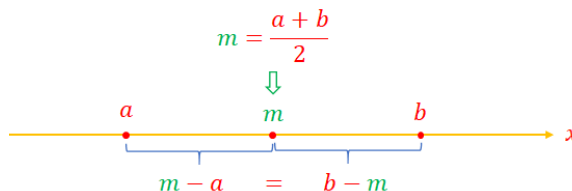# 2.1 Midpoint of a Line Segment

A Mid-Number

- ✓ The number equally distant from two other numbers.
- ✓ If a and b are any two real numbers, then the mid-number is given by the arithmetic average:

$$m = \frac{a+b}{2}$$

- ✓ The previous relation may be written as:
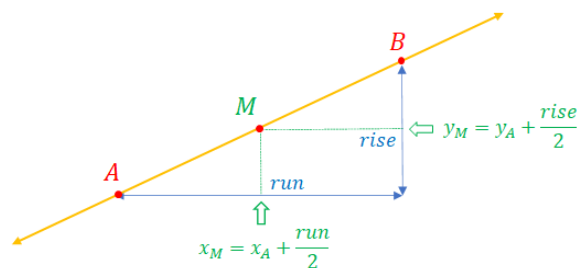 $$m - a = b - m$$

$$m = \frac{a+b}{2}$$
⇓

Ex 1. Find the mid-number for the following pair: -13 and 137.

B Mid-Point

- ✓ Is the point in the middle of a line segment.
- ✓ If $A(x_A, y_A)$ and $B(x_B, y_B)$ are the end points, then the midpoint M is given by:

$$M\left(x_A + \frac{run}{2}, y_A + \frac{rise}{2}\right)$$

$$y_M = y_A + \frac{rise}{2}$$

$$x_M = x_A + \frac{run}{2}$$

- ✓ It may be proved that $AM = MB$.

Ex 2. Prove that the midpoint M of a line segment AB may be computed by using the formula:

$$M\left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

Ex 3. Find the coordinates of the midpoint M of the segment line with the endpoints $A(-2,3)$ and $B(6,-5)$.

Ex 4. The point $M(2, -3)$ is the midpoint of the line segment AB. Given the endpoint $A(3, -1)$, find the coordinates of the point B.

Ex 5. Find h and k so $M(-2, -3)$ is the midpoint of the line segment AB where $A(h, -2)$ and $B(2, k)$.

C. Median of a Triangle

- ✓ A line joining a vertex point of a triangle and the midpoint of the opposite side.
- ✓ To find the equation of the median line from a vertex:
    1. Find the midpoint of the opposite side
    2. Find the slope of the median by using the vertex and the mid points
    3. Use $y = mx + b$, slope and one known point to find b
    4. Write the equation of the median line
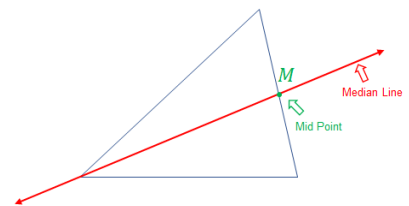
Ex 6. Consider the triangle ΔABC where $A(1,4)$, $B(5, -2)$ and $C(-1, 2)$. Find the equation of the median from the vertex A.

D Right Bisector

✓ A line perpendicular to a line segment and passing through the midpoint of that line segment.
✓ It is also called perpendicular bisector.
✓ To find the equation of the median line from a vertex:
1. Find the midpoint of the line segment
2. Find the slope of the line segment
3. Find the slope of the perpendicular line by using: $m_2 = -\frac{1}{m_1}$
4. Use $y = mx + b$, slope and the midpoint point to find b
5. Write the equation of the right bisector
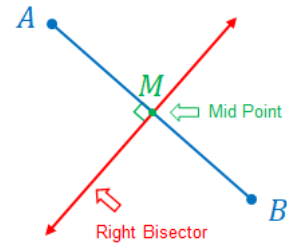
Ex 7. Consider the triangle ΔABC where $A(1,4)$, $B(5,-2)$ and $C(-1,2)$. Find the equation of the right bisector on the side AB.

Ex 8. Let consider the line segment AB where $A(-3,4)$ and $B(9,10)$. Find two points M and N that trisect AB (divide AB in three equal parts: $AM = MN = NB$).

Reading: Textbook Pages 56-65
Homework: Textbook Page 66-69 # 1a, 2a, 3a, 8, 13, 16, 19, 24, 28, 29