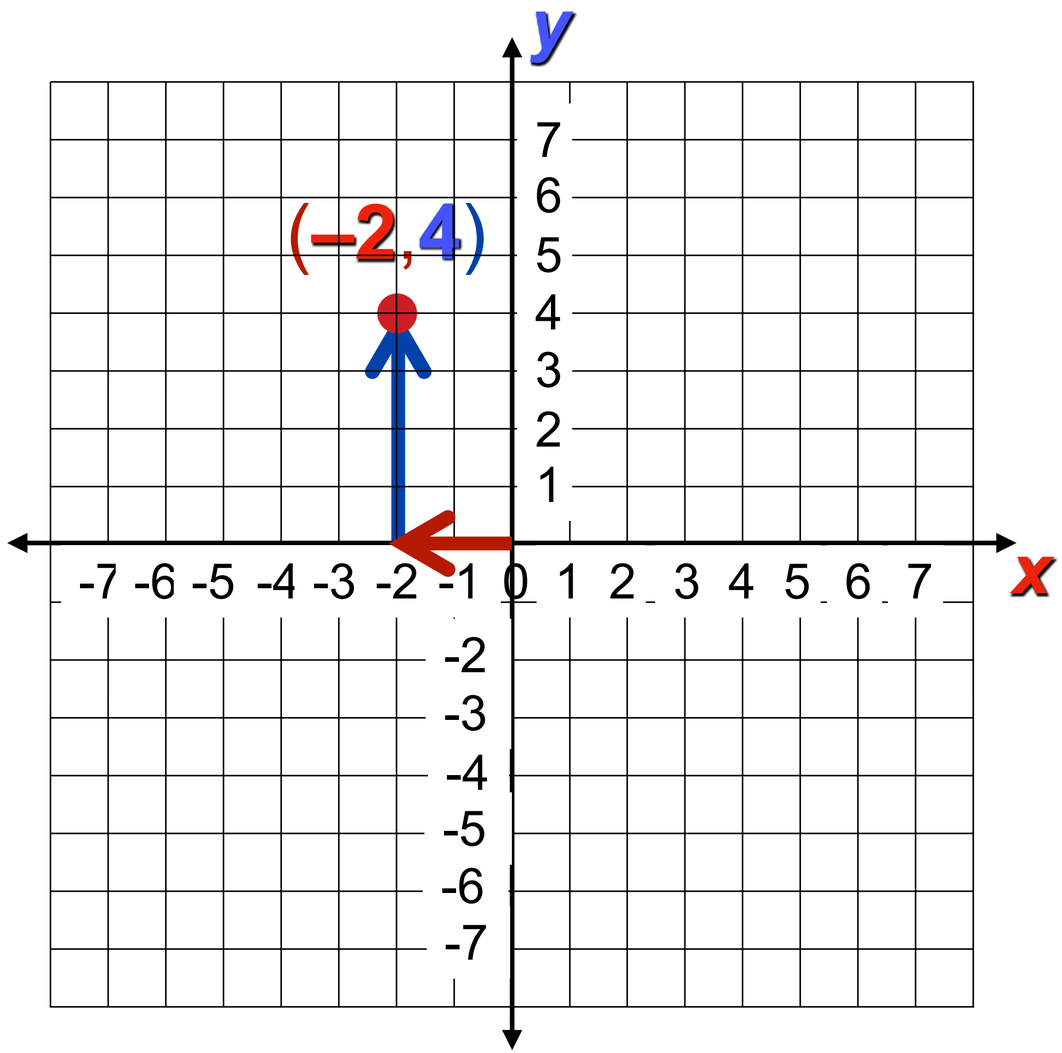
I can interpret information given by graphs.

Plot the point (**–2**,**4**).

To plot the point (**–2**,**4**), we move **2 units** to the left of the origin ...

and **4 units** up.



Plotting Points in the Rectangular Coordinate System

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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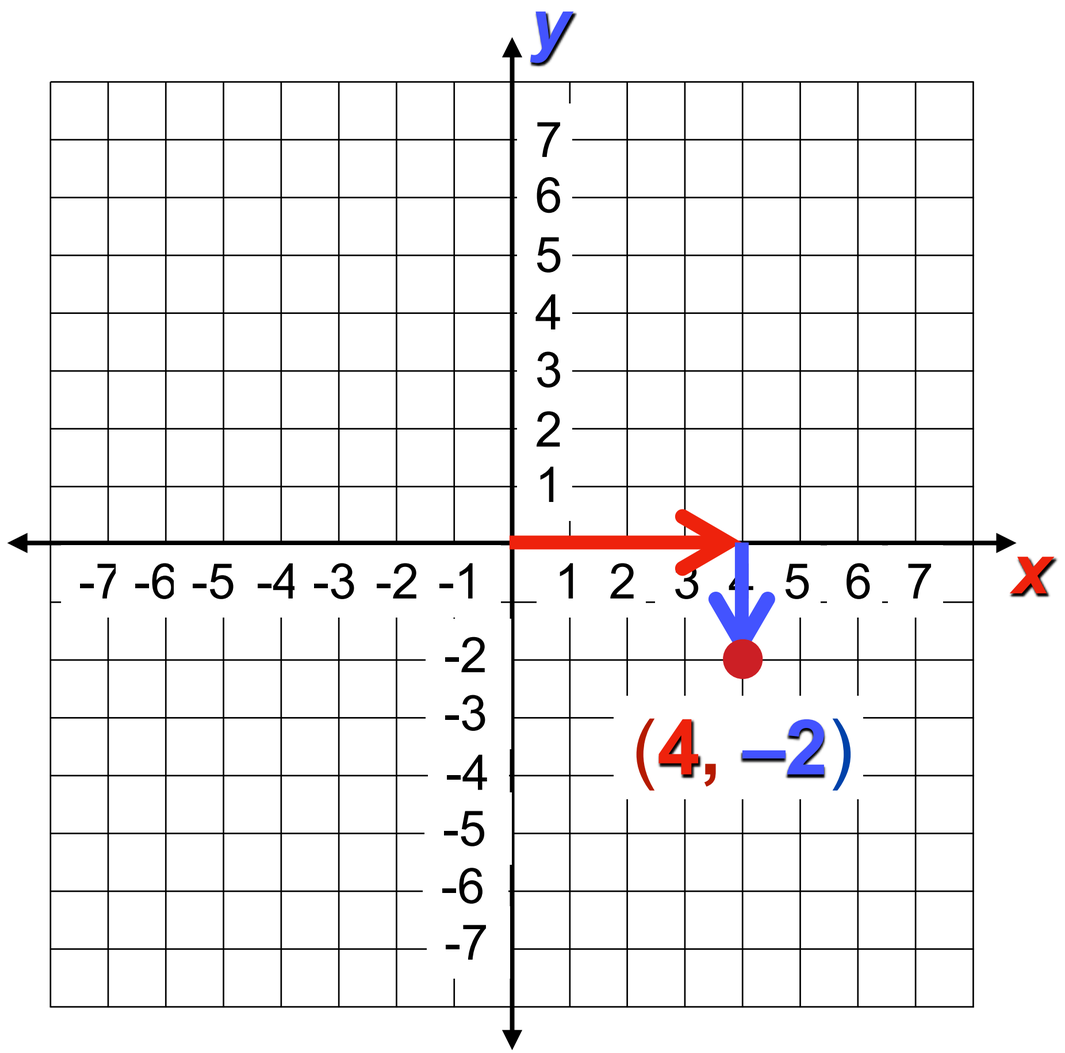
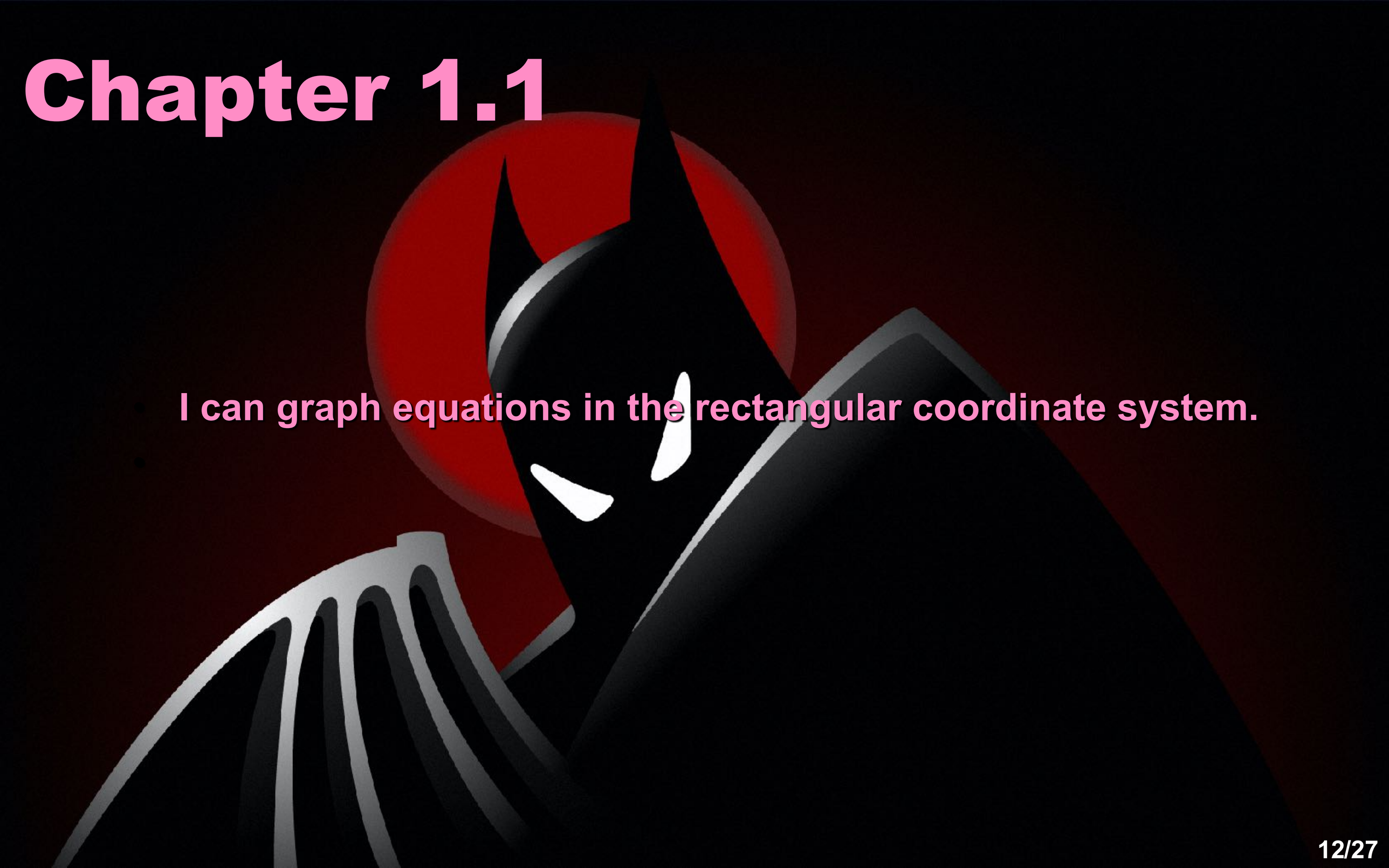
Plot the point (**4**, **–2**).

To plot the point (**4**, **–2**), we move **4 units** to the left of the origin …

and **2 units** down.



Chapter 1.1



I can graph equations in the rectangular coordinate system.

Graphs of Equations

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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A relationship between two quantities can be expressed as an ***equation in two variables***, such as

$$y = 4 - x^2$$

A **solution of an equation in two variables**, ***x*** and ***y***, is an **ordered pair** of real numbers with the following property:

When the ***x*-coordinate** is substituted for ***x*** and the ***y*-coordinate** is substituted for ***y*** in the equation, we obtain a true statement.

Solutions

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
I can use a graph to determine intercepts.
I can interpret information given by graphs.

So to repeat,

The solutions to an equation in two variables are...

ordered pair,

(x, y)

In other words, the solutions are …

POINTS

Graphing Equations

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
I can use a graph to determine intercepts.
I can interpret information given by graphs.

There are many ways to find the graph of an equation, and I am certain you have been shown many, but the only method that works **every single time** is by **using a table of values**. The only conditions necessary to graph using a table of values are that you are able to find points and you know the basic shape of the graph (parent function).

Graphing an Equation by Plotting Points

I can plot points in the rectangular coordinate system.
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Graph $y = |x + 1|$

To graph we need a few things.

We need some idea about the shape the graph will take.

And we need some points.

To find some points, select integers for ***x***, (here we will start with –4 and end with 2)...

... and then find the appropriate **y-value.**

This gives us a **table of values.**

x	y=|x+1|	y
-4	y=|-4+1|	3
-3	y=|-3+1|	2
-2	y=|-2+1|	1
-1	y=|-1+1|	0
0	y=|0+1|	1
1	y=|1+1|	2
2	y=|2+1|	3

Solutions

(x,y)
(-4,3)
(-3,2)
(-2,1)
(-1,0)
(0,1)
(1,2)
(2,3)

Graphing an Equation Using the Point-Plotting Method

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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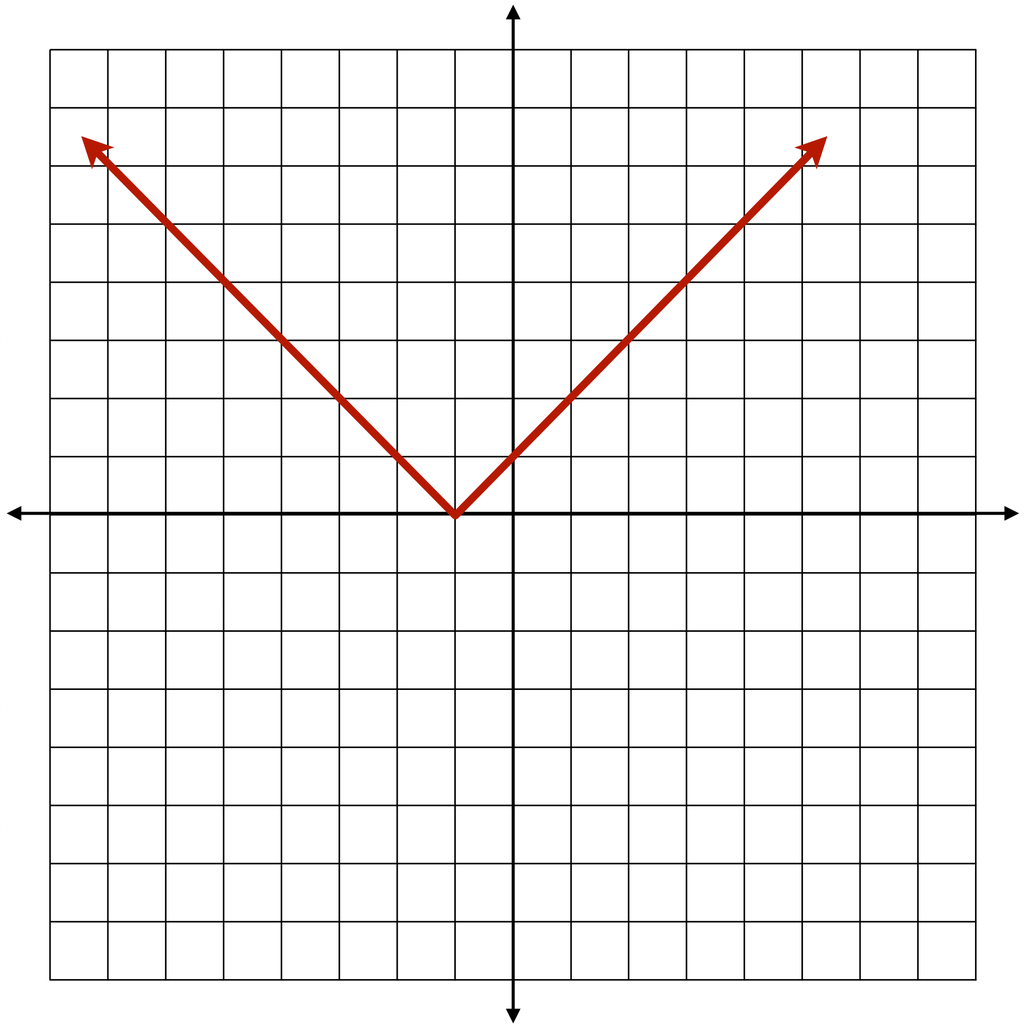
Graph $y = |x + 1|$

We plot the points from our table of values.

Then connect the dots to draw the graph

x	y	(x,y)
-4	3	(-4,3)
-3	2	(-3,2)
-2	1	(-2,1)
-1	0	(-1,0)
0	1	(0,1)
1	2	(1,2)
2	3	(2,3)



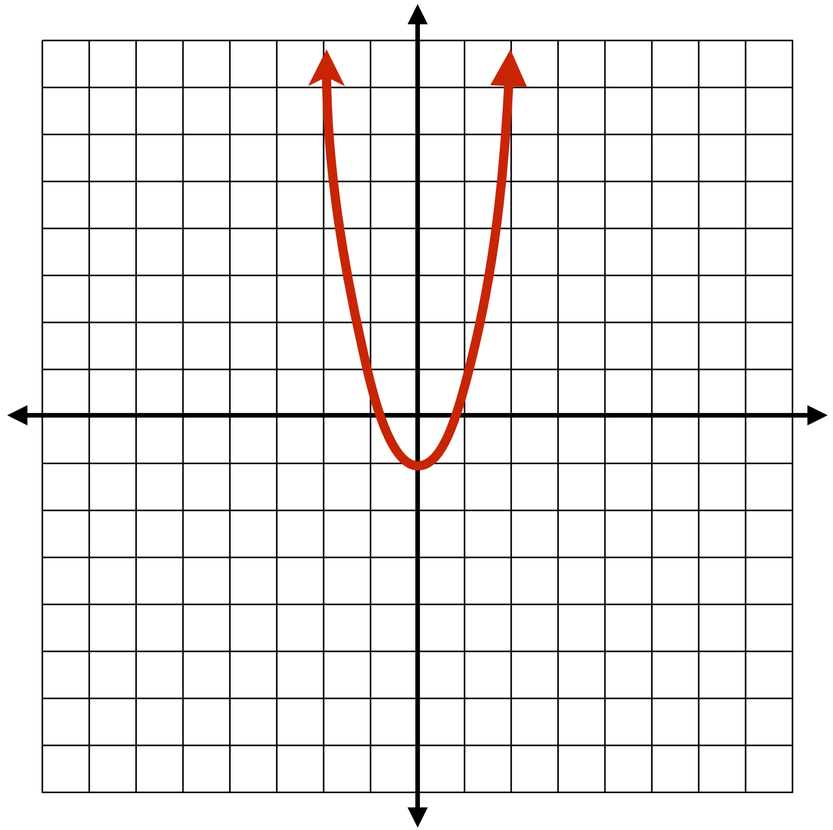
Graphing Equations

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
I can use a graph to determine intercepts.
I can interpret information given by graphs.

Graph the function $y = 2x^2 - 1$. Select integers for x, starting with –2 and ending with 2.

Why do you think we choose –2 to 2 for x?

x	$y = 2x^2-1$
–2	7
–1	1
0	–1
1	1
2	7



STUDY TIP

One of your goals in this course is to learn to classify the basic shape of a graph from its equation. For instance, you will learn that the *linear equation* in Example 2 has the form

$$y = mx + b$$

and its graph is a line. Similarly, the *quadratic equation* in Example 3 has the form

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

and its graph is a parabola.

Chapter 1.1

- I can use a graph to determine intercepts.

Intercepts

I can plot points in the rectangular coordinate system.
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I can interpret information given by graphs.

An ***x*-intercept** of a graph is the ***x*-coordinate** of a point where the graph intersects the ***x*-axis**. The ***y*-coordinate** corresponding to an ***x*-intercept** is **always zero**.

$$(x, 0)$$

To find the ***x*-intercept** of a graph; set the ***y*-coordinate** to 0 and solve for ***x***.

A ***y*-intercept** of a graph is the ***y*-coordinate** of a point where the graph intersects the ***y* axis**. **The *x*-coordinate** corresponding to a ***y*-intercept** **is always zero**.

$$(0, y)$$

To find the ***y*-intercept** of a graph; set the ***x*-coordinate** to 0 and solve for ***y***.

Identifying Intercepts

I can plot points in the rectangular coordinate system.
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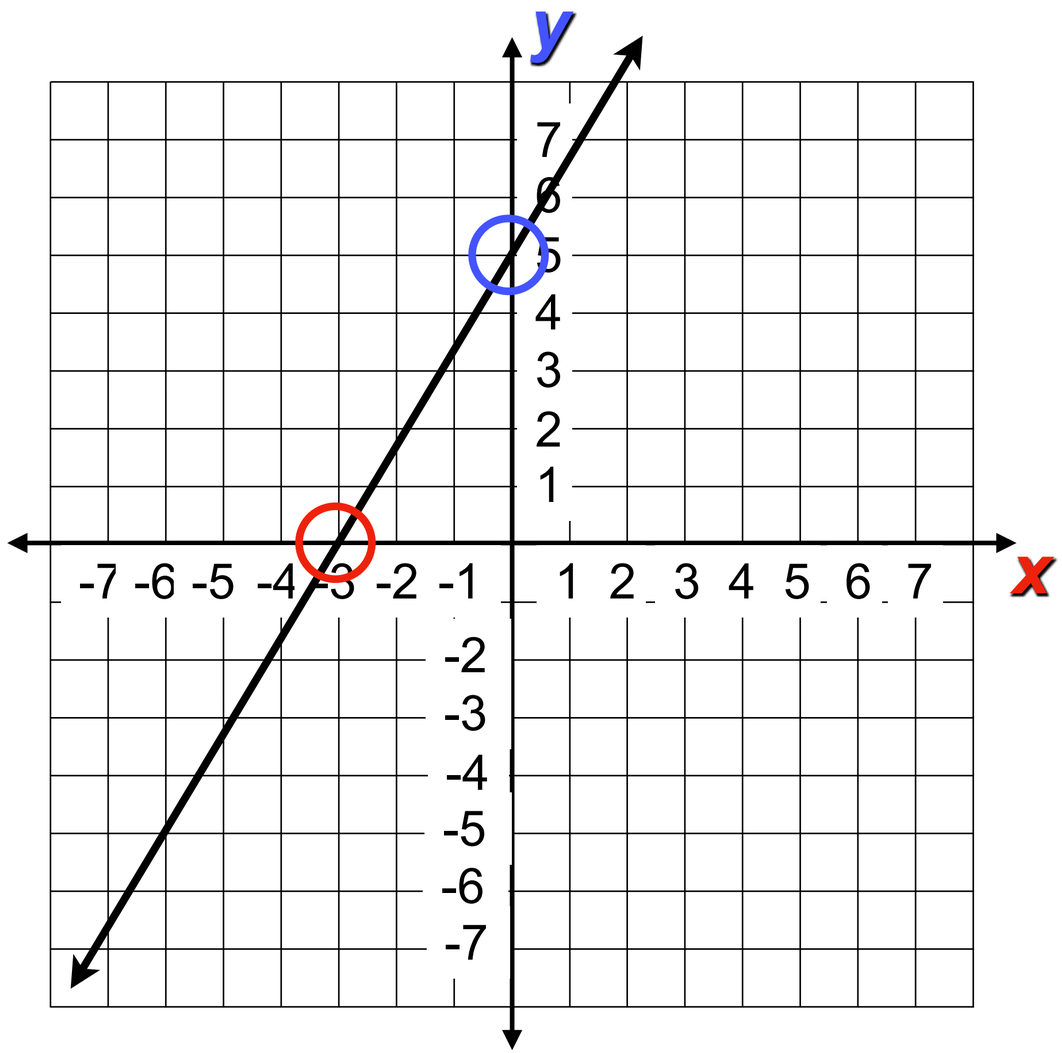
Identify the ***x***- and ***y***-intercepts.



The graph crosses the ***x***-axis at (–3, 0).
Thus, the ***x*-intercept** is –3.

The graph crosses the ***y***-axis at (0, 5).
Thus, the ***y*-intercept** is 5.

Identifying Intercepts

I can plot points in the rectangular coordinate system.
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Find the **x**- and **y**-intercepts for $y = 2x - 6$.

x-intercept

Set **y** = 0 $\quad 0 = 2x - 6$

Solve for **x** $\quad 2x = 6 \quad x = 3 \quad$ **x-intercept = 3**

y-intercept

Set **x** = 0 $\quad y = 2(0) - 6$

Solve for **y** $\quad y = -6 \quad$ **y-intercept = –6**

Finding Intercepts

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
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I can interpret information given by graphs.

Find the x and y intercepts for $y = x^2 - x - 6$

x intercepts

$0 = x^2 - x - 6$

$0 = (x + 2)(x - 3)$

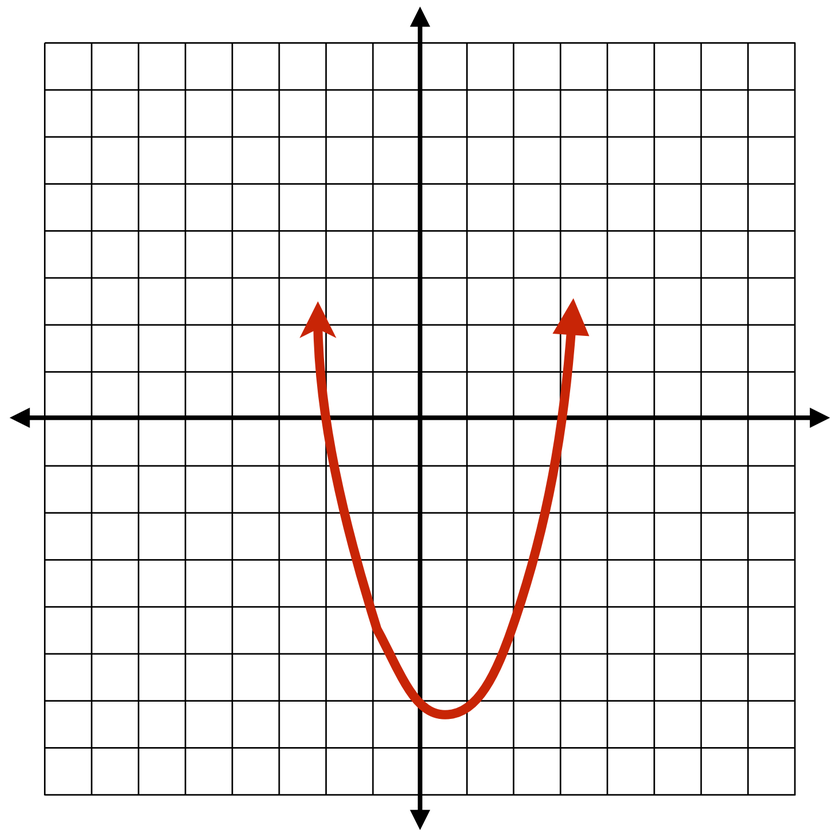
$x + 2 = 0$ or $x - 3 = 0$

$x = -2$ or $x = 3$ ●

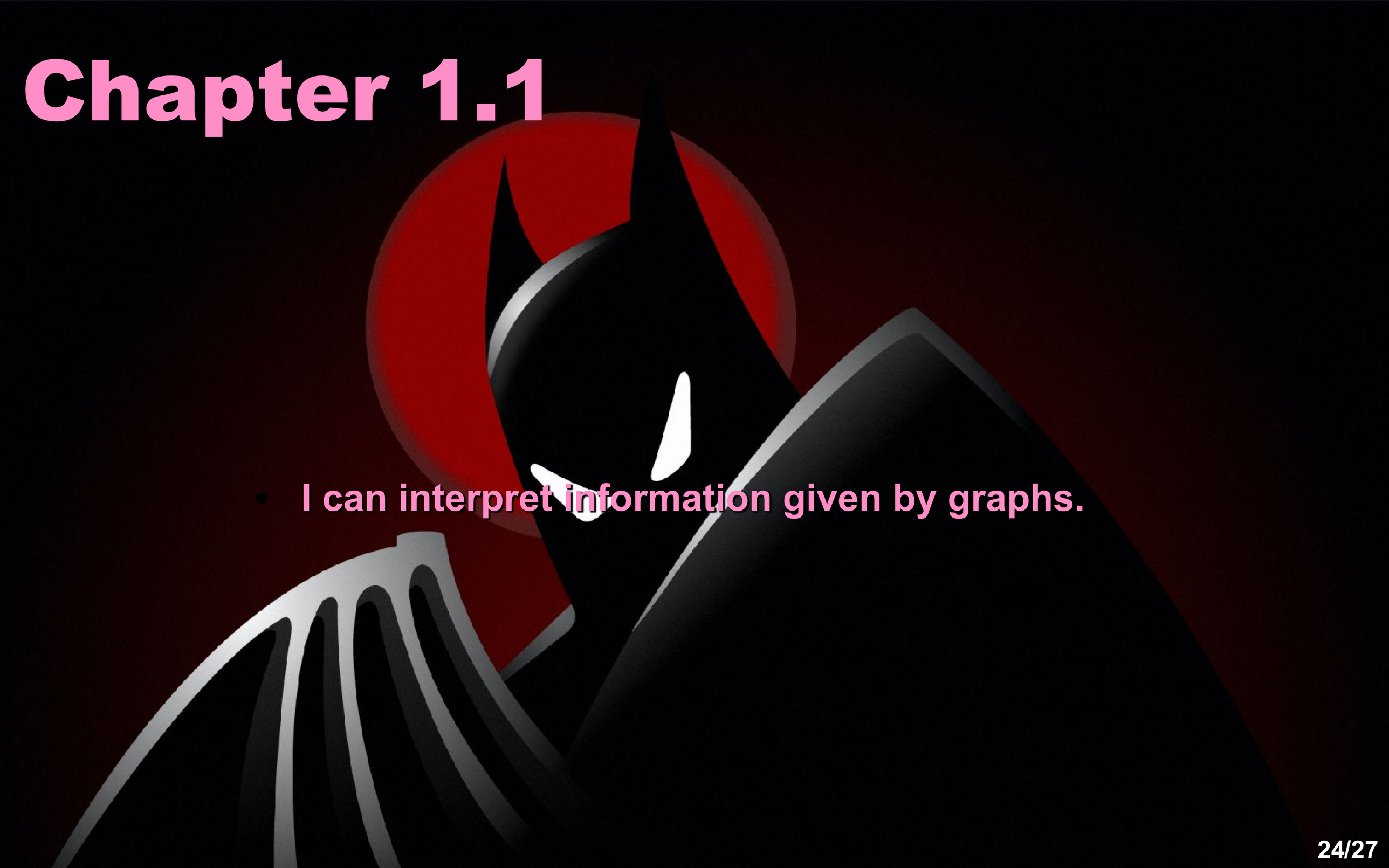
y intercepts

$y = 0^2 - 0 - 6$

$y = -6$ ●



Chapter 1.1



- I can interpret information given by graphs.

Interpret Information Given by Graphs

I can plot points in the rectangular coordinate system.
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I can interpret information given by graphs.

Divorce rates are considerably higher for couples who marry in their teens. The equation

$$d = 4n + 5$$

models the percentage, ***d***, of marriages that end in divorce after ***n*** years when the wife was under 18 at the time of marriage.

Determine the percentage of marriages ending in divorce after 15 years when the wife is under 18 at the time of the marriage.

Example: Interpret Information Given by Graphs

I can plot points in the rectangular coordinate system.
I can graph equations in the rectangular coordinate system.
I can use a graph to determine intercepts.
I can interpret information given by graphs.

Determine the percentage of marriages ending in divorce after 15 years when the wife is under 18 at the time of the marriage.

$$d = 4n + 5$$

To determine the percentage of marriages ending in divorce after 15 years when the wife is under 18 at the time of the marriage we let ***n* = 15** years.

$$d = 4(15) + 5 = 65 \text{ percent}$$

Interpret Information Given by Graphs

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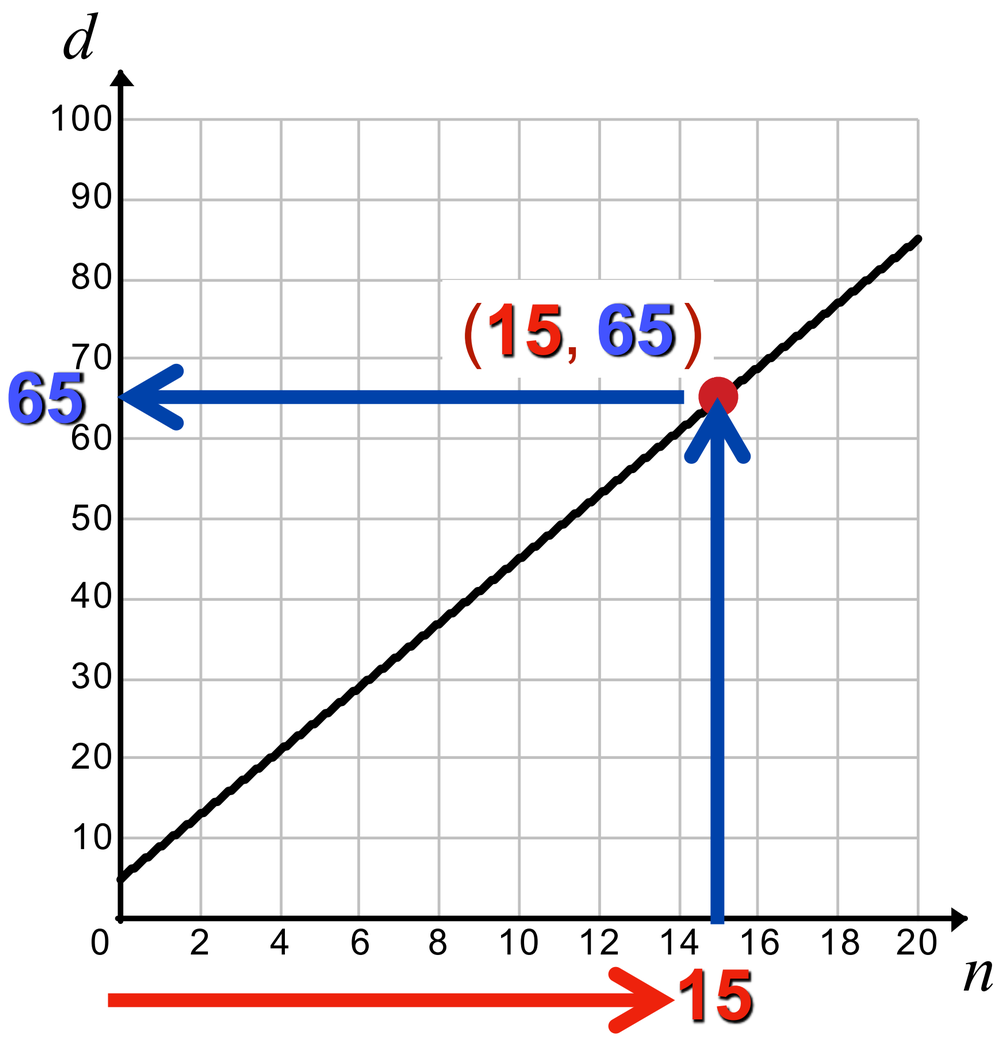

The graph of $d = 4n + 5$ is shown to the left. We calculated that 65% of marriages would end in divorce after 15 years. How can we check our answer with the graph?

Since we know **n = 15**, find **15** on the **n-axis**.

Find the point on the graph where **n = 15**, by going up to the graph above **n = 15**.

Determine the **d value** of that point by finding it on the **d-axis**.

Our solution on the graph is the point (**15**, **65**).