Name: Key

Date: _____

UNIT 7

LESSON 4

AIM: HOW DO WE WRITE THE EQUATIONS OF PERPENDICULAR BISECTORS?

Do Now: For each set of coordinates, find the coordinates of the midpoint of the segment joining the two using the midpoint formula.

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

$x_1 y_1 \quad x_2 y_2$

(a) $(-5, 7)$ and $(9, 15)$

$\left(\frac{-5+9}{2}, \frac{7+15}{2} \right)$

$(2, 11)$

$x_1 y_1 \quad x_2 y_2$

(b) $(-8, 12)$ and $(5, 4)$

$\left(\frac{-8+5}{2}, \frac{12+4}{2} \right)$

$(-1.5, 8)$

Determine the Equation of a Perpendicular Bisector		
Step 1: Slope Formula Then find ⊥ slope	**Step 2:** Midpoint Formula	**Step 3:** Write Equation of Line Using ⊥ slope and midpoint
$\frac{y_2 - y_1}{x_2 - x_1}$	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	$y - y_1 = m(x - x_1)$

Example 2: What is the equation of a perpendicular bisector to $\overline{AB}$ where A(−1, −3) and B(3, 7)?

$x_1 y_1 \quad x_2 y_2$

STEP 1: $\frac{7 - -3}{3 - -1} = \frac{10}{4} = \frac{5}{2}$

$m = -2/5$

STEP 2: $\left(\frac{-1+3}{2}, \frac{-3+7}{2} \right) = \left(\frac{2}{2}, \frac{4}{2} \right) = (1, 2)$

STEP 3: $y - 1 = \frac{-2}{5}(x - 2)$

$y - 1 = -\frac{2}{5}(x - 2)$

Example 3: What is the equation of a perpendicular bisector to $\overline{AB}$ where $A(2,8)$ and $B(-1,0)$.

$x_1\ y_1$ $\quad$ $x_2\ y_2$

STEP 1: $\frac{0-8}{-1-2} = \frac{-8}{-3} = \frac{8}{3}$ $\quad \perp m = \frac{-3}{8}$

STEP 2: $\left(\frac{2+-1}{2}, \frac{8+0}{2}\right) = \left(\frac{1}{2}, 4\right)$

$x_1 \quad y_1$

STEP 3: $y - 4 = \frac{-3}{8}\left(x - \frac{1}{2}\right)$

$$\boxed{y - 4 = \frac{-3}{8}\left(x - \frac{1}{2}\right)}$$

Example 4: In rhombus *NOYA*, the coordinates of the endpoints of the diagonal $\overline{NY}$ are $N(-11,5)$ and $Y(5,-7)$. Write an equation of the diagonal $\overline{OA}$ that is the perpendicular bisector of $\overline{NY}$.

$x_1\ y_1$ $\quad$ $x_2\ y_2$

STEP 1: $\frac{-7-5}{5--11} = \frac{-12}{16} = -\frac{3}{4}$ $\quad \perp m = \frac{4}{3}$

STEP 2: $\left(\frac{-11+5}{2}, \frac{5+-7}{2}\right) = (-3, -1)$

$x_1 \quad y_1$

STEP 3: $y - -1 = \frac{4}{3}(x - -3)$

$$\boxed{y + 1 = \frac{4}{3}(x + 3)}$$

Practice NYTS(Now You Try Some!)

2. In rhombus *GEOM*, the coordinates of the endpoints of diagonal $\overline{GO}$ are $G(2,-2)$ and $O(-4,2)$. Write an equation of the line that contains diagonal $\overline{EM}$, the perpendicular bisector of $\overline{GO}$.

$x_1\ y_1 \quad x_2\ y_2$

STEP 1: $\frac{2--2}{-4-2} = \frac{4}{-6} = -\frac{2}{3}$ $\quad +m \neq \frac{3}{2}$

STEP 2: $\left(\frac{2+-2}{2}, \frac{-4+2}{2}\right) = (0,-1)$

$x_1\ y_1$

STEP 3: $y--1 = \frac{3}{2}(x-0)$

$y+1 = \frac{3}{2}x$ or $y = \frac{3}{2}x-1$

$x_1\ y_1 \quad x_2\ y_2$

2. If $\overline{AB}$ is defined by the endpoints $A(0,-1)$ and $B(8,10)$, write an equation of the line that is the perpendicular bisector of $\overline{AB}$.

STEP 1: $\frac{10--1}{8-0} = \frac{11}{8}$ $\quad -m \neq -\frac{8}{11}$

STEP 2: $\left(\frac{0+8}{2}, \frac{-1+10}{2}\right) = \left(4, \frac{9}{2}\right)$

$x_1\ y_1$

STEP 3: $y-\frac{9}{2} = -\frac{8}{11}(x-4)$

$y-\frac{9}{2} = -\frac{8}{11}(x-4)$

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UNIT 7

LESSON 4 HOMEWORK

1. In rhombus *MATH*, the coordinates of the endpoints of diagonal $\overline{MT}$ are $M(-1,1)$ and $T(7,-5)$. Write an equation of the line that contains diagonal $\overline{AH}$, the perpendicular bisector of $\overline{MT}$.

$x_1 y_1 \quad x_2 y_2$

STEP 1: $\frac{-5-1}{7-1} = \frac{-6}{8} = \frac{-3}{4}$ $\quad \perp m = \frac{4}{3}$

STEP 2: $\left(\frac{-1+7}{2}, \frac{1+-5}{2}\right) = \left(\frac{6}{2}, \frac{-4}{2}\right) = (3,-2)$

STEP 3: $y - -2 = \frac{4}{3}(x-3)$

$\boxed{y+2 = 4/3(x-3)}$

2. If $\overline{AB}$ is defined by the endpoints $A(-3,0)$ and $B(4,10)$, write an equation of the line that is the perpendicular bisector of $\overline{AB}$.

$x_1 y_1 \quad x_2 y_2$

STEP 1: $\frac{10-0}{4-3} = \frac{10}{7}$ $\quad \perp m = \frac{-7}{10}$

STEP 2: $\left(\frac{-3+4}{2}, \frac{0+10}{2}\right) = \left(\frac{1}{2}, 5\right)$

STEP 3: $\boxed{y-5 = -\frac{7}{10}\left(x-\frac{1}{2}\right)}$

3. Find an equation of the line passing through the point $(6,5)$ and parallel to the line whose equation is $2y+3x=6$.

$x_1 y_1$

$\boxed{y-5 = -\frac{3}{2}(x-6)}$

$-3x \quad -3x$

$\frac{2y}{2} = \frac{-3x}{2} + \frac{6}{2}$

$y = -\frac{3}{2}x + 3$

$m = -3/2$

$\parallel m = -3/2$