

GIVEN 2 POINTS:

$$(x_1, y_1) \quad (x_2, y_2)$$

DISTANCE FORMULA

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

$$\textcircled{1} \quad \begin{matrix} (1, 5) & (5, 8) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} d &= \sqrt{\left(\frac{8}{y_2} - \frac{5}{y_1}\right)^2 + \left(\frac{5}{x_2} - \frac{1}{x_1}\right)^2} \\ &= \sqrt{3^2 + 4^2} \\ &= \sqrt{9 + 16} \\ &= \sqrt{25} \\ &= \textcircled{5} \end{aligned}$$

$$\textcircled{2} \quad \begin{matrix} (-2, -3) & (7, -5) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} d &= \sqrt{\left(\frac{-5}{y_2} - \frac{-3}{y_1}\right)^2 + \left(\frac{7}{x_2} - \frac{-2}{x_1}\right)^2} \\ &= \sqrt{(-5+3)^2 + (7+2)^2} \\ &= \sqrt{(-2)^2 + (9)^2} \\ &= \sqrt{4+81} \\ &= \sqrt{85} \end{aligned}$$

$$\begin{matrix} 85 \\ \swarrow \searrow \\ 5 \quad 17 \end{matrix}$$

$$\textcircled{3} \quad \begin{matrix} (3\sqrt{2}, \sqrt{7}) & (5\sqrt{2}, 4\sqrt{7}) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} d &= \sqrt{\left(\frac{4\sqrt{7}}{y_2} - \frac{\sqrt{7}}{y_1}\right)^2 + \left(\frac{5\sqrt{2}}{x_2} - \frac{3\sqrt{2}}{x_1}\right)^2} \\ &= \sqrt{(3\sqrt{7})^2 + (2\sqrt{2})^2} \\ &= \sqrt{3^2(\sqrt{7})^2 + 2^2(\sqrt{2})^2} \\ &= \sqrt{9(7) + 4(2)} \\ &= \sqrt{63+8} \\ &= \sqrt{71} \end{aligned}$$

MIDPOINT FORMULA

GIVEN 2 POINTS

$$(x_1, y_1) \quad (x_2, y_2)$$

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

MIDPOINT

$$\textcircled{4} \quad \begin{matrix} (2, 7) & (4, 3) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} m &= \left(\frac{2+4}{2}, \frac{7+3}{2}\right) \\ &= \left(\frac{6}{2}, \frac{10}{2}\right) \\ &= (3, 5) \end{aligned}$$

$$\textcircled{5} \quad \begin{matrix} (1, 5) & (3, 2) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} m &= \left(\frac{1+3}{2}, \frac{5+2}{2}\right) \\ &= \left(\frac{4}{2}, \frac{7}{2}\right) \\ &= (2, \frac{7}{2}) \end{aligned}$$

$$\textcircled{6} \quad \begin{matrix} (4\sqrt{3}, 2\sqrt{5}) & (8\sqrt{3}, 3\sqrt{5}) \\ x_1, y_1 & x_2, y_2 \end{matrix}$$

$$\begin{aligned} m &= \left(\frac{4\sqrt{3}+8\sqrt{3}}{2}, \frac{2\sqrt{5}+3\sqrt{5}}{2}\right) \\ &= \left(\frac{12\sqrt{3}}{2}, \frac{5\sqrt{5}}{2}\right) \end{aligned}$$

$$(6\sqrt{3}, \frac{5\sqrt{5}}{2})$$