5.2 Warm-Up:

1. Solve $3x = 8x - 15$.

2. Solve $6x + 3 = 8x - 14$.

3. If M is the midpoint of $\overline{AB}$, $AM = 5x - 2$, and $MB = 3x + 6$, find AB.

1. $3x = 8x - 15$

$-5x = -15$

$x = 3$

2. $6x + 3 = 8x - 14$

$17 = 2x$

$8.5 = x$

3. $AM = MB$

$5x - 2 = 3x + 6$

$2x = 8$

$x = 4$

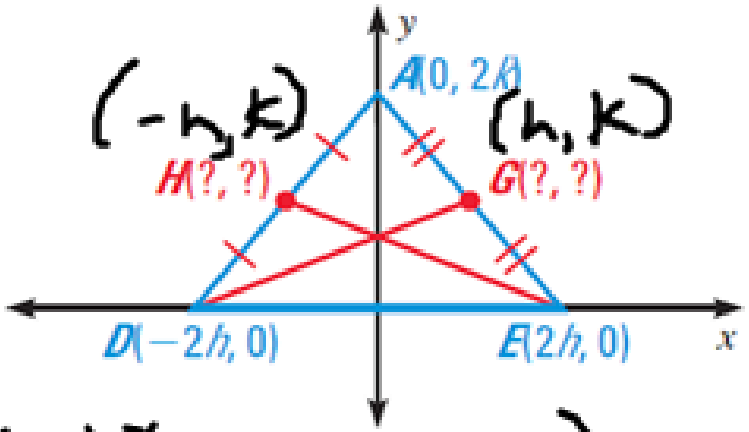
$AM = 5x - 2$

$= 5 \cdot 4 - 2$

$= 18$

$AB = 2 \cdot 18 = 36$

30. slope of $\overline{HE} = -(\text{slope of } \overline{DG})$



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

$\left(\frac{-2h+0}{2}, \frac{0+2k}{2}\right)$ n

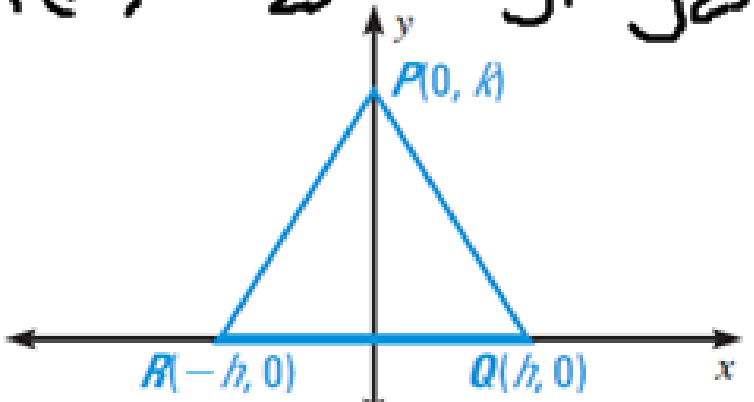
$H(-h, k)$

$G(h, k)$

36. **GIVEN** ▶ $P(0, k)$, $Q(h, 0)$, $R(-h, 0)$

PROVE ▶ $\triangle PQR$ is isosceles.

$\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$



$PR = \sqrt{(0+h)^2+(k-0)^2}$

$= \sqrt{h^2+k^2}$

$PQ = \sqrt{(h-0)^2+(0-k)^2}$

$\sqrt{h^2+k^2}$

By def. of isosceles $\triangle PQR$ is isosceles.

review: What is a segment bisector?

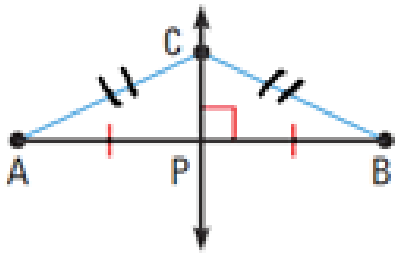
point, line, segment, or ray that divides a segment into 2 ≅ parts.

How could we define perpendicular bisector?

segment, ray or line that bisects a segment at a 90° angle.

equidistant - (points) a figure that is an equal distance from 2 figures.

Perpendicular Bisector Theorem



Use what we know to complete the theorem.

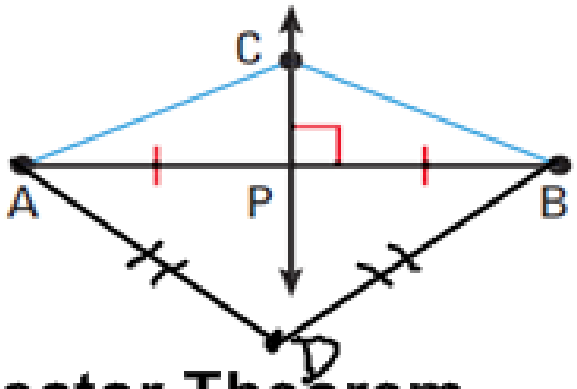
1. Using a ruler, draw a segment on your paper.
2. In order to find the midpoint, fold the paper so that the endpoints of the line are on top of each other.
3. Use a protractor to draw the segment's perpendicular bisector. (Angle formed must be 90 degrees.)
4. Complete the theorem below.

If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.

Perpendicular Bisector Theorem

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

If $\overleftrightarrow{CP}$ is the $\perp$ bisector of $\overline{AB}$, then $CA = CB$.



Converse of the Perpendicular Bisector Theorem

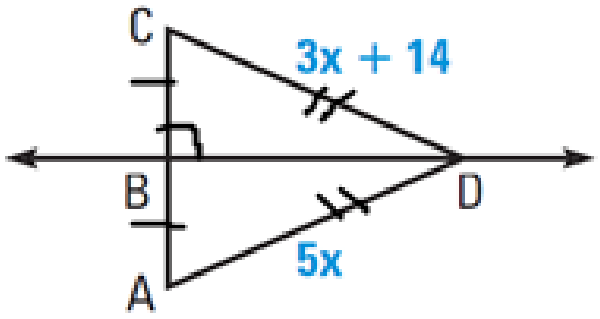
If a point is equidistant from the endpoints of a segment, then it is on the $\perp$ bisector of the segment.

$\overleftrightarrow{BD}$ is the perpendicular bisector of $\overline{AC}$. Find AD.

$3x + 14 = 5x$

$14 = 2x$

$7 = x$



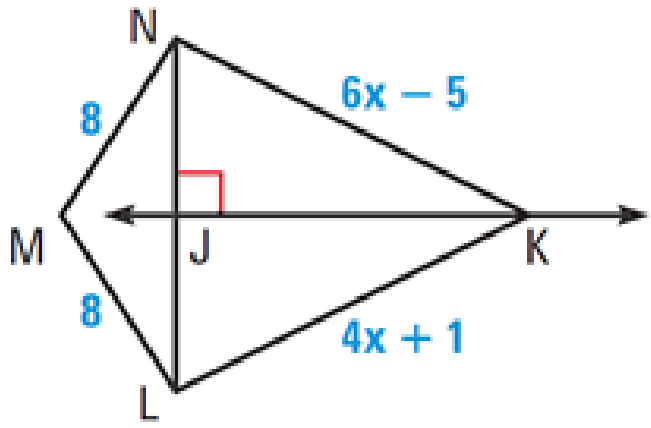
$AD = 5x$

$= 5 \cdot 7$

$= 35$

In the diagram, $\overleftrightarrow{JK}$ is the perpendicular bisector of $\overline{NL}$.

1. What segment lengths are equal? *Explain* your reasoning. $NK \cong KL$ by ⊥ bisector Thm.
2. Find NK.
3. *Explain* why M is on $\overleftrightarrow{JK}$.



2. $NK = LK$

$6x - 5 = 4x + 1$

$2x = 6$

$x = 3$

$NK = 6x - 5$

$= 6 \cdot 3 - 5 = 13$

3. Since $mN = mL$, so m is on $\overleftrightarrow{JK}$ by the ⊥ bisect. Converse.

ACTIVITY FOLD THE PERPENDICULAR BISECTORS OF A TRIANGLE

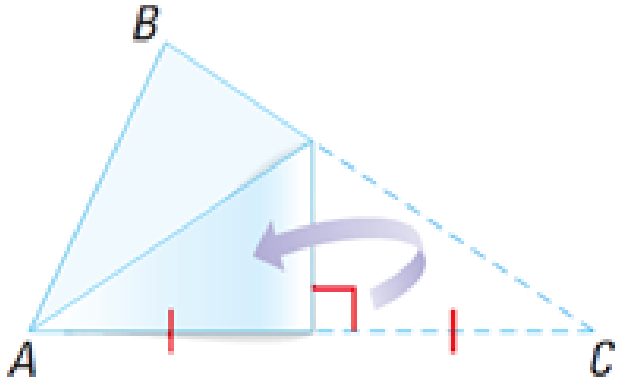
QUESTION Where do the perpendicular bisectors of a triangle meet?

Materials:
- paper
- scissors
- ruler

Follow the steps below and answer the questions about perpendicular bisectors of triangles.

STEP 1 Cut four large acute scalene triangles out of paper. Make each one different.

STEP 2 Choose one triangle. Fold it to form the perpendicular bisectors of the sides. Do the three bisectors intersect at the same point? yes.



STEP 3 Repeat the process for the other three triangles. Make a conjecture about the perpendicular bisectors of a triangle.

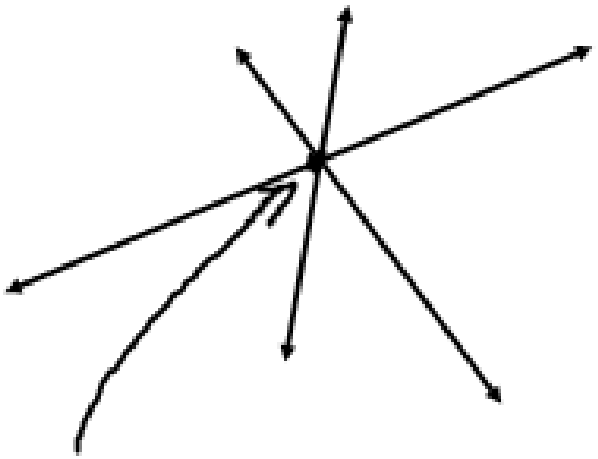
STEP 4 Choose one triangle. Label the vertices A, B, and C. Label the point of intersection of the perpendicular bisectors as P. Measure $\overline{AP}$, $\overline{BP}$, and $\overline{CP}$. What do you observe? $AP \cong BP \cong CP$

Vocab to Know!

concurrent - three or more lines, segments or rays meeting at the same point.

point of concurrency - the point where the lines, segments or rays meet.

example of concurrent lines



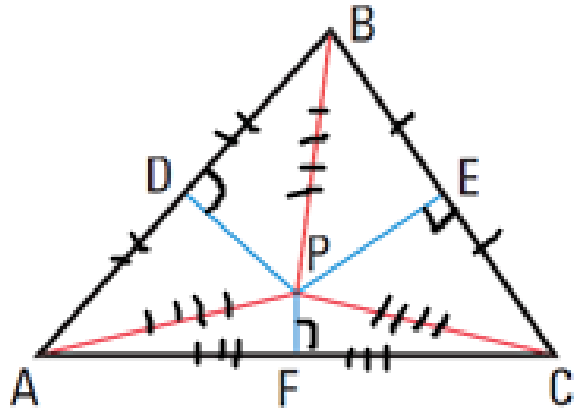
point of concurrency

Recall what we learned from the perpendicular bisector of a triangle activity...

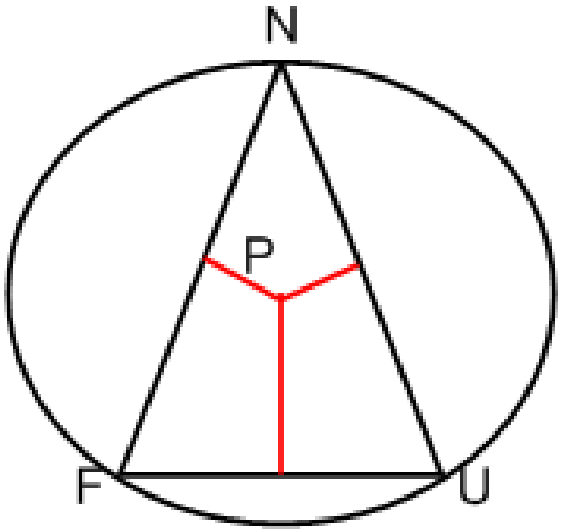
Concurrency of Perpendicular Bisectors of a Triangle

The perpendicular bisectors of a triangle intersect at a point that is equidistant from the veritces of the triangle.

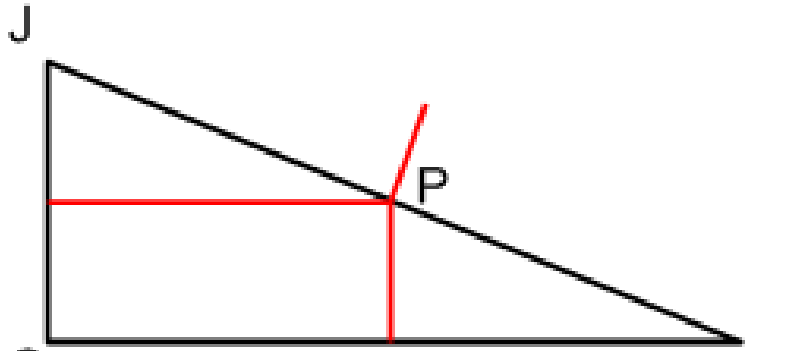
$AP = BP = CP$



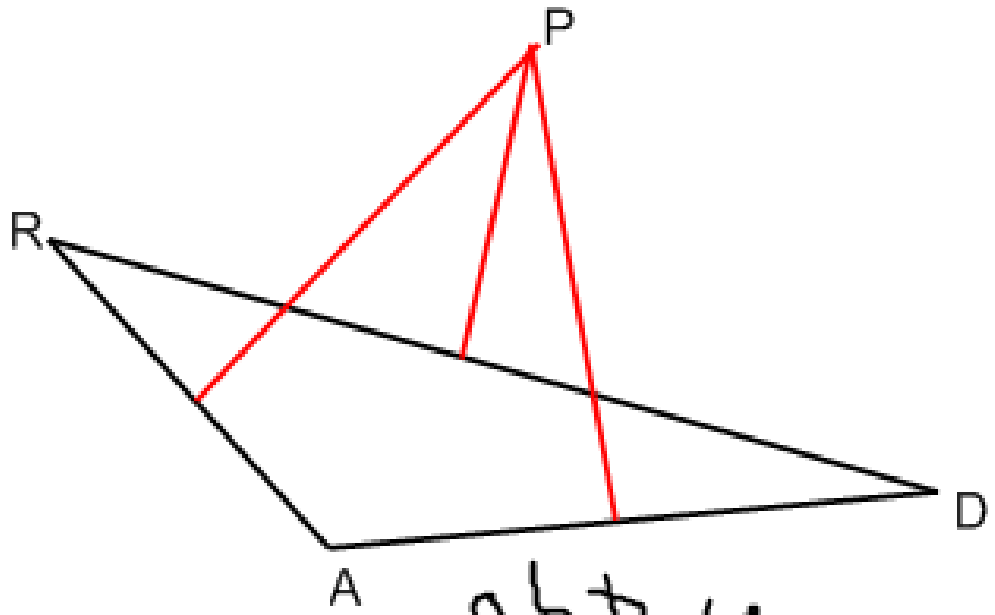
P is the circumcenter



acute

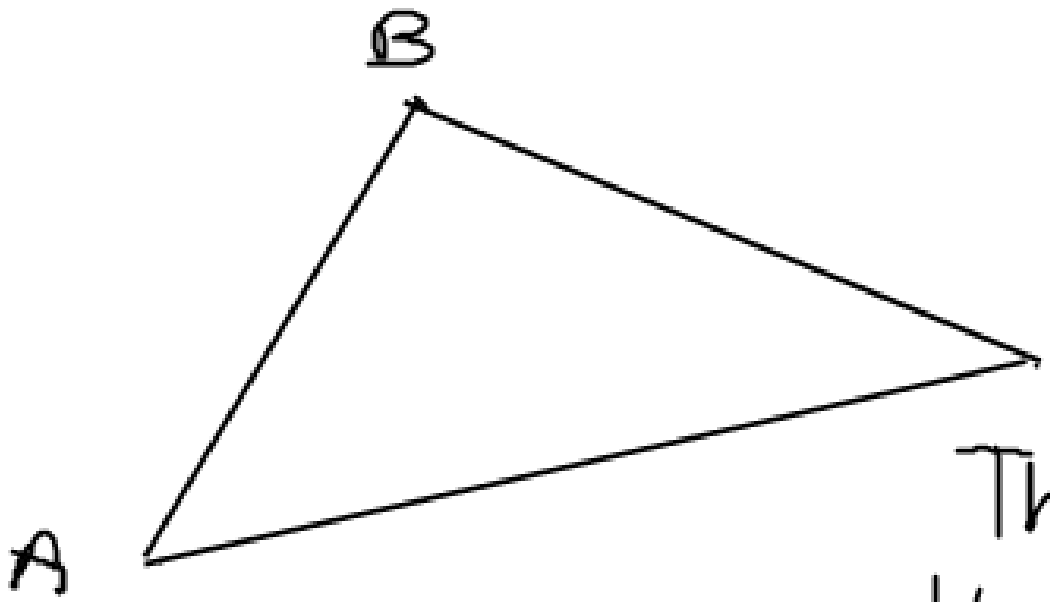


right



obtuse.

Each of three different forest ranger stations is the same distance from the main office. Describe how to find the location of the office.



Find the ⊥ bisectors of the △.

The main office is the point where the ⊥ bisectors meet (aka circumcenter).

Homework:

pp 306-309
#'s 1, 2-8 e, 9-13,
16, 20-22, 26, 38, 40