THE COORDINATE PLANE AND LINE SEGMENTS

In this unit, you will review plotting points and lines in the coordinate plane. Next you will examine the ruler postulate, measuring line segments, and the segment addition postulate.

Graphing Points in Quadrant I

Graphing Points in Quadrants II, III, and IV

Ruler Postulate and Segment Addition

Graphing in Quadrant I of the Coordinate Plane

Ordered pair - An ordered pair is a pair of numbers that represent the location in a grid. In the coordinate plane, an ordered pair is the *x* and *y*-coordinate of a point represented as (*x*, *y*).

Origin - The origin is the beginning point in the coordinate plane. It is the point where the *x*-axis and the *y*-axis intersect. The coordinates of the origin are (0,0).

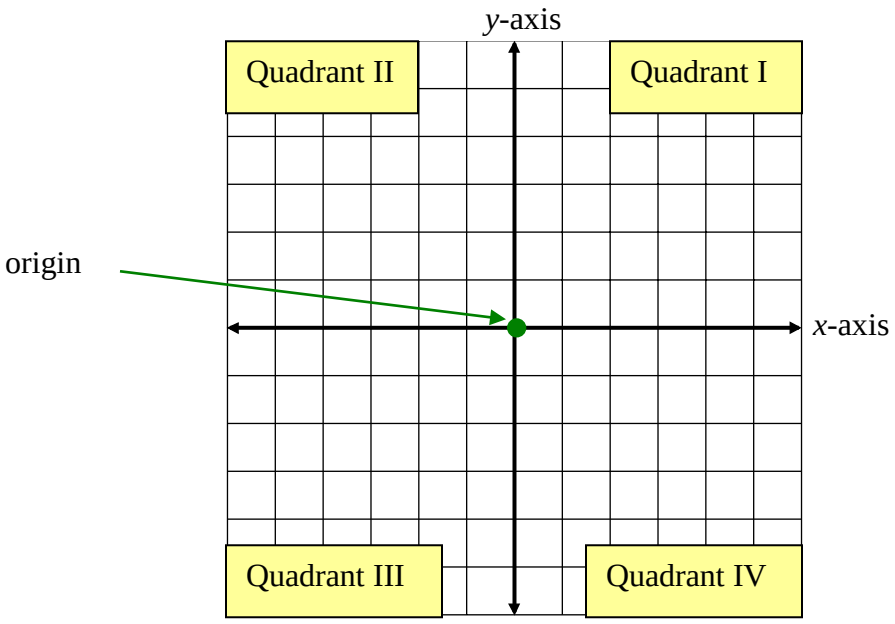
Quadrants - Quadrants are the four regions of the coordinate plane. The *x* and *y*-axis divide the coordinate plane into four quadrants.

Axes - Axes is the plural of axis. There are two axes in a coordinate plane. The *x*-axis is the horizontal axis and is a number line. The *y*-axis is the vertical axis and is a vertical number line.

Coordinates - Coordinates are the components of an ordered pair. In an ordered pair, the first number is called the *x*-coordinate and the second number is called the *y*-coordinate.

Coordinate plane - The coordinate plane is a numbered grid system that has a horizontal and a vertical number line in the center. These lines are perpendicular to each other and meet at the origin, the point considered the starting point of the system. The origin is numbered as (0, 0).

In a **coordinate plane**, points may be located by **plotting** them. The coordinate plane is divided into **four quadrants** by the ***x*–axis** and the ***y*-axis**. The starting point, the **origin**, is the center, or point where the *x* and *y*-axis intersect (cross).



A point is designated by both an ***x*-coordinate** and a ***y*-coordinate.** The origin's coordinates are (0, 0). The *x*-coordinate is the first number and the *y*-coordinate is the second number.

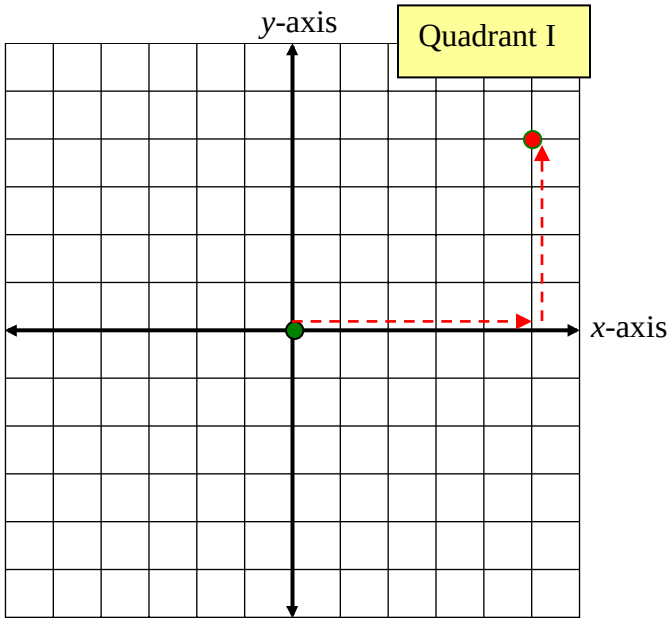
The ***x*-coordinate** is how far you count **right or left** of the origin. The ***y*-coordinate** is how far you then count **up or down**. A point's location is written as an **ordered pair (*x*,*y*)**.

In this grid, each space represents one unit.

Plot (5, 4)

When plotting points, start at the origin. Count right if the *x*-coordinate is positive, left if it is negative. Then count up if the *y*-coordinate is positive, count down if it is negative.

To plot (5, 4) start at the origin, count 5 units to the right, and then count 4 units up.



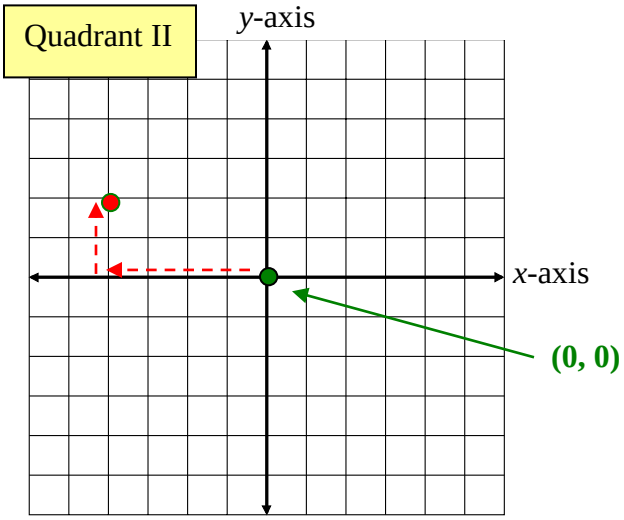
Graphing in Quadrants II, III, and IV

In these grids each space represents one unit. The starting point is the origin (0,0).

Plot (–4, 2)

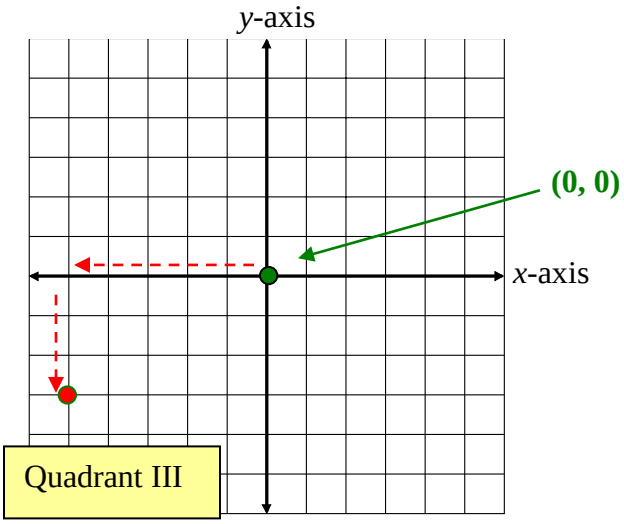
When plotting points, start at the origin. Count right if the *x*-coordinate is positive, left if it is negative. Then count up if the *y*-coordinate is positive, count down if it is negative.

To plot (–4, 2) starting at the origin, count 4 units to the left, and then count 2 units up.



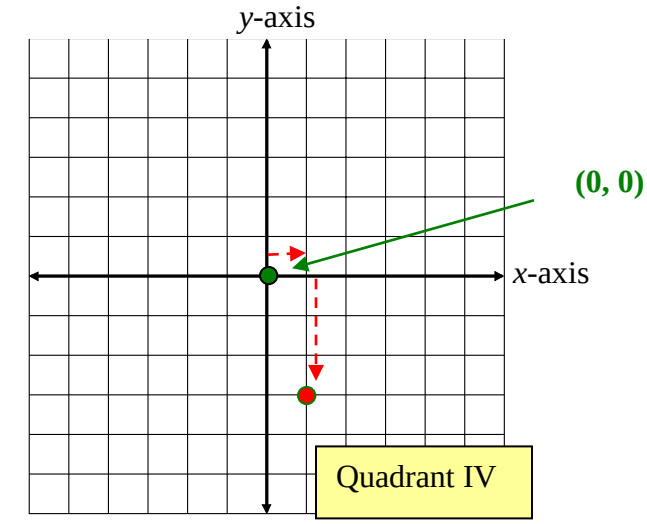
Plot (–5, –3)

To plot (–5, –3), start at the origin, count 5 units to the left, and then count 3 units down.



Plot (1, –3)

To plot (1, –3), start at the origin, count 1 unit to the right, and then count 3 units down.



Ruler Postulate and Segment Addition

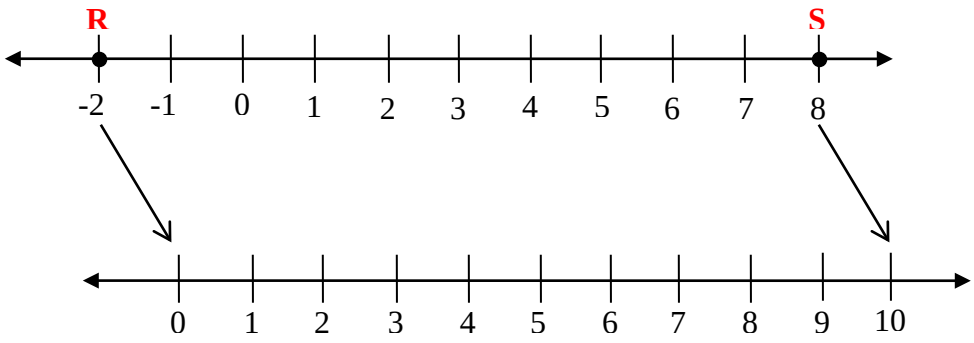
Congruent line segments - Congruent line segments are line segments that measure the same length. The symbol for congruency is $\cong$.

Absolute value - The absolute value of a number is the number's distance from zero on the number line. The symbol for absolute value is | |.

Postulate 3-A Ruler

Two points on a line can be paired with real numbers so that, given any two points R and S on the line, R corresponds to zero, and S corresponds to a positive number.

Point R could be paired with 0, and S could be paired with 10.



Example 1: Find the Distance from **R** to **S**.

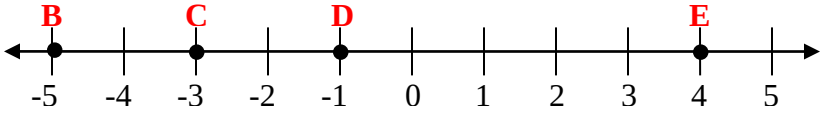
To solve, find the absolute value of the difference between the two points. When finding absolute value, order doesn't matter.

$$| -2 - 8 | = | -10 | = 10$$

OR

$$| 8 - (-2) | = | 8 + 2 | = 10$$

Refer to the numberline to answer the following questions.



Example 2: Find the lengths of **CD**, **DE**, and **CE**.

CD = | –3 – (–1) |
= | –3 + 1 |
= | –2 | or 2

DE = | –1 – 4 |
= | –5 | or 5

CE = | –3 – 4 |
= | –7 | or 7

Example 3: Find two congruent segments.

CD = | –3 – (–1) |
= | –3 + 1 |
= | –2 | or 2

BC = | –5 – (–3) |
= |–5 + 3|
= | –2 | or 2

CD ≅ **BC**

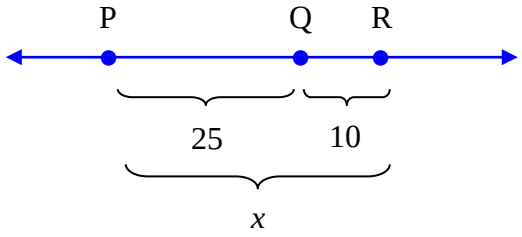
CD is congruent to **BC**.

Postulate 3-B Segment Addition

If N is between M and P, then MN + NP = MP.
Conversely, if MN + NP = MP, then N is between M and P.

Example 1: P, Q, and R are collinear and Q is between P and R. If segment PQ = 25 inches long and QR = 10 inches long, then how long is PR?

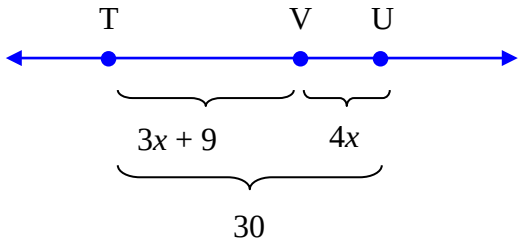
Draw a picture to help visualize the problem.



PQ + QR	=	PR
25 + 10	=	*x*
35	=	*x*
35	=	PR

Example 2: T, U, and V are collinear and V is between T and U. The length of TU is 30 inches. If segment TV = 3*x* +9 inches long and VU is 4*x* units long, find the length of VU.

Draw a picture to help visualize the problem.



TV	+	VU	=	TU
3*x* + 9	+	4*x*	=	30
7*x* + 9			=	30
7*x*			=	21
x			=	3

Through substitution, VU = 4*x* = 4(3) = 12 inches.