5.1 Extra Practice **ACC**   *Key*   ⟨midpt diagram⟩

USING BISECTOR THEOREMS In Exercises 21–26, match the angle measure or segment length described with its correct value.

A. $60°$

C. $40°$

E. $50°$

B. 8

D. 4

F. 3.36

21. SW $B = 8$

23. $m\angle VWX$ $C = 40°$

25. $WX = UW = \boxed{D = 4}$
   By SAS
   $\triangle WVU \cong \triangle WVX$

22. $m\angle XTV$ $A = 60°$

24. VU $F = 3.36$

26. $m\angle WVX = 50°$
   E

⟨triangle diagram with vertices W, U, S, V, T, X; labels 4, 40, 40, 50°, 3.36, 50°, 50°, 30°, 60, 40°⟩
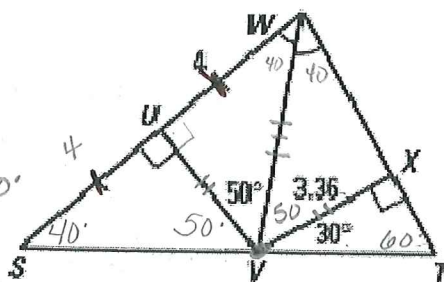
$VU \cong XV$
Equidistant to sides

37. **MULTI-STEP PROBLEM** Use the map shown and the following information. A town planner is trying to decide whether a new household *X* should be covered by fire station *A*, *B*, or *C*.

  a. Trace the map and draw the segments $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$.

  b. Construct the perpendicular bisectors of $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$. Do the perpendicular bisectors meet at a point? **Yes, it is called a circumcenter**

  c. The perpendicular bisectors divide the town into regions. Shade the region closest to fire station *A* ~~red~~ **Yellow**. Shade the region closest to fire station *B* ~~blue~~ **Pink**. Shade the region closest to fire station *C* ~~gray~~ **green**.

  d. *Writing* In an emergency at household *X*, which fire station should respond? Explain your choice. **Station A should respond because it is closer to A than both C + B (see midpts)**

USING MEDIANS OF A TRIANGLE In Exercises ~~8-12~~, use the figure below and the given information.

P is the centroid of $\triangle DEF$, $\overline{EH} \perp \overline{DF}$, $DH = 9$, $DG = 7.5$, $EP = 8$, and $DE = FE$.

⟨triangle diagram DEF with G, P, J, H; labels 7.5, 8, 7.5, 7.5, 9, x, 7.5⟩

Find the length of $\overline{FH}$.
  H is midpt
  ∴ FH = DH and
  FH = 9

Find the length of $\overline{PH}$.
  PH = 4
  See

Find the length of $\overline{EH}$.
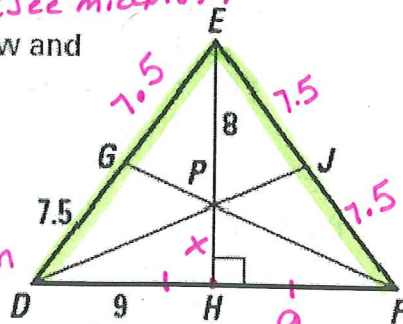 **EP = $\frac{2}{3}$ EH   Centroid thm**
  8 = $\frac{2}{3}$(8 + x)
  24 = 16 + 2x
  x = 4
  EH = 8 + 4
  EH = 12

Find the perimeter of $\triangle DEF$.
  P = 48 units

Use the triangle WHA for #1 & 2.

1. If $\overline{WP}$ is a median and an angle bisector, $AP = 3y + 11$, $PH = 7y - 5$, $m\angle HWP = x + 12$, $m\angle PAW = 3x - 2$, and $m\angle HWA = 4x - 16$, find x and y. Is $\overline{WP}$ also an altitude? Explain.

Find x:
$\angle HWA = 2\angle HWP$ def of $\angle$ Bisector
$4x - 16 = 2(x + 12)$
$4x - 16 = 2x + 24$
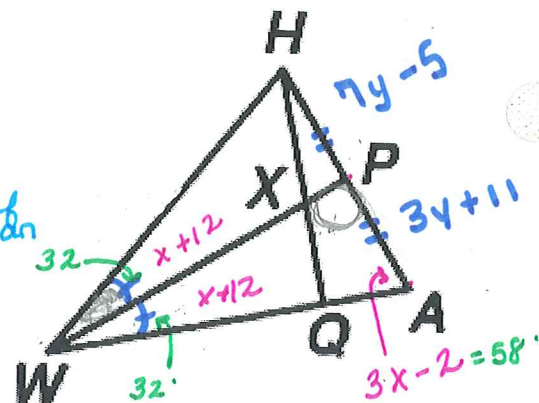$\boxed{x = 20}$

Find y: $HP = PA$ def of median
$7y - 5 = 3y + 11$
$y = \boxed{4}$

$\triangle$ Sum Says
$\angle WPA = 90$
$\therefore WP$ is An altitude
by def.

2. If $\overline{WP}$ is a perpendicular bisector, $m\angle WHA = 8q + 17$, $m\angle HWP = 10 + q$, $AP = 6r + 4$, and $PH = 22 + 3r$, find r, q, and $m\angle HWP$.

Find q $\triangle$ Sum
$90 + \angle HWP + \angle WHA = 180$
$90 + 10 + q + 8q + 17 = 180$
$9q + 117 = 180$
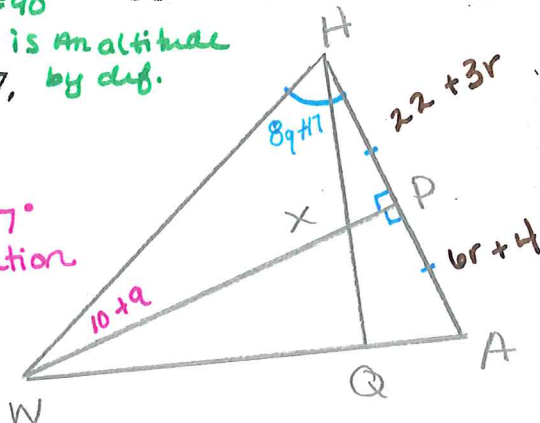$9q = 63$
$\boxed{q = 7}$

Find r def of $\perp$ bisector
$PH = PA$
$22 + 3r = 6r + 4$
$18 = 3r$
$\boxed{6 = r}$

$\angle HWP = 17°$
substitution

Use The following with the figure to the right.

In $\triangle PQR$, $ZQ = 3a - 11$, $ZP = a + 5$, $PY = 2c - 1$, $YR = 4c - 11$, $m\angle PRZ = 4b - 17$, $m\angle ZRQ = 3b - 4$, $m\angle QYR = 7b + 6$, and $m\angle PXR = 2a + 10$.

3. $\overline{PX}$ is an altitude of $\triangle PQR$. Find a.
$\angle PXR = 90$ def of altitude
$2a + 10 = 90$
$2a = 80$
$\boxed{a = 40}$

4. If $\overline{RZ}$ is an angle bisector, find $m\angle PRZ$.
$\angle PRZ = \angle ZRQ$ def of $\angle$ bisector
$4b - 17 = 3b - 4$
$b = 13$
$\angle PRZ = 4 \cdot 13 - 17$
$\angle PRZ = 35°$

5. Find PR if $\overline{QY}$ is a median.
$PY = YR$ def of median
$2c - 1 = 4c - 11$
$10 = 2c$
$5 = c$

$PR = PY + YR$ segment addition
$PR = 2(5) - 1 + 4(5) - 11$
$\boxed{PR = 18 \text{ units}}$

6. If $\overleftrightarrow{QY}$ is a perpendicular bisector of $\overline{PR}$, find b.
$\angle QYR = 90°$ def of $\perp$ bisector
$7b + 6 = 90$
$7b = 84$
$\boxed{b = 12}$