Notes: SEGMENTS AND MIDPOINTS

Content Objective: I will be able to determine the coordinate(s) of the midpoint of a segment when given the coordinates of its endpoints as represented on one-dimensional (1-D) or two-dimensional (2-D) coordinate systems.

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<th>TERM</th>
<th>DESCRIPTION</th>
<th>EXAMPLE</th>
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<td>MIDPOINT</td>
<td>A point on a segment ____________ from both endpoints.</td>
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<td>A point is the midpoint of segment if the distances from this point to each endpoint are __________.</td>
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CONSTRUCTION: Construct the midpoint of segment \( \overline{AB} \).

\[
M = \frac{a+b}{2}
\]

where \( a \) and \( b \) are the coordinates of the endpoints of the segment

EXAMPLE 1: Find the coordinate of the midpoint of \( \overline{FG} \). ___________
QUICK CHECK: Find the coordinate of the midpoint of \(JK\). _____

EXAMPLE 2: If the coordinate of the midpoint of \(AB\) on a number line is 3, and \(A\) is at \(-2\), find the coordinate of \(B\). _______
EXAMPLE 4: If the distance of \( \overline{AB} \) is 6 and the coordinate of \( A \) on a number line is -4, find the coordinate of the midpoint of \( \overline{AB} \). ____________

QUICK CHECK: If the distance of \( \overline{CD} \) is 5 and the coordinate of \( A \) on a number line is -2, find the midpoint of \( \overline{CD} \). ________________

Midpoint Formula for Two-Dimensional Coordinate System (grid)

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

where \((x_1, y_1)\) and \((x_2, y_2)\) are the coordinates of endpoints of the segment

Find the coordinates of the midpoint of each segment formed by the given points.

EXAMPLE 5: \((-9, 3)\) and \((8, -7)\)  QUICK CHECK: \((3, -6)\) and \((7, 2)\)

Midpoint:________________________

Midpoint:________________________
Find the coordinates of the missing endpoint of each segment.

**EXAMPLE 6:** M is the midpoint of \( \overline{AB} \) with \( A(0,1) \) and \( M(3,5) \). Find the coordinates of \( B \).

**QUICK CHECK:** The midpoint of \( \overline{CD} \) is \( M(-1, 4) \). What are the coordinates of \( C \) if \( D \) is at \((3, -2)\)?

**EXAMPLE 7:** Given line \( y = \frac{3}{2}x + 4 \), \( M \) is the midpoint of \( \overline{AB} \), the distance of \( \overline{AB} \) is \( \sqrt{13} \), and \( A(-4,-2) \). Find the coordinates of \( M \) and \( B \).

**QUICK CHECK:** Given line \( y = -\frac{12}{5}x + 3 \), \( M \) is the midpoint of \( \overline{CD} \), the distance of \( \overline{CD} \) is 13, and \( C(5, -9) \). Find the coordinates of \( M \) and \( D \).