Tools For Geometry – Segments, Distance & Midpoint

Notes Section 1.2 Name_____

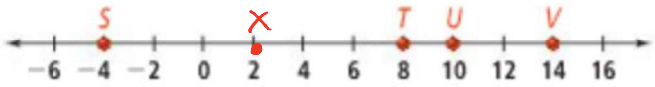
Congruent Segments – $\overline{OX} \cong \overline{EN}$ iff $OX = EN$

If $\overline{OX} \cong \overline{EN}$, then $OX = EN$

or

If $OX = EN$, then $\overline{OX} \cong \overline{EN}$

Equal vs Congruent

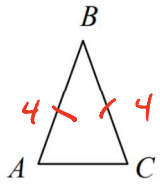


$\overline{ST} \cong \overline{XV}$

$ST = 12$

$AB = 4\ cm$

$BC = 4\ cm$



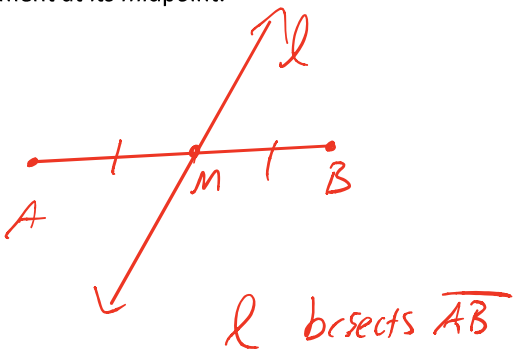
$AB = BC$

$\overline{AB} \cong \overline{BC}$

Definition of Midpoint - If M is the midpoint of $\overline{PQ}$, then M is the point between *P* and *Q* such that $PM = MQ$.

If P — M — Q, then $PM = MQ$

Segment Bisector - any segment, line, or plane that intersects a segment at its midpoint.



ℓ bisects $\overline{AB}$

Midpoint in the Coordinate Plane - The coordinates of the midpoint of a line segment whose endpoints have coordinates (x_1, y_1) and (x_2, y_2)

$$M = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$$

$\Sigma x = x_1 + x_2$

$\Sigma y = y_1 + y_2$

Distance formula - The distance, d, between any points with coordinates (x_1, y_1) and (x_2, y_2) is given by the following formula:

$$d = \sqrt{[\Delta x]^2 + [\Delta y]^2}$$

$\Delta x = x_2 - x_1$

$\Delta y = y_2 - y_1$

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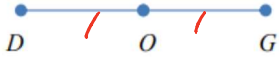
1. **Given** O is the midpoint of $\overline{DG}$

$DO = 6x - 7$

$OG = 5x + 1$



Find *DO*

$DO = OG$

$6x - 7 = 5x + 1$

$x - 7 = 1$

$x = 8$

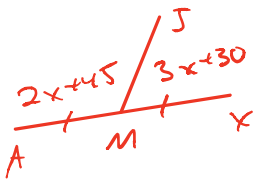
$DO = 6x - 7$

$= 6(8) - 7$

$= 48 - 7$

$DO = 41$

2. $\overline{JM}$ bisects $\overline{AX}$ at M. *AM = 2x + 45, MX = 3x + 30*, find *MX*.



$AM = MX$

$2x + 45 = 3x + 30$

$45 = x + 30$

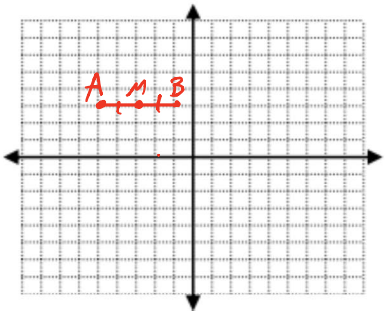
$15 = x$

3. Find the midpoint and length of $\overline{AB}$.

EASY

A (-5,3)

B (-1,3)



Midpoint of $\overline{AB}$ = $(-3, 3)$

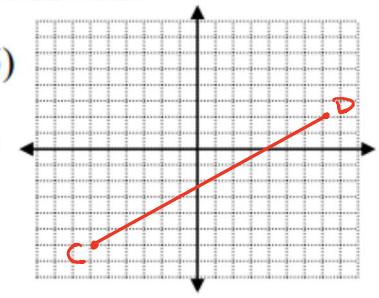
AB = 6

4. Find the midpoint and length of $\overline{CD}$.

NOT SO EASY

C (-6,-5)

D (7,3)



Midpoint of $\overline{CD}$ = $\left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$

$= \left(\frac{(-6)+(7)}{2}, \frac{(-5)+(3)}{2}\right)$

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

$M_{CD} = \left(\frac{1}{2}, -1\right)$

$CD = \sqrt{[\Delta x]^2 + [\Delta y]^2}$

$= \sqrt{[(-6)+(-7)]^2 + [(-5)+(-3)]^2}$

$= \sqrt{[-13]^2 + [-8]^2}$

$= \sqrt{169 + 64}$

$CD = \sqrt{233}$

5. $\overline{ME}$ has the endpoints of M(-6, 4) and E(5, -2). Find the midpoint and length of $\overline{ME}$.

$M_{ME} = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$

$= \left(\frac{(-6)+(5)}{2}, \frac{(4)+(-2)}{2}\right)$

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

$M_{ME} = \left(-\frac{1}{2}, 1\right)$

$ME = \sqrt{[\Delta x]^2 + [\Delta y]^2}$

$= \sqrt{[(-6)-(5)]^2 + [(4)-(-2)]^2}$

$= \sqrt{[-11]^2 + [6]^2}$

$= \sqrt{121 + 36}$

$ME = \sqrt{157}$