

Grade 6 - The Coordinate Plane and Polygons - Lesson

Common Core 6.NS.C.6b, 6.NS.C.6c, 6.NS.C.8, 6.G.A.3 · maths-pdf.fr/en/

The coordinate plane uses two perpendicular number lines, the x-axis and y-axis, to locate points with ordered pairs (x, y). It has four quadrants, and a reflection changes the sign of one coordinate. If two points share an x or y coordinate, their distance is found from absolute values. Polygons can be drawn by plotting vertices and measuring sides.

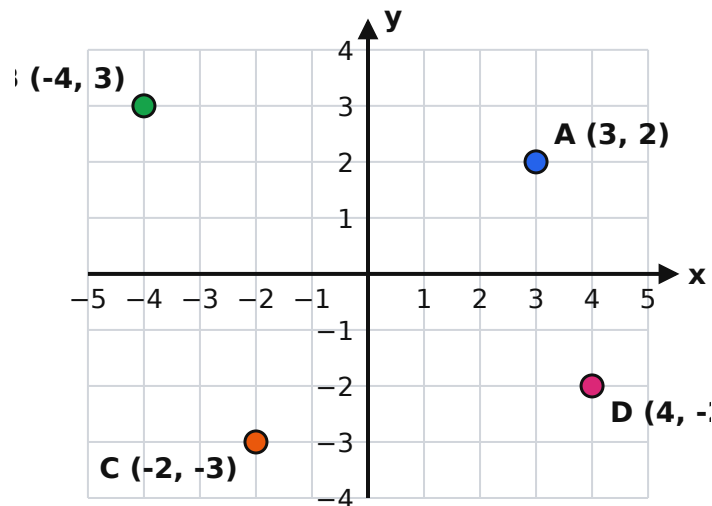
Grade 6 · Common Core State Standards: **6.NS.C.6b, 6.NS.C.6c, 6.NS.C.8, 6.G.A.3**

Key facts

- An ordered pair (x, y) gives the horizontal move first, then the vertical move.
- The signs of x and y tell the quadrant.
- Reflecting across the x-axis changes the sign of y; across the y-axis changes the sign of x.
- Points that share a coordinate are a distance apart equal to the difference or sum of the absolute values.
- Side lengths of a polygon on the plane give its perimeter and area.

How does the coordinate plane work?

The coordinate plane has a horizontal x-axis and a vertical y-axis that cross at the origin (0,0). An ordered pair (x,y) tells you to move x units right or left, then y units up or down. The axes split the plane into four **quadrants**.



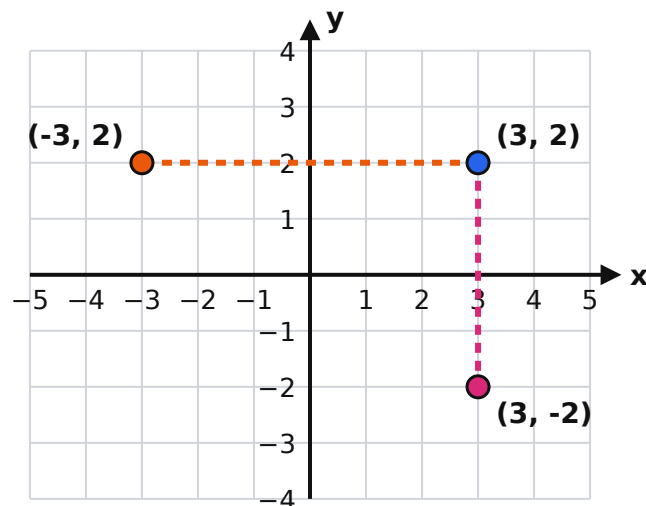
Quadrants I to IV start at the upper right and go counterclockwise.

Quadrants

Quadrant I: $(+,+)$. Quadrant II: $(-,+)$. Quadrant III: $(-,-)$. Quadrant IV: $(+,-)$. A point on an axis is in no quadrant.

What is a reflection?

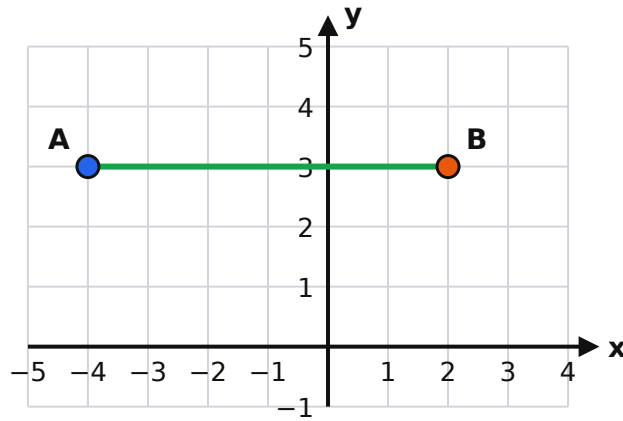
A reflection flips a point over an axis. Reflecting $(3,2)$ across the y -axis gives $(-3,2)$, because x changes sign. Reflecting across the x -axis gives $(3,-2)$, because y changes sign. The two points are opposites in one coordinate.



Reflect across the y -axis: x changes sign. Reflect across the x -axis: y changes sign.

How do you find distance on the plane?

If two points have the same x or the same y, the distance is the absolute value of the difference. If the coordinates have the same sign, subtract the absolute values. If they have opposite signs, add them. The points $(-4,3)$ and $(2,3)$ are $|-4|+|2|=6$ units apart.

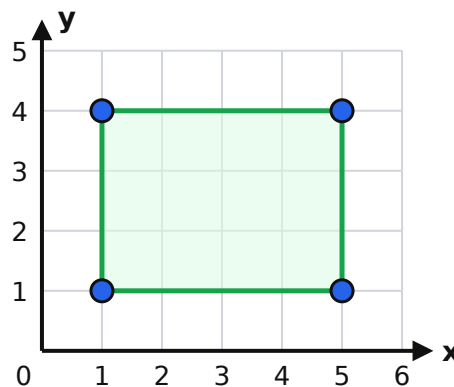


Same y-coordinate: distance = $|-4| + |2| = 6$.

How do you draw polygons on the plane?

1. Plot each vertex and connect the points in order.
2. Find the side lengths using distances between points with a shared coordinate.
3. Use the lengths to find perimeter and area.

Example: The rectangle with vertices $(1,1)$, $(5,1)$, $(5,4)$, and $(1,4)$ has length $5-1=4$ and width $4-1=3$. Its perimeter is $2(4+3)=14$ and its area is $4 \times 3 = 12$.



Side lengths come from the distances between vertices: 4 and 3.

Questions about the coordinate plane and polygons

What is an ordered pair?

An ordered pair (x, y) gives the location of a point. The first number is the horizontal move from the origin and the second is the vertical move.

How do you tell which quadrant a point is in?

Check the signs. $(+, +)$ is Quadrant I, $(-, +)$ is Quadrant II, $(-, -)$ is Quadrant III, and $(+, -)$ is Quadrant IV.

How do you reflect a point across an axis?

For the x-axis, change the sign of the y-coordinate. For the y-axis, change the sign of the x-coordinate.

How do you find the distance between two points on the same horizontal line?

Use the x-coordinates. If they have the same sign, subtract the absolute values; if they have opposite signs, add them.

How do you find the perimeter of a polygon on the coordinate plane?

Find the length of each side from the coordinates of its endpoints, then add all the lengths.