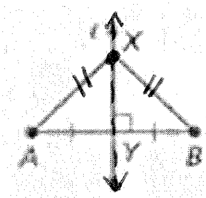
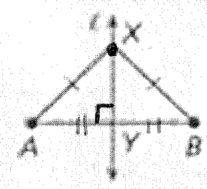
Honors Geometry
Notes - Section 5.1
Perpendicular and Angle Bisectors

Name KEY
Date ________________ Period ______

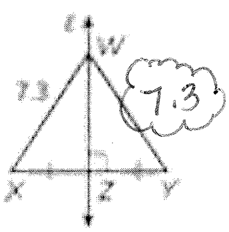
When a point is the same distance from two or more objects, the point is said to be **equidistant** from the objects.

Theorems Distance and Perpendicular Bisectors

	THEOREM	HYPOTHESIS	CONCLUSION
5-1-1	**Perpendicular Bisector Theorem** If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.	 $\overline{XY} \perp \overline{AB}$, $\overline{YA} \cong \overline{YB}$	$XA = XB$
5-1-2	**Converse of the Perpendicular Bisector Theorem** If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.	 $XA = XB$	$\overline{XY} \perp \overline{AB}$, $\overline{YA} \cong \overline{YB}$

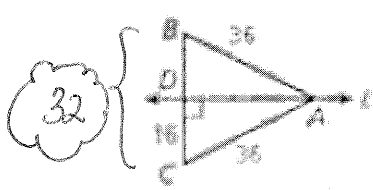
Example #1: Find each measure.

A. YW



7.3

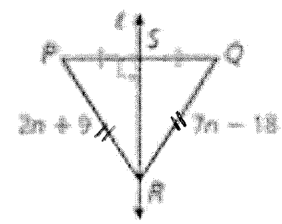
B. BC



32

C. PR

$2(5.4)+9 = 19.8$



$2n+9 = 7n-18$

$9 = 5n-18$

$27 = 5n$

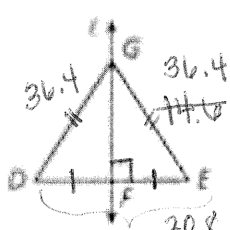
$n = \frac{27}{5}$

$n = 5.4$

D. Find each measure.

Given that line ℓ is the perpendicular bisector of $\overline{DE}$ and $EG = 14.6$, find DG.

Given that $DE = 20.8$, $DG = 36.4$, and $EG = 36.4$, find EF.

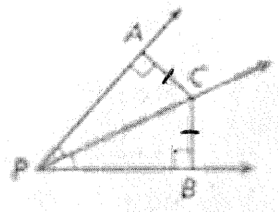
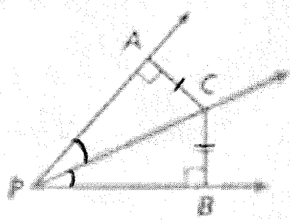


$DG = 14.6$

$EF = 10.4$

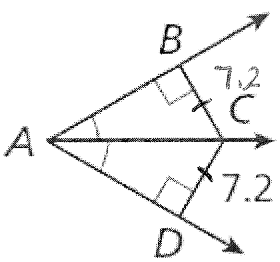
REMEMBER: The distance between a point and a line is the length of the perpendicular segment from the point to the line.

Theorems Distance and Angle Bisectors

THEOREM	HYPOTHESIS	CONCLUSION
5-1-3 **Angle Bisector Theorem** If a point is on the bisector of an angle, then it is equidistant from the sides of the angle.	 $\angle APC \cong \angle BPC$	$AC = BC$
5-1-4 **Converse of the Angle Bisector Theorem** If a point in the interior of an angle is equidistant from the sides of the angle, then it is on the bisector of the angle.	 $AC = BC$	$\angle APC \cong \angle BPC$

<u>Example #2</u>: Find each measure.

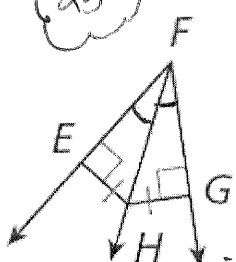
A. BC = 7.2



C is on the bis. b/c ∠BAC ≅ ∠DAC

B. m∠EFH, given the m∠EFG = 50°

25°

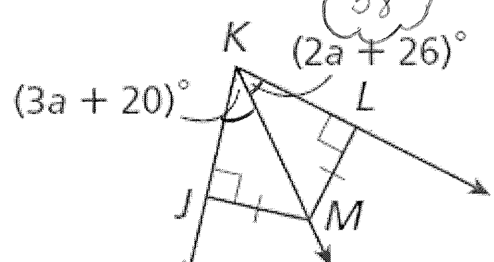


H is on the bisector since EH = HG, and H is on the int. of the ∠.

C. m∠MKL

2(6) + 26

38°



3a + 20 = 2a + 26

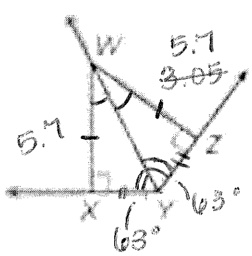
a = 6

D. Find each measure.

Given that $\overrightarrow{YW}$ bisects ∠XYZ and WZ = 3.05, find WX. 3.05

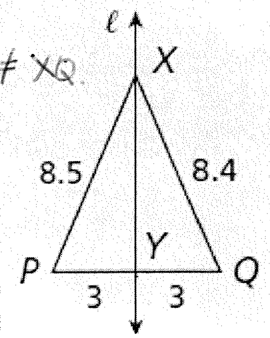
Given that m∠WYZ = 63°, XW = 5.7, and ZW = 5.7, find m∠XYZ.

126°

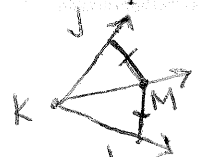


THINK AND DISCUSS

1. Is line ℓ a bisector of $\overline{PQ}$? yes Is it a perpendicular bisector of $\overline{PQ}$? Explain. no $XP \neq XQ$

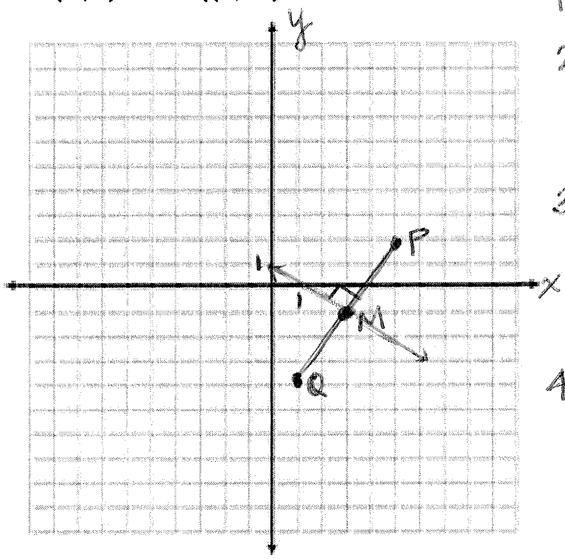


2. Suppose that M is in the interior of $\angle JKL$ and $MJ = ML$. Can you conclude that $\overrightarrow{KM}$ is the bisector of $\angle JKL$? Explain. no, we would need to know that $\overline{MJ} \perp \overline{KJ}$ and $\overline{ML} \perp \overline{KL}$



Example #3: Writing Equations for Bisectors in the Coordinate Plane

A. Write an equation in point-slope form for the perpendicular bisector of the segment with endpoints P(5,2) and Q(1,-4).



1. Graph $\overline{PQ}$
2. Find the midpt of $\overline{PQ}$

$M = \left(\frac{5+1}{2}, \frac{2+(-4)}{2}\right) = (3,-1)$

3. slope of $\overline{PQ} = \frac{-4-2}{1-5} = \frac{-6}{-4} = \frac{3}{2}$

slope of $\perp$ bis $= -\frac{2}{3}$

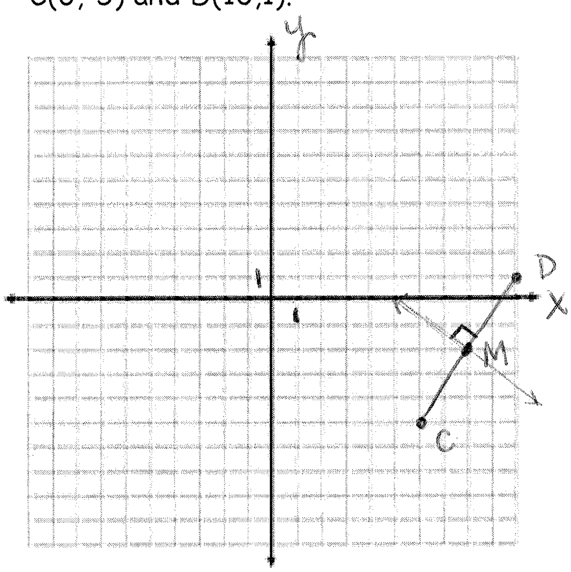
4. Point slope Form

$m = -\frac{2}{3}$

$(3,-1)$

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

B. Write an equation in point-slope ~~from~~ form for the perpendicular bisector of the segment with endpoints C(6,-5) and D(10,1).



1. Graph $\overline{CD}$
2. Find the midpt of $\overline{CD}$

$M = \left(\frac{6+10}{2}, \frac{-5+1}{2}\right) = (8,-2)$

3. Slope of $\overline{CD} = \frac{1-(-5)}{10-6} = \frac{6}{4} = \frac{3}{2}$

Slope of $\perp$ bis $= -2/3$

4. Point Slope Form

$(8,-2)$

$m = -\frac{2}{3}$

$y+2 = -\frac{2}{3}(x-8)$