

## Distance and Midpoint Formulas

For each of the following, find the distance and midpoint between each pair of points.

The distance between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The midpoint between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  is  $Mdpt = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$$1. D = \sqrt{(5 - 2)^2 + (4 - 8)^2}$$

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

$$D = \sqrt{9 + 16} = \sqrt{25} = 5$$

$$Mdpt = \left( \frac{2+5}{2}, \frac{8+4}{2} \right)$$

$$Mdpt = \left( \frac{7}{2}, \frac{12}{2} \right) = \left( 3\frac{1}{2}, 6 \right)$$

$$2. D = \sqrt{(-4 - 3)^2 + (7 - (-4))^2}$$

$$D = \sqrt{(-7)^2 + (11)^2}$$

$$D = \sqrt{49 + 121} = \sqrt{170} \approx 13.04$$

$$Mdpt = \left( \frac{3+(-4)}{2}, \frac{-4+7}{2} \right)$$

$$Mdpt = \left( \frac{-1}{2}, \frac{3}{2} \right) = \left( -\frac{1}{2}, 1\frac{1}{2} \right)$$

$$3. D = \sqrt{(7.6 - 2.6)^2 + (-9.5 - 3.5)^2}$$

$$D = \sqrt{5^2 + (-13)^2}$$

$$D = \sqrt{25 + 169} = \sqrt{194} \approx 13.93$$

$$Mdpt = \left( \frac{2.6+7.6}{2}, \frac{3.5-9.5}{2} \right)$$

$$Mdpt = \left( \frac{10.2}{2}, \frac{-6}{2} \right) = (5.1, -3)$$

$$4. D = \sqrt{\left(7\frac{1}{2} - 4\frac{1}{2}\right)^2 + \left(4\frac{1}{3} - (-3\frac{2}{3})\right)^2}$$

$$D = \sqrt{3^2 + 8^2}$$

$$D = \sqrt{9 + 64} = \sqrt{73} \approx 8.54$$

$$Mdpt = \left( \frac{4\frac{1}{2} + 7\frac{1}{2}}{2}, \frac{-3\frac{2}{3} + 4\frac{1}{3}}{2} \right)$$

$$Mdpt = \left( \frac{12}{2}, \frac{\frac{2}{3}}{2} \right) = \left( 6, \frac{1}{3} \right)$$

$$5. D = \sqrt{(3.25 - 2.9)^2 + (7.29 - (-4.8))^2}$$

$$D = \sqrt{0.6^2 + 12.09^2}$$

$$D = \sqrt{0.36 + 146.1681}$$

$$D = \sqrt{146.5281} \approx 12.1$$

$$Mdpt = \left( \frac{2.9+3.25}{2}, \frac{-4.8+7.29}{2} \right)$$

$$Mdpt = \left( \frac{6.15}{2}, \frac{2.49}{2} \right) = (3.075, 1.245)$$

$$6. D = \sqrt{\left(5\frac{2}{7} - 2\frac{2}{7}\right)^2 + \left(3\frac{1}{4} - (-4\frac{2}{3})\right)^2}$$

$$D = \sqrt{3^2 + \left(\frac{95}{12}\right)^2}$$

$$D = \sqrt{9 + \frac{9025}{144}} = \sqrt{\frac{10321}{144}}$$

$$D = \frac{\sqrt{10321}}{\sqrt{144}} = \frac{\sqrt{10321}}{12} \approx 8.47$$

$$Mdpt = \left( \frac{2\frac{2}{7} + 5\frac{2}{7}}{2}, \frac{-4\frac{2}{3} + 3\frac{1}{4}}{2} \right)$$

$$Mdpt = \left( \frac{7\frac{4}{7}}{2}, \frac{-1\frac{5}{12}}{2} \right) = \left( 3\frac{11}{14}, -\frac{17}{24} \right)$$

$$\begin{aligned} 7. D &= \sqrt{(-5.2 - (-2.3))^2 + (-0.9 - (-7.8))^2} \\ D &= \sqrt{(-2.9)^2 + (6.9)^2} \\ D &= \sqrt{8.41 + 47.61} \\ D &= \sqrt{56.02} \approx 7.48 \\ Mdpt &= \left( \frac{-2.3-5.2}{2}, \frac{-7.8-0.9}{2} \right) \\ Mdpt &= \left( \frac{-7.5}{2}, \frac{-8.7}{2} \right) = (-3.75, -4.35) \end{aligned}$$

$$\begin{aligned} 8. D &= \sqrt{(-5.6 - (-5.6))^2 + (3.7 - 2.4)^2} \\ D &= \sqrt{0^2 + 1.3^2} \\ D &= \sqrt{1.69} = 1.3 \\ Mdpt &= \left( \frac{-5.6+(-5.6)}{2}, \frac{2.4+3.7}{2} \right) \\ Mdpt &= \left( \frac{-11.2}{2}, \frac{6.1}{2} \right) = (-5.6, 3.05) \end{aligned}$$