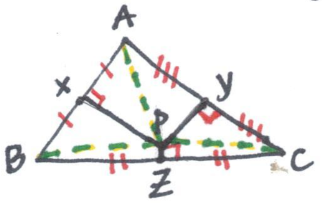
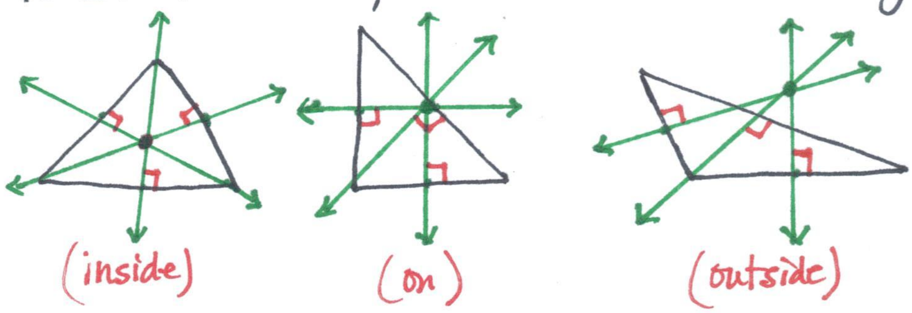
Bisectors in Triangles (Section 8-3)

* Concurrency of ⊥ Bisectors Theorem: The ⊥ bisectors of the sides of a triangle are concurrent @ a point equidistant from the vertices.

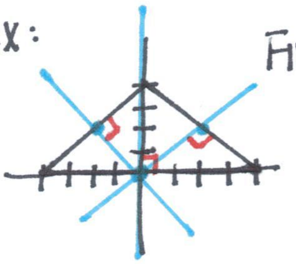


ex: $\overline{PX}$, $\overline{PY}$ & $\overline{PZ}$ are ⊥ bisectors that are concurrent @ point P. ∴ PA = PB = PC

* The point of concurrency is called the circumcenter of the triangle. It can be inside, on or outside of a triangle.



ex:



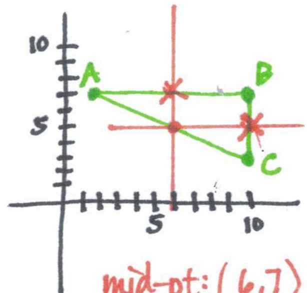
Find the coord. of the circumcenter.

mid-pts: (0,0)
(2,2)
(-2,2)

∴ (0,0) is the circumcenter.

ex: A (2,7)
B (10,7)
C (10,3)

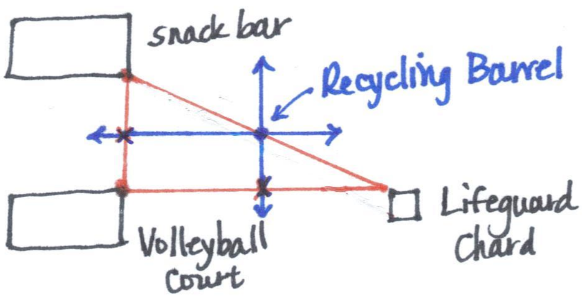
Find the coor. of the circumcenter.



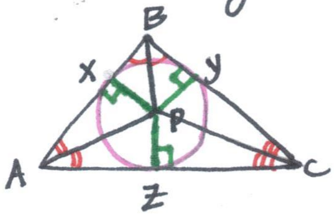
mid-pt: (6,7)
(10,5)

so... circumcent is @ (6,5)

ex:



* Concurrency of Angle Bisectors Theorem: The bisectors of the angles of a triangle are concurrent at a point equidistant from the sides.

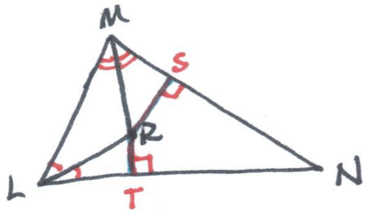


ex: Angle bisectors AP, BP, & CP are ≅ @ P. so,

PX = PY = PZ.

* Point "P" is also called the "incenter of the triangle" & can make an inscribed circle in the triangle w/radius of PX=PY=PZ.

ex:



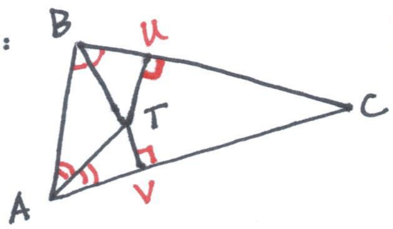
Find x if $RS = 4(x-3)+6$
$RT = 5(2x-6)$

$5(2x-6) = 4(x-3)+6$
$10x-30 = 4x-12+6$
$-4x+30 \quad -4x \quad +30$

$6x = 24$

$\boxed{x=4}$

ex:



Find x if $TV = 3x-12$
$TU = 5x-24$

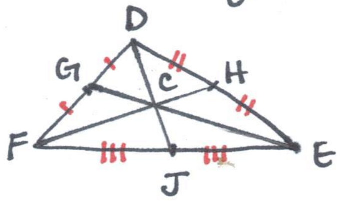
$3x-12 = 5x-24$
$-3x+24 \quad -3x+24$

$12 = 2x$

$\boxed{x=6}$

Medians & Altitudes (Section 8-4)

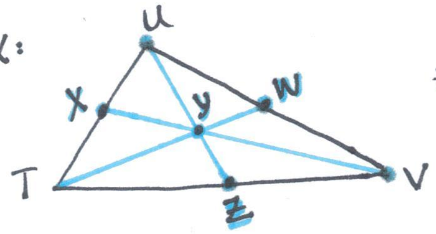
* **Concurrency of Medians Theorem:** The meadians of a triangle are concurrent @ a point that is 2/3 the distance from each vertex to the mid-pt of the opp. side.



ex: $DC = \frac{2}{3}DJ$, $EC = \frac{2}{3}EG$, $FC = \frac{2}{3}FH$

* "C" is called the centroid of the triangle.

ex:



* If YU = 3.6, find ZY & ZU

$UY = \frac{2}{3}UZ$

$\frac{3}{2}\cdot\left(3.6 = \frac{2}{3}UZ\right)\cdot\frac{3}{2}$

$\boxed{UZ = 5.4}$

$ZY = UZ - UY$

$= 5.4 - 3.6$

$\boxed{ZY = 1.8}$

* If VX = 9, find VY & YX.

$VY = \frac{2}{3}VX$

$VY = \frac{2}{3}(9)$

$\boxed{VY = 6}$

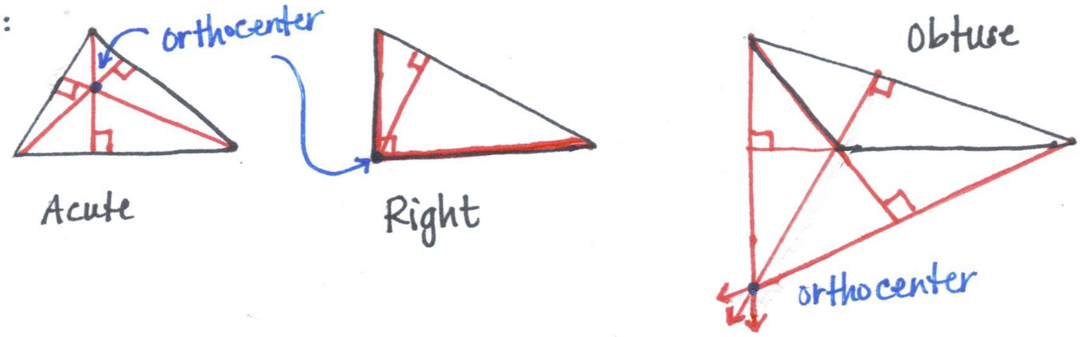
$XY = V[illegible] - VY$

$= 9 - 6$

$\boxed{XY = 3}$

* **Altitude** of a triangle is ⊥ segment from the vertex of the triangle to the line containing the opposite side. An altitude can be inside or outside the triangle or it can be a side of the triangle.

ex:



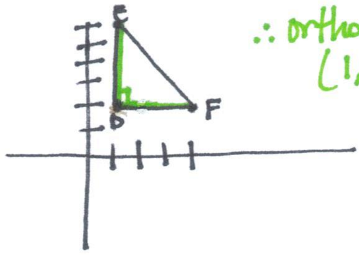
Acute Right

* **Concurrency of Altitudes Theorem:** lines that contain altitudes of triangles are called the "orthocenter" of the triangle & these are concurrent.

Got it?

ex: D(1,2), E(1,6), F(4,2)

Find the coord. of the orthocenter.

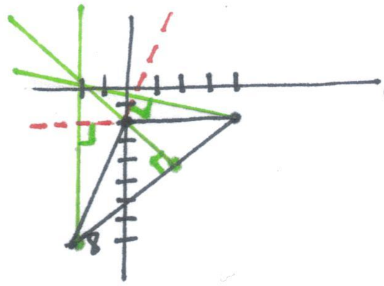


∴ orthocenter (1,2)

#6

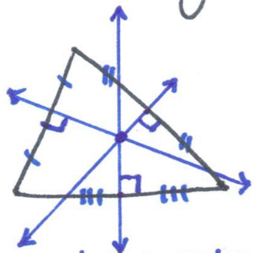
ex: A(0,-2), B(4,-2), C(-2,-8)

Find the coord. of the orthocenter.

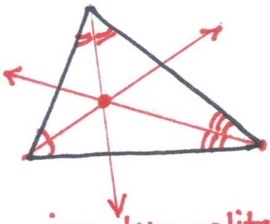


∴ orthocenter (-2,0)

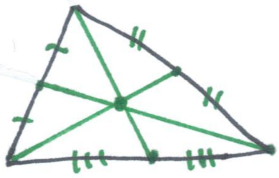
* Summary:



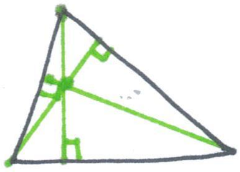
circumcenter: where ⊥ bisectors connect.



incenter: splits each angle in ½.

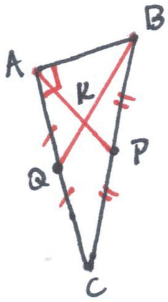


centroid: splits each side in ½



orthocenter: where all altitudes connect.

ex:



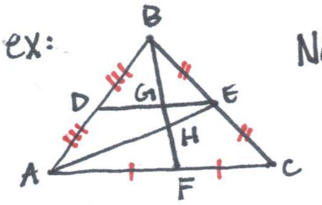
a) Is $\overline{AP}$ a median or an altitude? **median** it just splits $\overline{BC}$ in ½.

b) If AP = 18, what is KP? $\frac{2}{3}AP = KA$ $2/3(18) = 12$ if KA=12 then **KP=6.**

c) If BK = 15, what is KQ? $\frac{2}{3}BQ = BK$ $BQ = 3/2(15) = 22.5$ so... **KQ=7.5**

d) which two segments are altitudes? **$\overline{AB}$ + $\overline{AC}$**

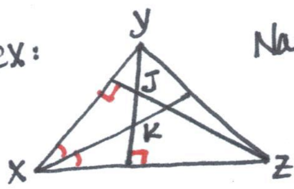
ex:



Name the centroid.

H.

ex:



Name the orthocenter.

J.