G.GPE.B.5: Parallel and Perpendicular Lines 8

1. What is an equation of the perpendicular bisector of the line segment shown in the diagram below?

![Diagram of a line segment and its perpendicular bisector]

1) \(y + 2x = 0\)
2) \(y - 2x = 0\)
3) \(2y + x = 0\)
4) \(2y - x = 0\)

2. The coordinates of the endpoints of \(AB\) are \(A(0,0)\) and \(B(0,6)\). The equation of the perpendicular bisector of \(AB\) is

1) \(x = 0\)
2) \(x = 3\)
3) \(y = 0\)
4) \(y = 3\)

3. Which equation represents the perpendicular bisector of \(AB\) whose endpoints are \(A(8,2)\) and \(B(0,6)\)?

1) \(y = 2x - 4\)
2) \(y = \frac{1}{2} x + 2\)
3) \(y = -\frac{1}{2} x + 6\)
4) \(y = 2x - 12\)

4. Triangle \(ABC\) has vertices \(A(0,0)\), \(B(6,8)\), and \(C(8,4)\). Which equation represents the perpendicular bisector of \(BC\)?

1) \(y = 2x - 6\)
2) \(y = -2x + 4\)
3) \(y = \frac{1}{2} x + \frac{5}{2}\)
4) \(y = -\frac{1}{2} x + \frac{19}{2}\)

5. Line segment \(NY\) has endpoints \(N(-11,5)\) and \(Y(5,-7)\). What is the equation of the perpendicular bisector of \(NY\)?

1) \(y + 1 = \frac{4}{3} (x + 3)\)
2) \(y + 1 = -\frac{3}{4} (x + 3)\)
3) \(y - 6 = \frac{4}{3} (x - 8)\)
4) \(y - 6 = -\frac{3}{4} (x - 8)\)
6 If \( \overline{AB} \) is defined by the endpoints \( A(4,2) \) and \( B(8,6) \), write an equation of the line that is the perpendicular bisector of \( \overline{AB} \).

7 Write an equation of the line that is the perpendicular bisector of the line segment having endpoints \((3, -1)\) and \((3, 5)\). [The use of the grid below is optional]

8 Write an equation of the perpendicular bisector of the line segment whose endpoints are \((-1, 1)\) and \((7, -5)\). [The use of the grid below is optional]

9 Determine the distance between point \( A(-1, -3) \) and point \( B(5, 5) \). Write an equation of the perpendicular bisector of \( \overline{AB} \). [The use of the accompanying grid is optional.]
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Answer Section

1 ANS: 4
The segment’s midpoint is the origin and slope is \(-2\). The slope of a perpendicular line is \(\frac{1}{2}\).

\[ y = \frac{1}{2} x + 0 \]
\[ 2y = x \]
\[ 2y - x = 0 \]

REF: 081724geo

2 ANS: 4
\(AB\) is a vertical line, so its perpendicular bisector is a horizontal line through the midpoint of \(AB\), which is \((0,3)\).

REF: 011225ge

3 ANS: 1
\[ m = \left( \frac{8 + 0}{2}, \frac{2 + 6}{2} \right) = (4,4) \]
\[ m = \frac{6 - 2}{0 - 8} = \frac{4}{-8} = -\frac{1}{2} \]
\[ m_\perp = 2 \]
\[ y = mx + b \]
\[ 4 = 2(4) + b \]
\[ -4 = b \]

REF: 081126ge

4 ANS: 3
midpoint: \(\left( \frac{6 + 8}{2}, \frac{8 + 4}{2} \right) = (7,6)\)
\[ m = \frac{8 - 4}{6 - 8} = \frac{4}{-2} = -2 \]
\[ m_\perp = \frac{1}{2} \]
\[ 6 = \frac{1}{2} (7) + b \]
\[ \frac{12}{2} = \frac{7}{2} + b \]
\[ \frac{5}{12} = b \]

REF: 081327ge

5 ANS: 1
\[ m = \left( \frac{-11 + 5}{2}, \frac{5 + 7}{2} \right) = (-3,-1) \]
\[ m = \frac{5 - 7}{-11 - 5} = \frac{12}{-16} = -\frac{3}{4} \]
\[ m_\perp = \frac{4}{3} \]

REF: 061612geo

6 ANS:
\[ M = \left( \frac{4 + 8}{2}, \frac{2 + 6}{2} \right) = (6,4) \]
\[ m = \frac{6 - 2}{8 - 4} = \frac{4}{4} = 1 \]
\[ m_\perp = -1 \]
\[ y - 4 = -(x - 6) \]

REF: 081536ge
7 ANS:

\[ M = \left( \frac{3 + 3}{2}, \frac{-1 + 5}{2} \right) = (3, 2), \quad y = 2. \]

REF: 011334ge

8 ANS:

\( y = \frac{4}{3}x - 6. \) \( M_x = \frac{-1 + 7}{2} = 3 \]

The perpendicular bisector goes through \((3, -2)\) and has a slope of \(\frac{4}{3}\).

\[ M_y = \frac{1 + (-5)}{2} = -2 \]

\[ m = \frac{1 - (-5)}{-1 - 7} = -\frac{3}{4} \]

\[ y - y_M = m(x - x_M). \]

\[ y + 2 = \frac{4}{3}(x - 3) \]

REF: 080935ge
9. \( d = \sqrt{(-1-5)^2 + (-3-5)^2} \)

\[ y - 1 = -\frac{3}{4}(x - 2). \]

To find the equation of the perpendicular bisector, calculate

\[ M_y = \frac{-1 + 5}{2} = 2 \]

midpoint and slope. \( M_y = \frac{-3 + 5}{2} = 1 \)

The perpendicular bisector of \( \overline{AB} \) goes through \((2,1)\) and has a slope of \(-\frac{3}{4}\).

\[ y - 1 = -\frac{3}{4}(x - 2). \]

REF: 080235a