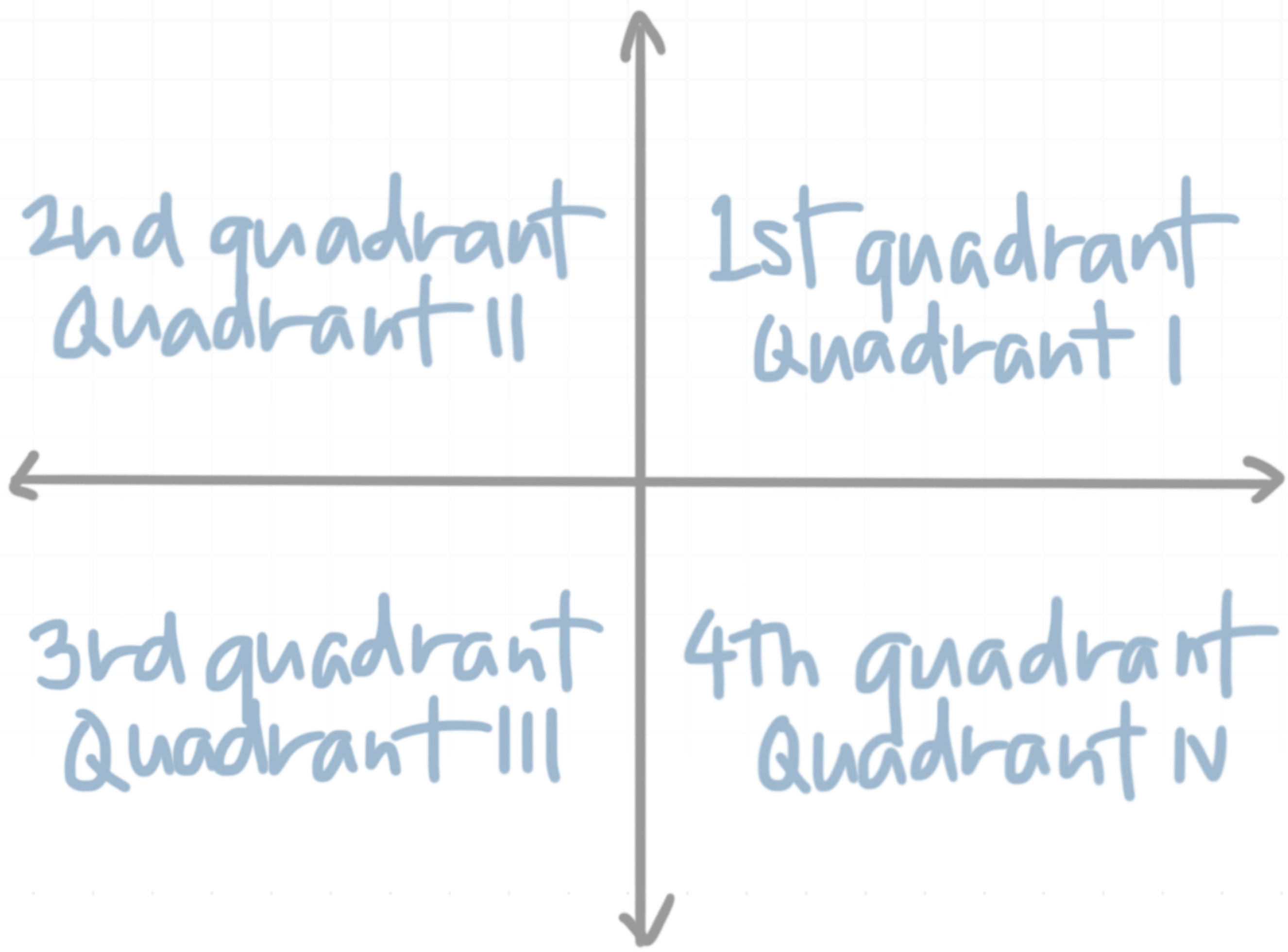
Quadrant of the angle

The horizontal x-axis and vertical y-axis divide two-dimensional space into four parts. Each of these four parts is known as a quadrant. The quadrants are always numbered 1 through 4, like this:



So when you hear that an angle is "in the third quadrant" that means that when you sketch it in standard position, the terminal side is somewhere in the third quadrant. If the terminal side falls exactly on one of the axes, technically it's not in any quadrant, since the axes aren't in a quadrant.

These are the angles that correspond to each axis.

Axis	**Degrees**	**Radians**
Positive x-axis	0	0

Positive y-axis	90	$\pi/2$
Negative x-axis	180	π
Negative y-axis	270	$3\pi/2$

Based on this table, we can make a new table to say which angles lie in each quadrant.

Quadrant	**Degrees**	**Radians**
First	$0 < \theta < 90$	$0 < \theta < \pi/2$
Second	$90 < \theta < 180$	$\pi/2 < \theta < \pi$
Third	$180 < \theta < 270$	$\pi < \theta < 3\pi/2$
Fourth	$270 < \theta < 360$	$3\pi/2 < \theta < 2\pi$

Example

Determine the quadrant in which 283° is located.

Because

$$270^\circ < 283^\circ < 360^\circ$$

we can tell from the table above that 283° lies in the fourth quadrant. We know that 270° is along the negative side of the y-axis, and that 360° is a full rotation and along the positive direction of the x-axis. 283° falls between them in the fourth quadrant.

Let’s look at an example with an angle that’s outside the interval $[0,2\pi)$.

Example

In which quadrant is $-(33/5)\pi$ located?

We can rewrite $-(33/5)$ as

$$-\frac{33}{5}=-\frac{30+3}{5}=-\left(\frac{30}{5}+\frac{3}{5}\right)=-6\frac{3}{5}$$

One full rotation is 2π radians, but this is

$-6\frac{3}{5}\pi$ radians

which means this angle is more than one full rotation. This is also a negative angle, which means we’ll be rotating clockwise. We know that one full rotation in the clockwise direction is -2π, that two full rotations is -4π, and that three full rotations is -6π. Therefore, after three full rotations, we’re sitting along the positive direction of the x-axis, with just $-(3/5)\pi$ radians to go.

One way to figure out the quadrant of this last part of the angle is to compare the angle to multiples of $\pi/2$, since we always have a multiple of $\pi/2$ along the coordinates axes.

We know that $(3/5)\pi$ is larger than $\pi/2$, but smaller than π. In other words, $3/5$ is larger than $1/2$, but smaller than 1. Which means that, in order to rotate $(3/5)\pi$, we want to rotate more than $\pi/2$, but not a full π radians. Therefore, moving clockwise from the positive direction of the x-axis, we'll go further than a $-\pi/2$ rotation, but not all the way to a $-\pi$ rotation. Which leaves us in the third quadrant.

So we can say that $-(33/5)\pi$ is located in the third quadrant.

Now let's deal with an angle in radians whose measure isn't given as a constant multiple of π.

Example

In which quadrant is 21.9 radians located?

Dividing 21.9 by π gives us about 6.97, so $21.9 \approx 6.97\pi$. Now this is outside the range 0 to 2π, and it's positive, so you'll need to subtract 2π again and again until you're left with an angle that's less than 2π.

$$6.97\pi - 2\pi = 4.97\pi$$

$$4.97\pi - 2\pi = 2.97\pi$$

$$2.97\pi - 2\pi = 0.97\pi$$

Now all we need to do is figure out the quadrant for 0.97π. Since 0.97 is more than $1/2$, but less than 1, it means that 0.97π is more than $\pi/2$, but less than π, which leaves us in the second quadrant.

Therefore, 21.9 radians is in the second quadrant.