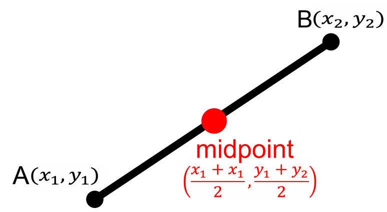
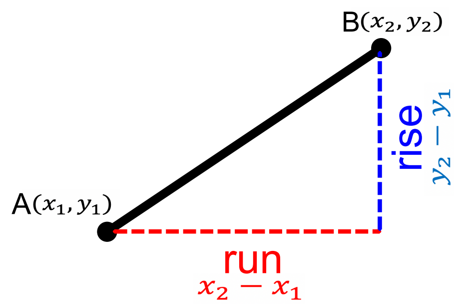
To find the _______________ of a line segment, you must find the middle (average) of both the x and y coordinates of the endpoints. If A has coordinates (x_1, y_1) and B has coordinates (x_2, y_2), then the coordinates of the midpoint of line segment AB are $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$



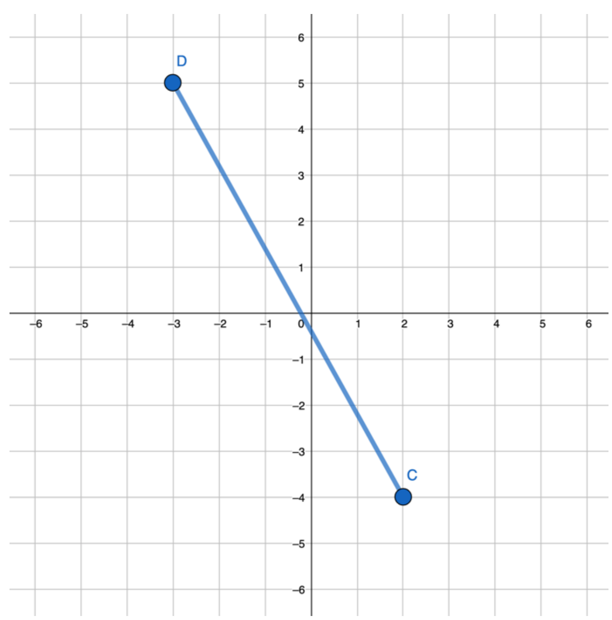
To find the _______________ of a line segment, we first construct a right-angle triangle using the rise and run of the line segment. The run is the difference in the x-coordinates of the endpoints, and the rise is the difference in the y-coordinates of the endpoints. You can then use Pythagorean Theorem, $a^2 + b^2 = c^2$ to calculate the length of the line segment.



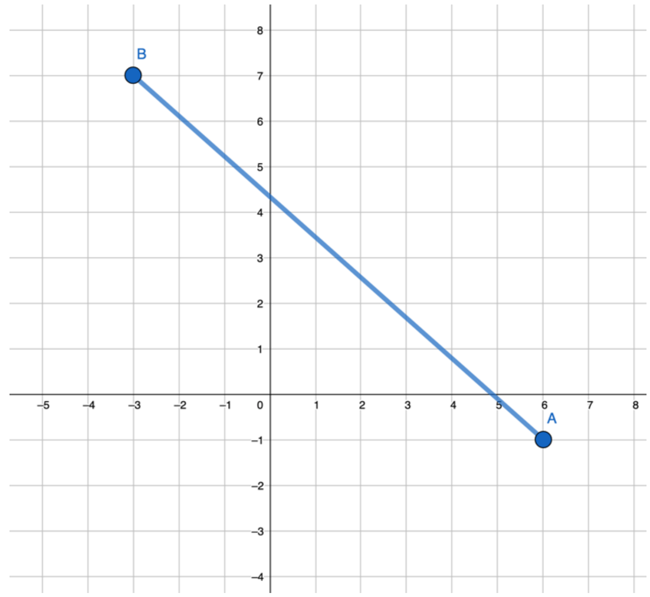
$$(length\ of\ AB)^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

$$length\ of\ AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Example 1: Calculate the length and midpoint of the line segment joining the endpoints $C(2, -4)$ and $D(-3,5)$.



Example 2: Calculate the length and midpoint of the line segment joining the endpoints $A(6, -1)$ and $B(-3,7)$.

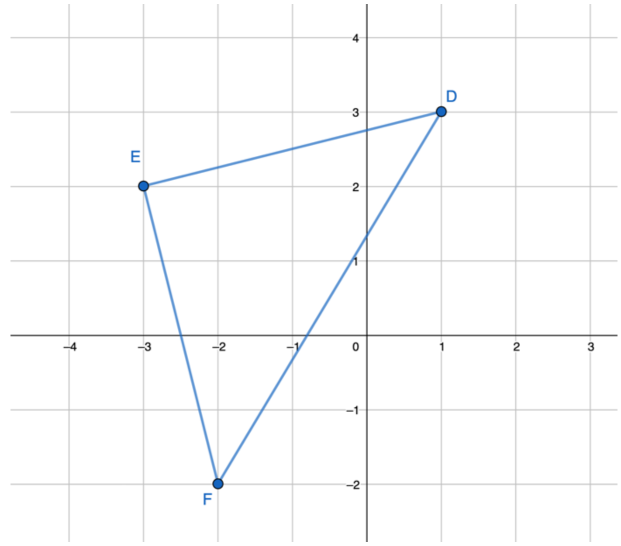


Example 3: Calculate the length and midpoint of the line segment joining the endpoints $E\left(-\frac{5}{8}, \frac{1}{8}\right)$ and $F(4, \frac{3}{4})$.

Example 4: If line segment AB has point $A(5,7)$ and a midpoint at $(4,8)$, what are the coordinates of point B?

Example 5: Triangle DEF has vertices $D(1,3)$, $E(-3,2)$, and $F(-2,-2)$.

a) Classify the triangle by side length



b) Determine the perimeter of the triangle rounded to the nearest tenth.

c) Is it a right-angle triangle? Give proof.