Topic: Quadrant of the angle

Question: Which two axes make up the boundary of the third quadrant?
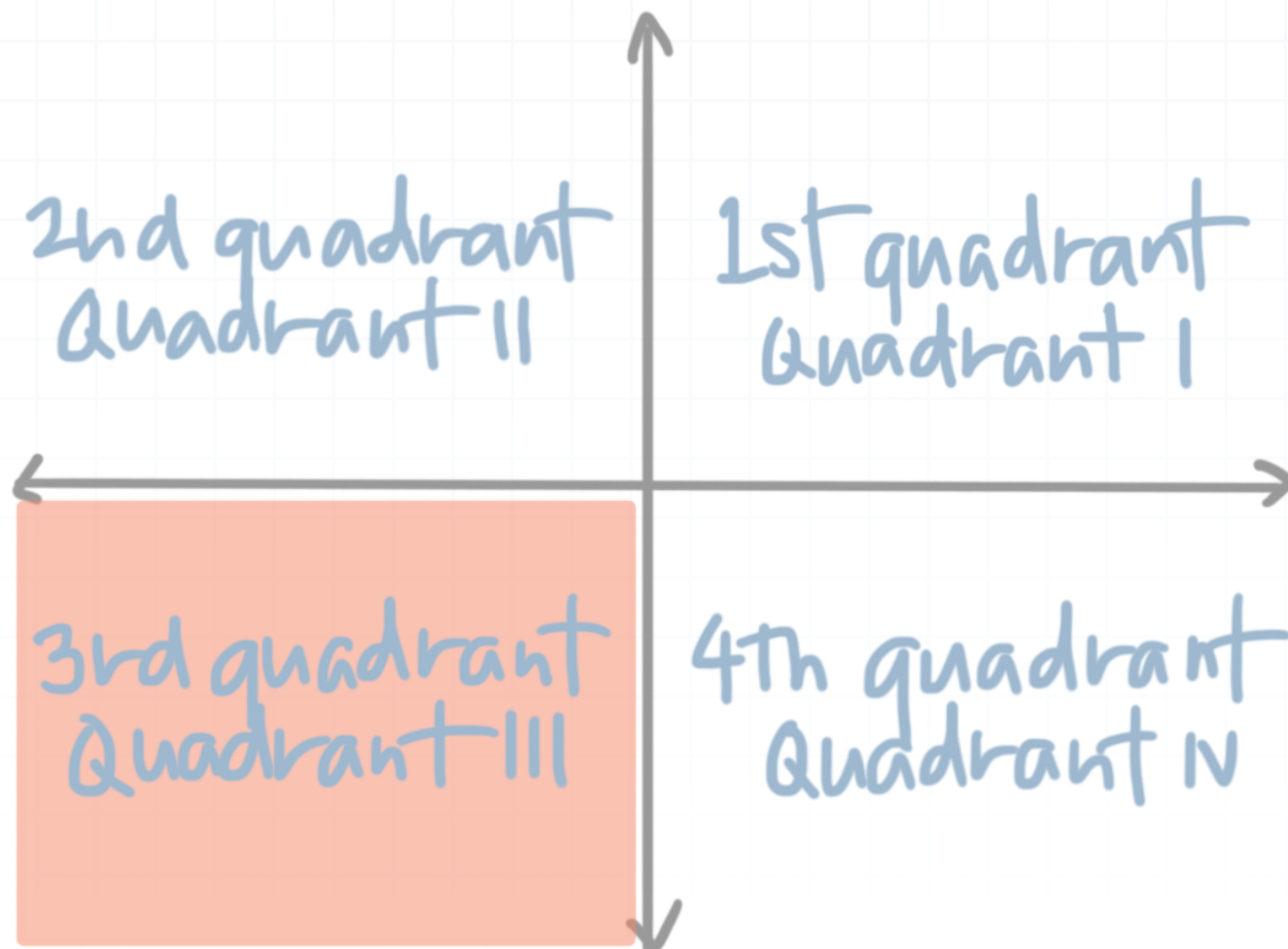
Answer choices:

A   The positive horizontal axis and the negative vertical axis

B   The negative horizontal axis and the negative vertical axis

C   The positive horizontal axis and the positive vertical axis

D   The negative horizontal axis and the positive vertical axis

Solution: B

The third quadrant is bounded by the negative horizontal axis and the negative vertical axis.

Topic: Quadrant of the angle

Question: Where is an angle of 10.5π radians in standard position located?

Answer choices:

A   On the positive vertical axis

B   On the negative vertical axis

C   In the second quadrant

D   In the fourth quadrant

Solution: A

One full rotation is 2π radians, so we know 10.5π radians is more than one full rotation. To figure out how many rotations are made by 10.5π, divide 10.5π by 2π.

$$\frac{10.5\pi}{2\pi}$$

$$5.25$$

So 10.5π is five and a quarter rotations in the positive direction. If we start along the positive x-axis in standard position and make 5 full rotations, we'll end up right back in the same place, on the positive x-axis.

One more quarter rotation will then put us along the positive y-axis.

Topic: Quadrant of the angle

Question: In which quadrant is the angle located?

$$-1,600°$$

Answer choices:

A   First quadrant

B   Second quadrant

C   Third quadrant

D   Fourth quadrant

Solution: C

One full rotation is $-360°$, so we know $-1,600°$ is more than one full rotation. To figure out how many rotations are made by $-1,600°$, divide $-1,600°$ by $-360°$.

$$\frac{-1,600°}{-360°}$$

$$4.44$$

So $-1,600°$ is almost four and a half rotations in the negative direction. If we start along the positive x-axis in standard position and make 4 full rotations in the negative direction, we'll end up right back in the same place, on the positive x-axis.

Four full rotations is

$$4(-360°)$$

$$-1,440°$$

and once we've made a $-1,440°$ rotation, to get to $-1,600°$, we'll need an additional $-160°$ of rotation. From standard position, we know $-90°$ puts us along the negative vertical axis, and then $-180°$ puts us along the negative horizontal axis. So a rotation of $-160°$ will put us in the third quadrant, just short of the negative horizontal axis.