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coordinates of midpoint

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The coordinates of the midpoint of a line segment are the arithmetic means of the coordinates of the endpoints of the segment. Thus, if the endpoints are  $(x_1, y_1)$  and  $(x_2, y_2)$ , then the midpoint is

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

For justifying the above coordinates of the midpoint, we know that its abscissa  $x_0$  halves on the  $x$ -axis the line segment between  $x_1$  and  $x_2$ . Since the lengths of the half-segments are  $x_0-x_1$  and  $x_2-x_0$ , if  $x_1 < x_2$ , and their opposite numbers, if  $x_2 < x_1$ , in any case we can write

$$x_0 - x_1 = x_2 - x_0.$$

Solving this equation for  $x_0$  yields:  $x_0 = \frac{x_1+x_2}{2}$ . result is gotten for the ordinate of the midpoint.