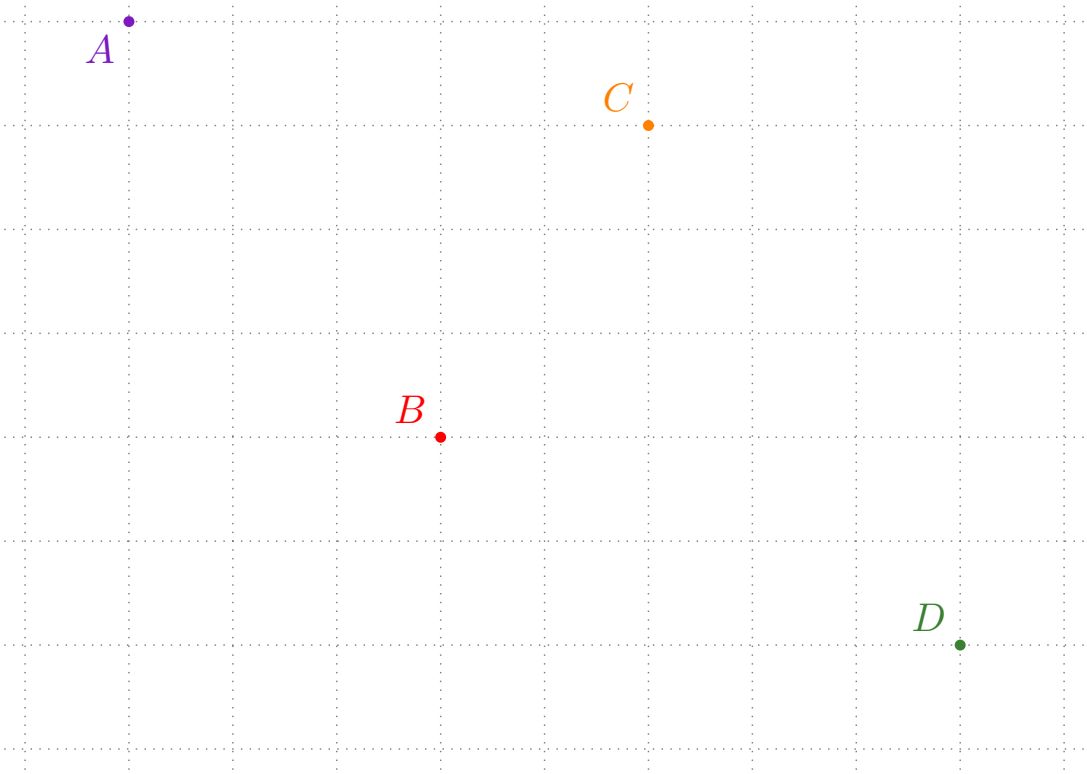
Shortest Distance

Find the shortest distance between all pairs of points



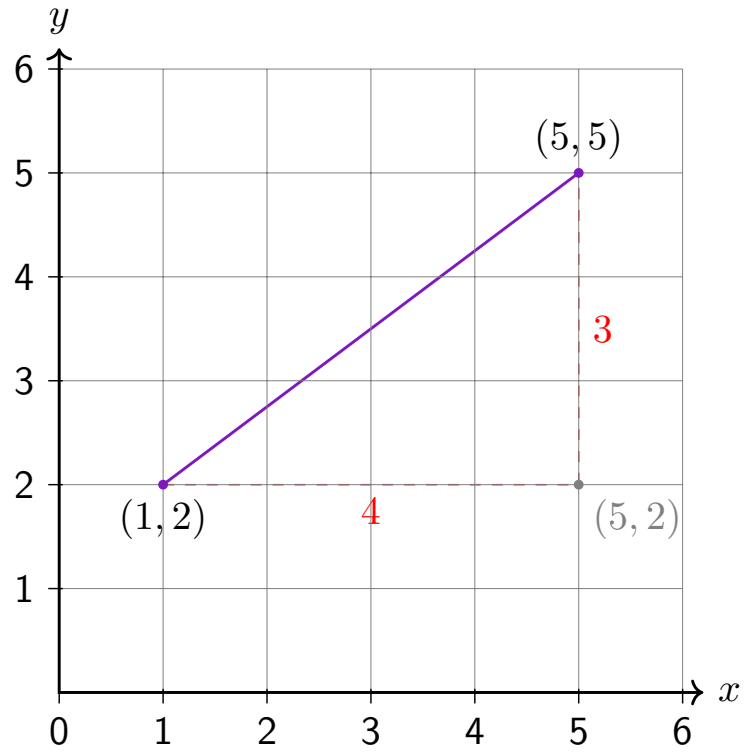
Example

Example 1

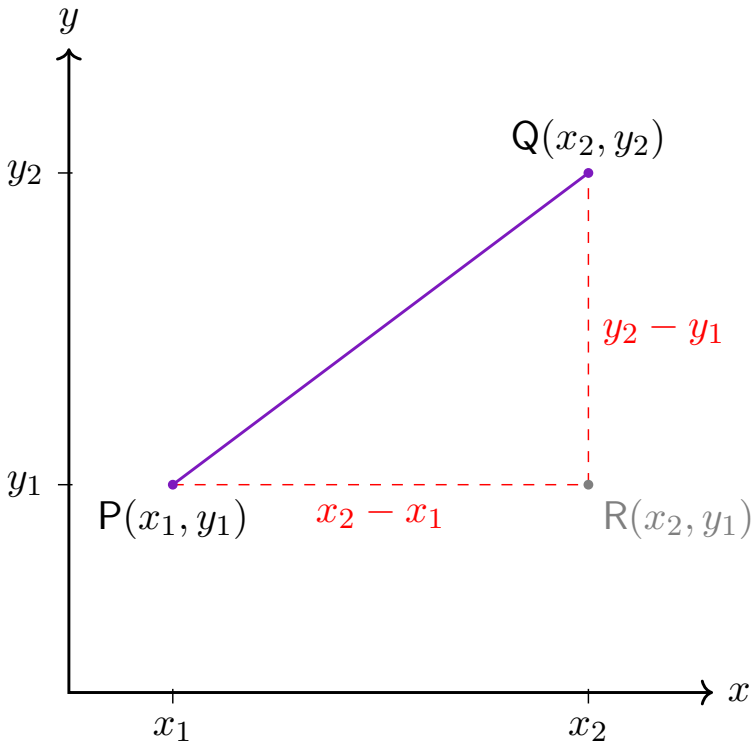
Find the shortest distance between the points $(1, 2)$ and $(5, 5)$.

Example

Find the shortest distance numerically



Algebraically



Distance between two points

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

Example

Example 2

Find the shortest distance between $(-2, 3)$ and $(4, -5)$.

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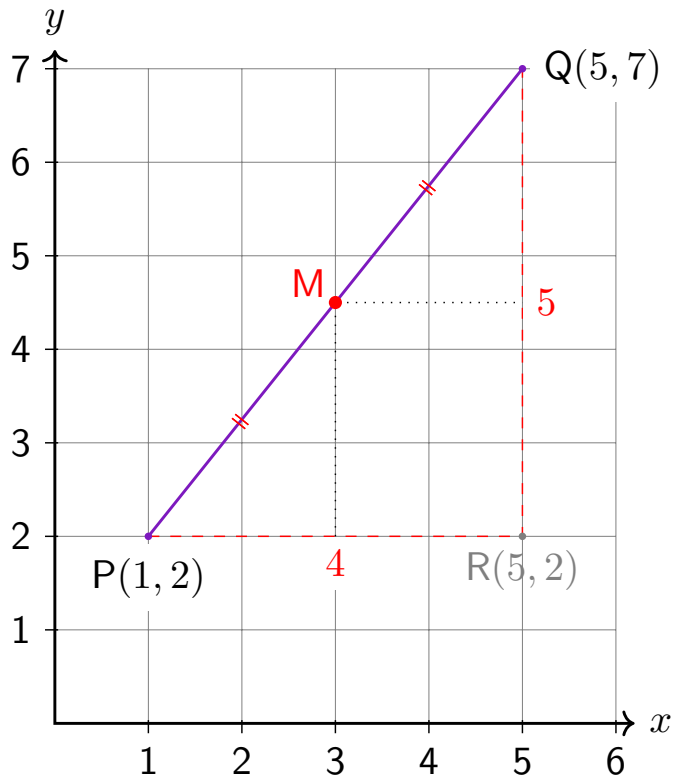
Example

Example 3

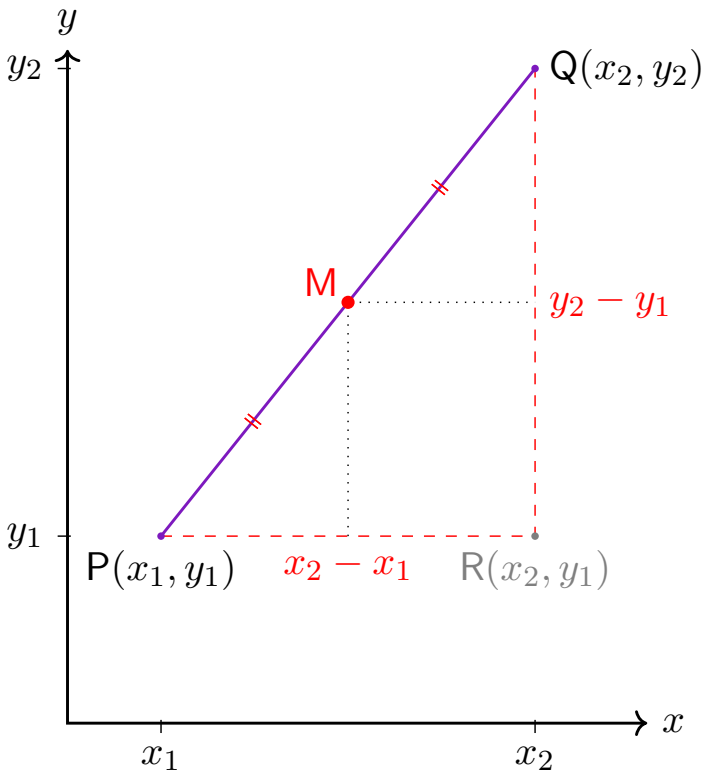
Find the midpoint of the line segment connecting the points $W(1, 2)$ and $Z(5, 7)$.

Example

Find the midpoint numerically



Algebraically



Midpoints

General formula

The **midpoint** of a line segment is the average of the two end coordinates

Midpoints

The midpoint of the line segment joining (x_1, y_1) and (x_2, y_2) is

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

Example

Example 4

M is the midpoint of the line segment joining $A(1, -3)$ to $B(3, 4)$.

a. Find the coordinates of M.

b. M is also the midpoint of the line segment CD, where $C(1, 3)$. Find the coordinates of D.

a. $M(2, \frac{1}{2})$ b. $D(3, -2)$