Geometry Honors Date: KEY

Chapter: Special Parts of the Triangle

The Perpendicular Bisector

You must be able to write the equation (find) of the perpendicular bisector to a line segment. Below is an example. Study it carefully and complete the problems.

Example: Find the perpendicular bisector of $\overline{AB}$ given the following coordinates:

A (1, 7) B (13, 9)

Step1: Find the midpoint of $\overline{AB}$. (Why? Since the perpendicular bisector intersects the segment at its midpoint, we have to know the midpoint.) **Important!** This is the point you must use in step 3 when you are looking for the y-intercept.

Midpoint $= \left(\frac{1+13}{2}, \frac{7+9}{2}\right)$

$= (7, 8)$

Step 2: Find the slope of $\overline{AB}$. (Why? Since the perpendicular bisector is *perpendicular* to the segment, we can find the slope of it by finding the slope of $\overline{AB}$ and using its negative reciprocal.

$m_{\overline{AB}} = \frac{9-7}{13-1} = \frac{2}{12} = \frac{1}{6}$ $m_{\perp} = -6$

Step 3: Find the y-intercept. Remember to use the midpoint from step 1 and the $m_{\perp}$ from step 2.

$y = mx + b$ $b = 50$

$8 = -6(7) + b$

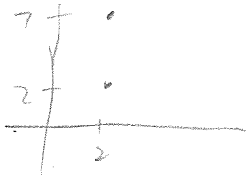
$8 = -42 + b$

This is the perpendicular bisector $y = -6x + 50$.

Find the perpendicular bisector for each line segment below.

1. $\overline{AB}$ if A (2,2) and B (2, 7)

① Midpt $\left(\frac{2+2}{2}, \frac{2+7}{2}\right)$ ② Slope: $m = \frac{7-2}{2-2} = \frac{5}{0}$



$\left(2, \frac{9}{2}\right)$ $m_{\perp} = 0$

$y = \frac{9}{2}$

2. $\overline{AB}$ if A (- 4, -3) and B (6, 2)

midpt of $\overline{AB}$ $\left(\frac{-4+6}{2}, \frac{-3+2}{2}\right)$

$(1, -\frac{1}{2})$

$m_{\overline{AB}} = \frac{-3-2}{-4-6} = \frac{-5}{-10} = \frac{1}{2}$

$m_{\perp} = -2$

$y = mx + b$

$-\frac{1}{2} = -2(1) + b$

$b = 1\frac{1}{2}$

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

3. $\overline{AB}$ if A (-6, - 4) and B (1, -4)

midpt of $\overline{AB}$ $\left(\frac{-6+1}{2}, \frac{-4-4}{2}\right)$

$(-\frac{5}{2}, -4)$

↑

x

$m_{\overline{AB}} = \frac{-4+4}{-6-1} = 0$

$m_{\perp}$ = undefined

vertical line

$x = \#$

$x = -\frac{5}{2}$

4. $\overline{AB}$ if A (-7, -2) and B (-1, -7)

midpt $\left(\frac{-7-1}{2}, \frac{-2-7}{2}\right)$

$(-4, -\frac{9}{2})$

$m_{\overline{AB}} = \frac{-2+7}{-7+1} = \frac{5}{-6}$

$m_{\perp} = +\frac{6}{5}$

$y = mx + b$

$-\frac{9}{2} = \frac{6}{5}(-4) + b$

$-\frac{9}{2} + \frac{24}{5} = b$

$\frac{3}{10} = b$

$y = \frac{6}{5}x + \frac{3}{10}$

5. $\overline{AB}$ if A (- 8 , 4) and B (- 4, 7)

midpt $\left(\frac{-8-4}{2}, \frac{4+7}{2}\right)$

$(-6, \frac{11}{2})$

$m_{\overline{AB}} = \frac{4-7}{-8+4} = \frac{-3}{-4} = \frac{3}{4}$

$m_{\perp} = -\frac{4}{3}$

$y = mx + b$

$\frac{11}{2} = -\frac{4}{3}(-6) + b$

$\frac{11}{2} = 8 + b$

$-\frac{5}{2} = b$

$y = -\frac{4}{3}x - \frac{5}{2}$