

1.3 Use Midpoint and Distance Formulas

G.PE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Big Idea!

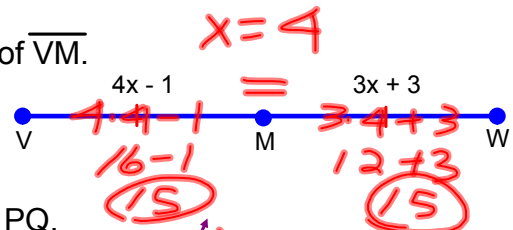
To learn how to find the midpoint and distance between two points in the coordinate plane.

Midpoint - the point that divides the segment into two congruent segments.

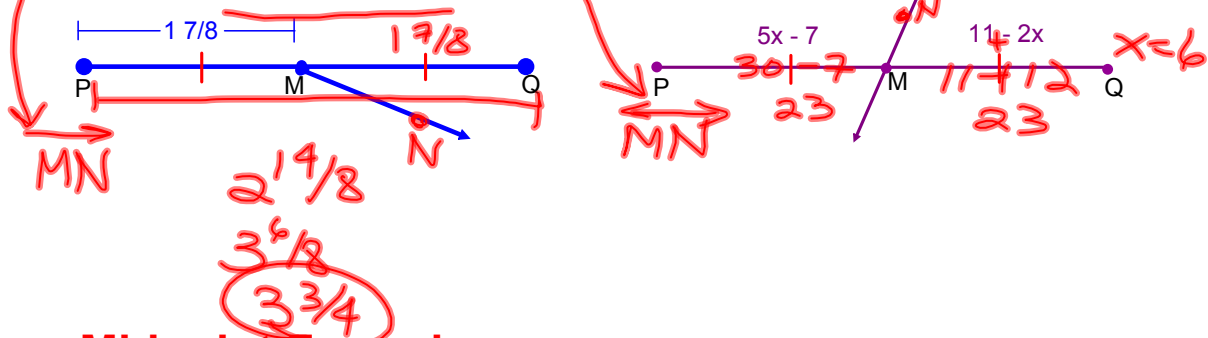
Segment Bisector - a point, ray, line, line segment, or plane that intersects the segment at its midpoint.

Using algebra with segment lengths.

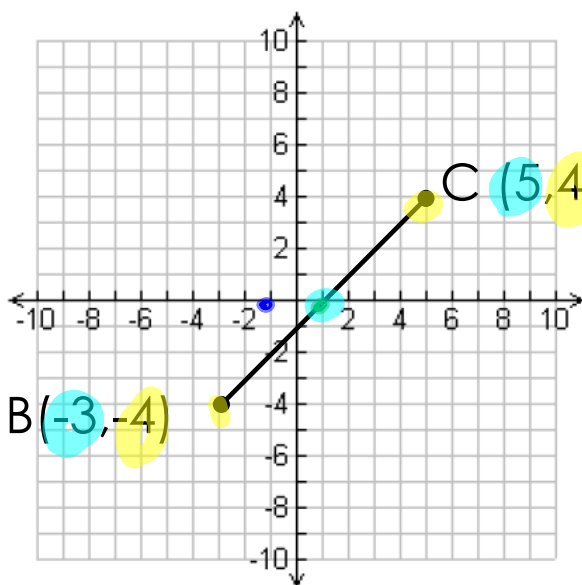
Point M is the midpoint of \overline{VW} . Find the length of \overline{VM} .



Identify the segment bisector of \overline{PQ} . Then find PQ .



Midpoint Formula:



$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\left(\frac{-3 + 5}{2}, \frac{-4 + 4}{2} \right)$$

$$(1, 0)$$

BC's midpoint:

$(1, 0)$

Pull

Find the coordinates of the midpoint of the segment with the given endpoints.

1. T(^x4, ^y-1) and K(^x6, ^y0)

$$\left(\frac{\cancel{4} + \cancel{6}}{2}, \frac{\cancel{-1} + \cancel{0}}{2} \right) = (5, -\frac{1}{2})$$

2. A(⁴4, ⁴2) and C(⁴0, ⁴2)

$$\left(\frac{\cancel{4} + \cancel{0}}{2}, \frac{\cancel{2} + \cancel{2}}{2} \right) = (2, 2)$$

3. P(-5,5) and C(7,3)

1. $(5, -\frac{1}{2})$

2. (2,2)

3. (1,4)

Pull

Find the coordinates of point B, given one endpoint A, and the midpoint M.

$$\frac{x_1 + x_2}{2} = x_m \quad \frac{y_1 + y_2}{2} = y_m$$

A(5,4) and M(3,-2)

$$\frac{5 + x}{2} = 3 \cdot 2 \quad \frac{4 + y}{2} = -2 \cdot 2$$

$$5 + x = 6 \quad 4 + y = -4$$

$$x = 1 \quad y = -8$$

A(-3,-2) and M(-1,-8)

$$\frac{-3 + x}{2} = -1 \cdot 2 \quad \frac{-2 + y}{2} = -8 \cdot 2$$

$$-3 + x = -2 \quad -2 + y = -16$$

$$x = 1 \quad y = -14$$

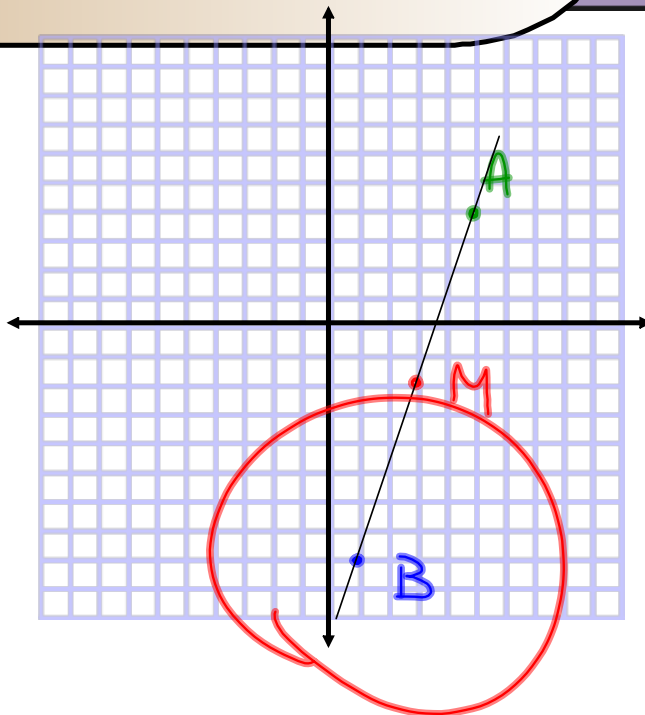
A(1,0) and M(3,-3)

1. (1,-8)

2. (1,-14)

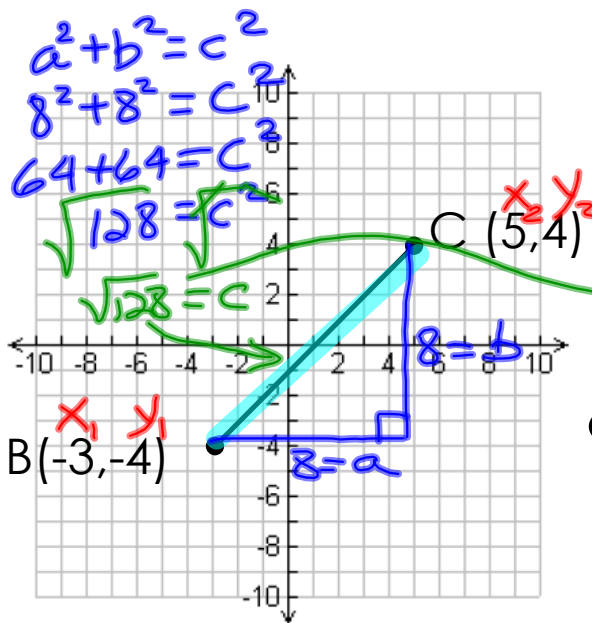
3. (5,-6)

Pull



Distance Formula

Distance Formula: $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ given (x_1, y_1) and (x_2, y_2) .



$$d = \sqrt{(-3 - 5)^2 + (-4 - 4)^2}$$

$$d = \sqrt{64 + 64}$$

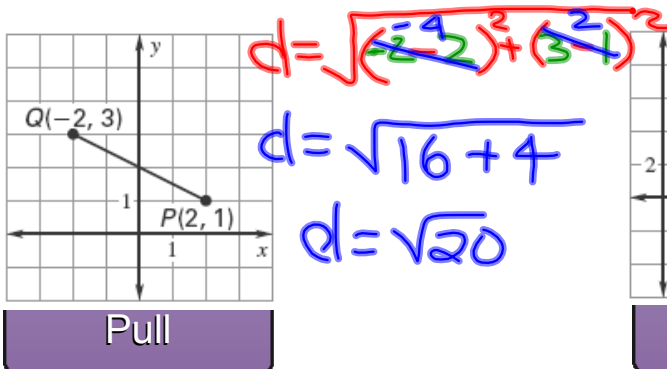
$$d = \sqrt{128}$$

Calculate BC:

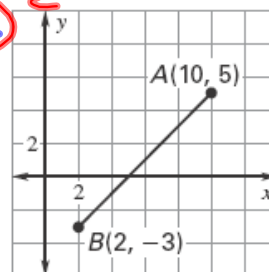
$$\sqrt{128} = 8\sqrt{2} \approx 11.31$$

Pull

Find the length of each segment.



Pull



Pull