Cartesian coordinate system

The Cartesian coordinate system is the structure we use to graph points in two dimensions.

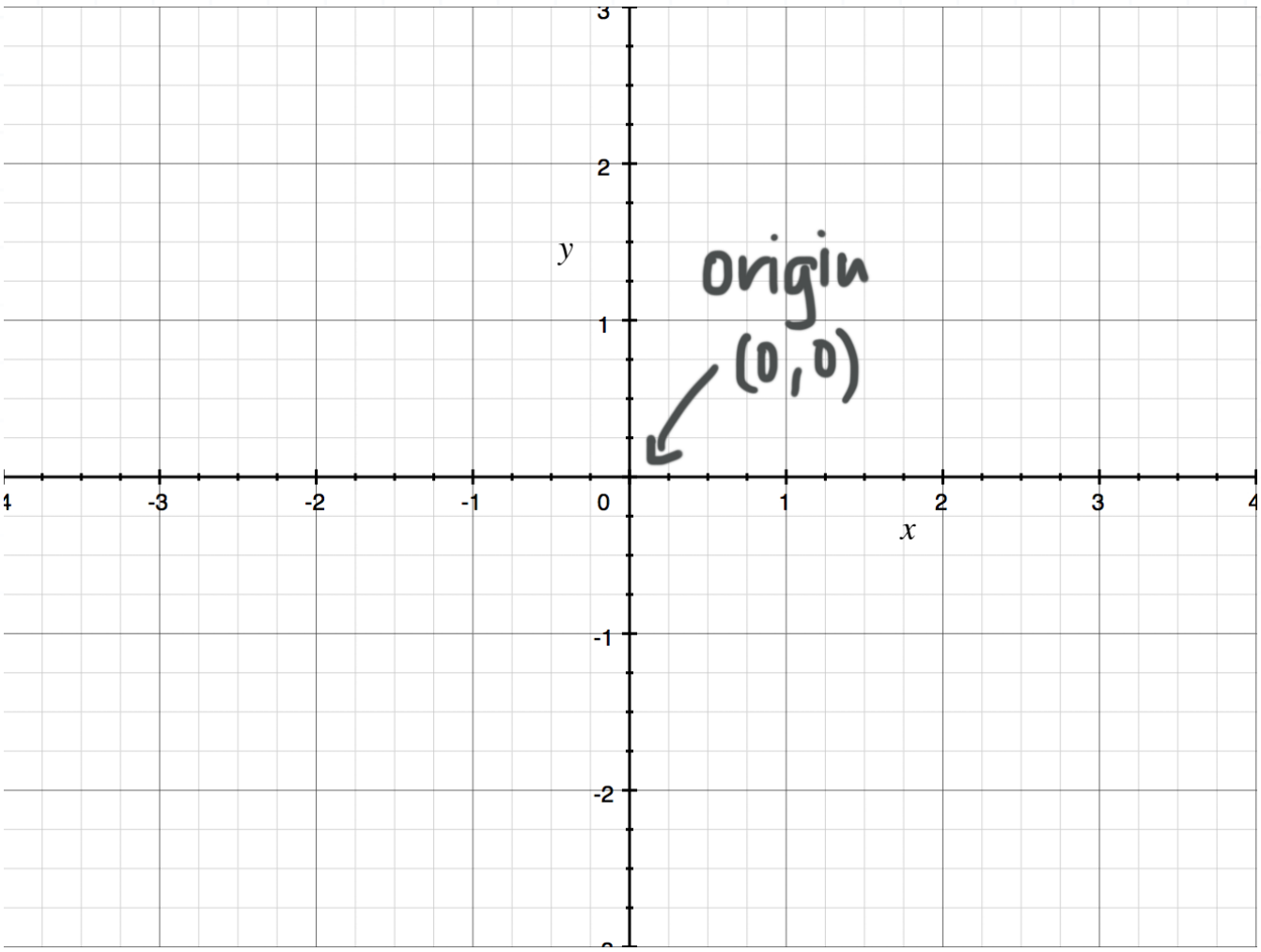
Something that has two dimensions is a surface. The Cartesian coordinate system (also called the Cartesian plane, or just "the plane") is a flat surface (like the cover of a book) that extends forever in all directions. It's made up of a pair of perpendicular lines - one horizontal and the other vertical - called **axes**, and the point where they meet, called the **origin**.

We call the horizontal axis the x-axis, and the vertical axis the y-axis. We sometimes refer to them, together, as the **coordinate axes**. We draw arrows at the ends of the axes to indicate that they extend forever. Also, we call the part of the x-axis that's to the right of the origin the positive x-axis, and the part that's to the left of the origin the negative x-axis.

Similarly, we call the part of the y-axis that's above the origin the positive y-axis, and the part that's below the origin the negative y-axis.

We represent every point in the plane by a pair of numbers (x, y), called its coordinates, where x (called the horizontal coordinate or the x-coordinate) is the horizontal (left-right) location of the point (think "x marks the spot on the ground" to help you remember), and y (called the vertical coordinate or the y-coordinate) is the vertical (up-down) location of the point (think "y to the sky"). A pair (x, y) is actually called an ordered pair, because the order of the numbers x and y matters. The first number in the ordered pair is the x-coordinate, and the second number is the y-coordinate.

The x-coordinate of a point in the plane is positive if the point is located to the right of the y-axis, negative if it's located to the left of the y-axis, and 0 if it's located on the y-axis. Similarly, the y-coordinate of a point is positive if the point is located above the x-axis, negative if it's located below the x-axis, and 0 if it's located on the x-axis. The origin is the center of the coordinate system, so its coordinates are $(0,0)$. In other words, its x-coordinate is 0 and its y-coordinate is 0.



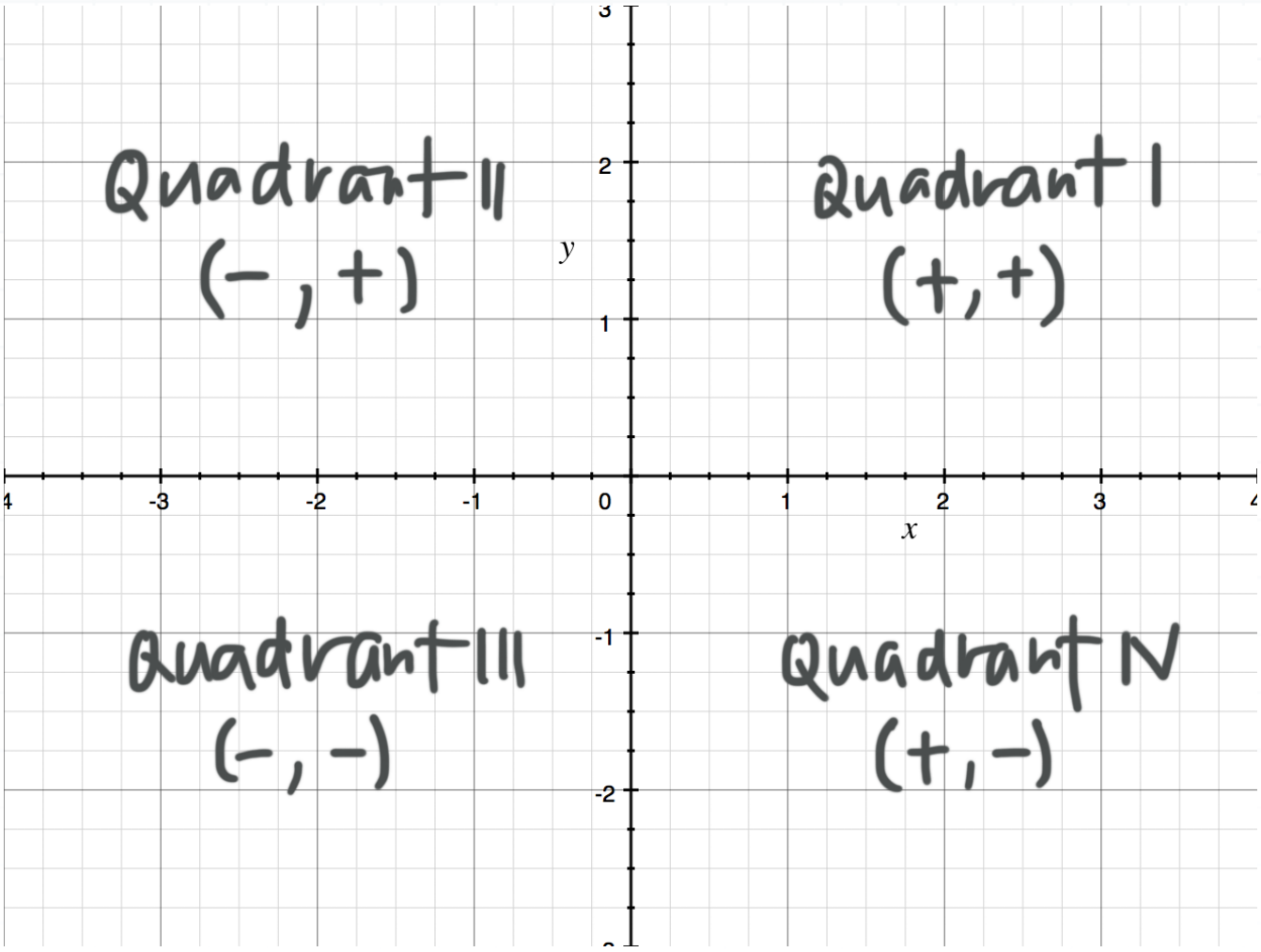
The axes divide the coordinate plane into four parts, called quadrants. Quadrant I is where x and y are both positive. The other three quadrants are named in order going counterclockwise.

Quadrant I: both x and y are positive $(+,+)$

Quadrant II: x is negative and y is positive $(-,+)$

Quadrant III: both x and y are negative $(-,-)$

Quadrant IV: x is positive and y is negative $(+,-)$



Quadrants I, II, III, and IV are also called the first, second, third, and fourth quadrants, respectively.

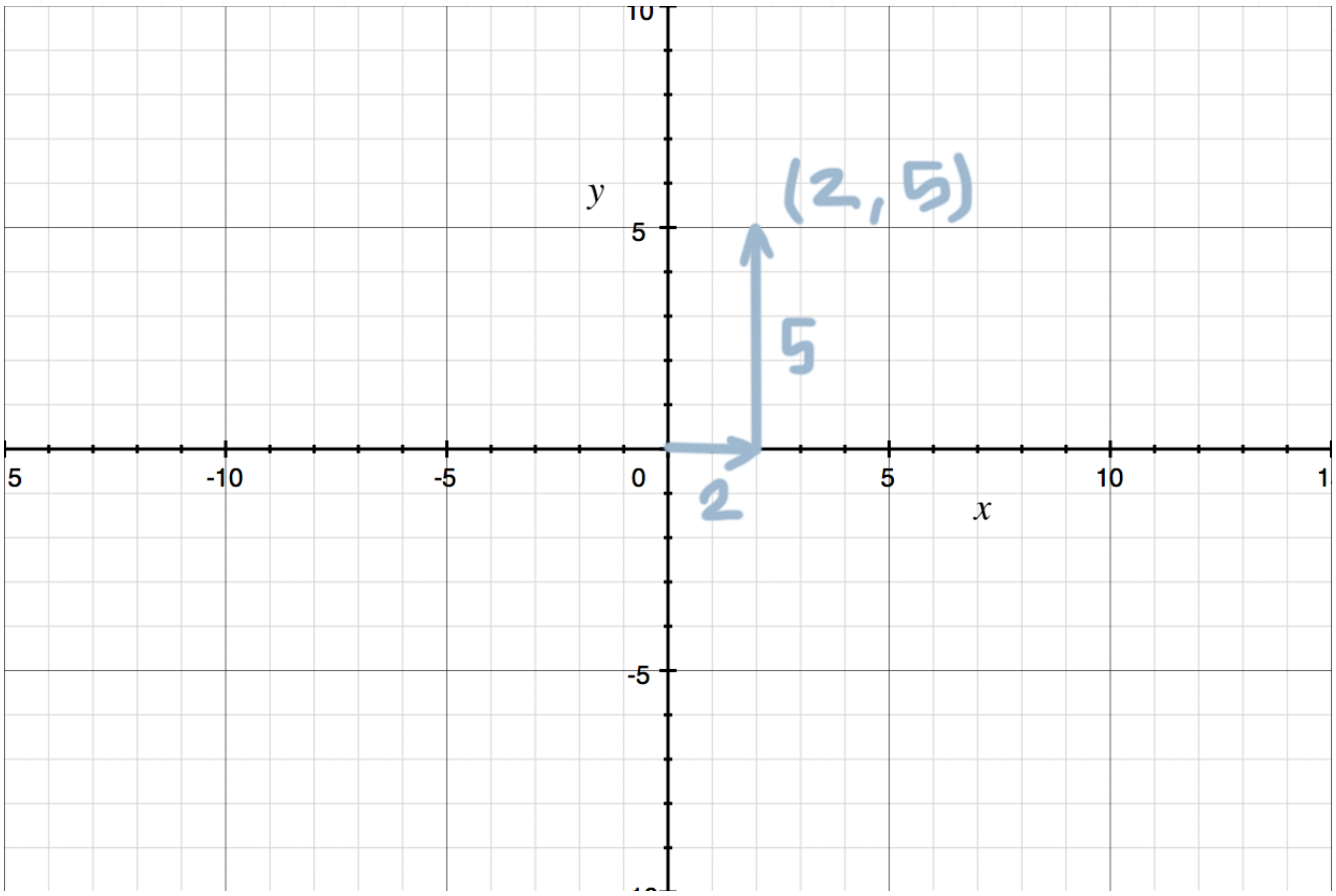
We "graph a point" in the plane by placing a dot at its location in the Cartesian coordinate system. We sometimes say that we "plot a point," which means the same thing.

Example

Graph the point in the Cartesian coordinate system.

$(2,5)$

Remember that points are in the form (x, y), so the 2 tells us how to move on the x-axis (left or right) and the 5 tells us how to move on the y-axis (up or down). Since the x-coordinate (2) is positive, we move 2 units from the origin in the direction of the positive x-axis (to the right). And since the y-coordinate (5) is positive, we move 5 units up from there in the direction of the positive y-axis (up).



Let's try another example of graphing in the Cartesian coordinate system.

Example

In which quadrant would you plot the point?

$$(1, -7)$$

Since the x-coordinate is positive and the y-coordinate is negative, the correct quadrant is Quadrant IV.