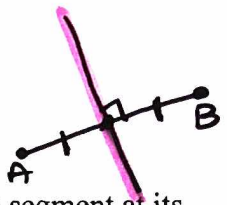
Name: Date: Period: 1

Perpendicular and Angle Bisectors

Lesson Objective WBAT apply thms about ⊥ and ∠ bisectors.

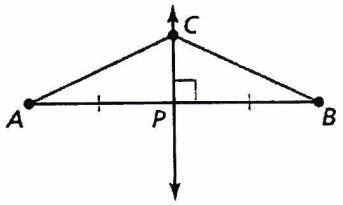


In Chapter 3, you learned that a *perpendicular bisector* of a line segment if the line that is ⊥ to the segment at its midpoint.

Equidistant: A point is equidistant from two figures when the point is the same distance from each figure.

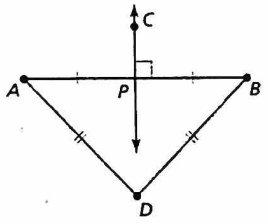
Perpendicular Bisector Theorem

In a plane, if a point lies on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.



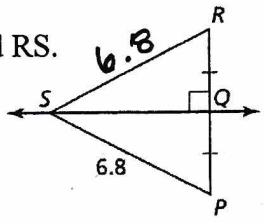
Converse of the Perpendicular Bisector Theorem

In a plane, if a point is equidistant from the endpoints of a segment, then it lies on the ⊥ bisector of the segment.

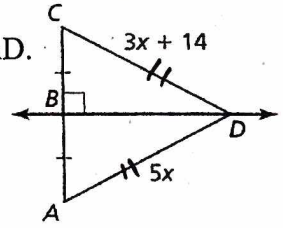


Examples:

1. Find RS.



2. Find AD.

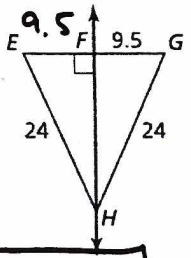


$5x = 3x + 14$

$x = 7$

AD = 35

3. Find EG

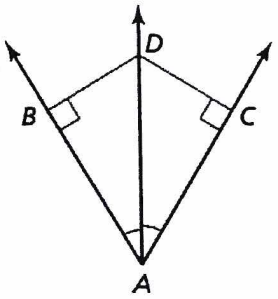


EG = 19

In Chapter 1, you learned that an *angle bisector* is a ray that divides an angle into two congruent adjacent angles.

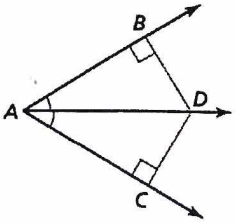
You also learned that the *distance from a point to a line* is the length of the ⊥ segment from the point to the line.

So, in the figure at right, $\overrightarrow{AD}$ is the bisector of $\angle BAC$, and the distance from point D to $\overrightarrow{AB}$ is DB, where $\overline{DB} \perp \overrightarrow{AB}$



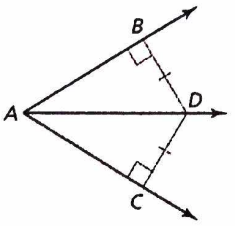
Angle Bisector Theorem

If a point lies on the bisector of an angle, then it is equidistant from the two sides of the angle.



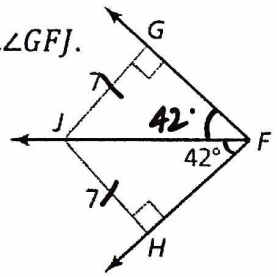
Converse of the Angle Bisector Theorem

If a point is in the interior of an angle and is equidistant from the two sides of the angle, then it lies on the ∠ bisector of the angle.

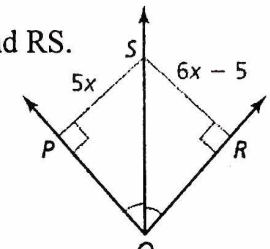


Examples:

4. Find $m\angle GFJ$.



5. Find RS.

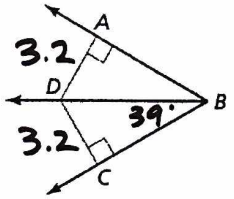


$5x = 6x - 5$

$x = 5$

$RS = 25$

6. Find $m\angle ABC$ when AD = 3.2, CD = 3.2 and $m\angle DBC = 39°$

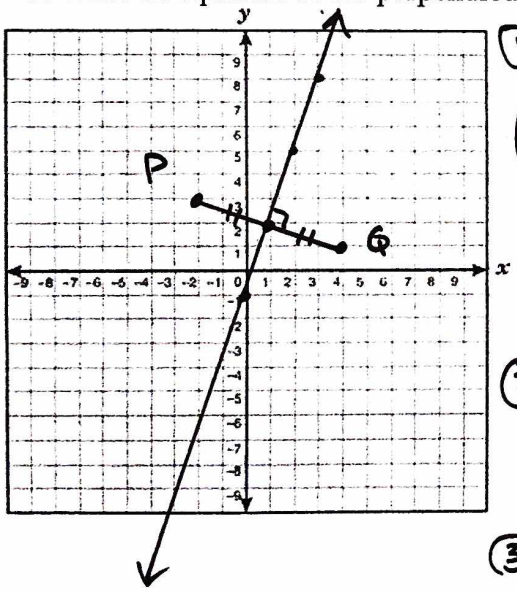


78°

Writing Equations of Perpendicular Bisectors

Example:

7. Write an equation of the perpendicular bisector of the segment with endpoints P(-2, 3) and Q(4, 1)



① find mdpt

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

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

$(1, 2)$

② find slope

$\frac{1-3}{4-(-2)} = \frac{-2}{6} = -\frac{1}{3}$

③ ⊥ slope = 3

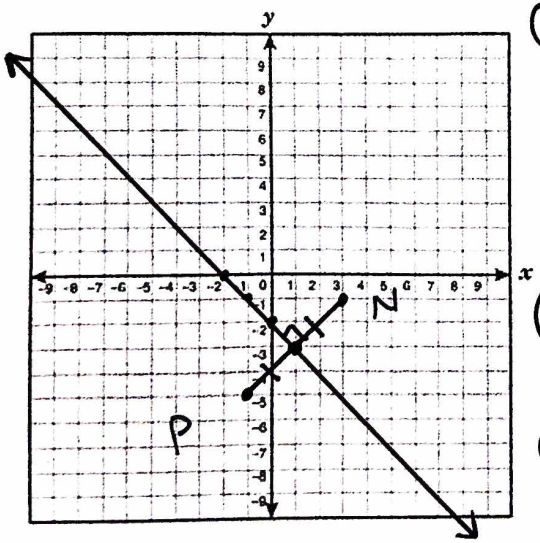
$y - y_1 = m(x - x_1)$

$y - 2 = 3(x - 1)$

$y - 2 = 3x - 3$

$y = 3x - 1$

8. Write the equation of the perpendicular bisector of the segment with endpoints P(-1, -5) and N(3, -1)



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

$\left(\frac{2}{2}, \frac{-6}{2}\right)$

$(1, -3)$

② $\frac{-1-(-5)}{3-(-1)} = \frac{4}{4} = 1$

③ ⊥ slope = −1

$y - (-3) = -(x - 1)$

$y + 3 = -x + 1$

$y = -x - 2$