GEOMETRY

1.7   Segment and Angle Bisectors

Midpoint – Point that divides a segment into 2 $\cong$ segments.

Segment Bisector – Segment, ray, or line that bisects a segment at its midpoint.

Midpoint Formula - If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in the coordinate plane, then the midpoint is

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

Ex Find the coordinates of the midpoint of a segment with the given endpoints.

(1) A(-2, 3) and B(5, -2)

$$M = \left(\frac{-2+5}{2}, \frac{3+-2}{2} \right)$$

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

(2) A(-7, 2) and B(3, 0)

$$M = \left(\frac{-7+3}{2}, \frac{2+0}{2} \right)$$

$$= \left(\frac{-4}{2}, \frac{2}{2} \right)$$

$$= (-2, 1)$$

Ex Find the coordinates of the other endpoint of the segment with the given endpoint and midpoint M.

(1) A(-1, 7)
M(2, 4)

$(5, 1)$

$B(x_2, y_2)$

$$\frac{-1 + x_2}{2} = \frac{2}{1}$$

$$-1 + x_2 = 4$$

$$x_2 = 5$$

$$\frac{7 + y_2}{2} = \frac{4}{1}$$

$$7 + y_2 = 8$$

$$y_2 = 1$$

(2) A(-4, -4)
M(3, 0)

$$\frac{-4 + y_2}{2} = 0$$
$$\quad +4 \qquad +4$$

$$y_2 = 4$$

$$\frac{-4 + x_2}{2} = 3 \cdot 2$$

$$2 \cdot 2$$

$$-4 + x_2 = 6$$
$$+4 \qquad\qquad +4$$

$$x_2 = 10$$

$$B = (10, 4)$$

Distance Formula –

If A(x , y) and B(x , y) are points in the coordinate plane, then the distance between A and B is:

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

Example: Given the following points, determine if $\overline{AB} \cong \overline{BC}$.

A(4, -4)   B(1, -6)   C(-1, -3)

$$AB = \sqrt{(1-4)^2 + (-6--4)^2}$$

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

$$= \sqrt{9+4}$$

$$= \sqrt{13}$$

yes

$$BC = \sqrt{(-1-1)^2 + (-3--6)^2}$$

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

$$= \sqrt{4+9}$$

$$= \sqrt{13}$$