Geometry Ch 5-4, Exer., pg 324 #1, 3-6, 9-10, 17-22, 25-27, 33-35

1. Name the four types of concurrency points. When is each type in/on/outside a triangle?

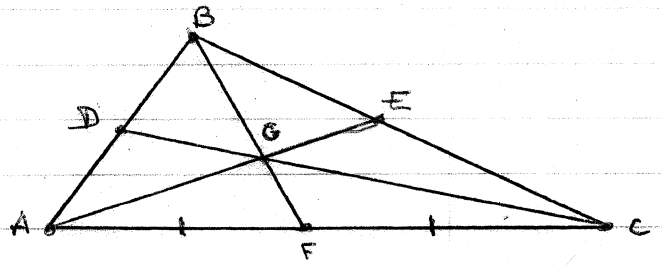
Incenter [from angle bisectors] is always *in*.

Centroid [from medians] is always *in*.

Circumcenter [from ⊥ bisectors] is
- in for acute △'s,
- on for right △'s,
- outside for obtuse △'s.

Orthocenter [from altitudes] is
- in for acute △'s,
- on for right △'s,
- outside for obtuse △'s.

G is the centroid of △ABC;
BG = 6; AF = 12; AE = 15.
Find length of each segment.



3. $\overline{FC}$ $\quad \overline{FC} \cong \overline{AF}$ Since AF = 12, **FC = 12**

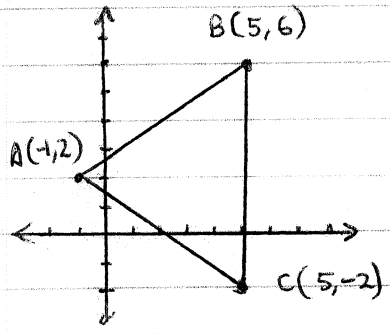
4. $\overline{BF}$ $\quad BG = \frac{2}{3} BF$ $\quad \frac{3}{2} BG = BF$ $\quad \frac{3}{2}(6) = BF$ **BF = 9**

5. $\overline{AG}$ $\quad AG = \frac{2}{3} AE$ $\quad AG = \frac{2}{3}[15]$ **AG = 10**

6. $\overline{GE}$ $\quad GE = \frac{1}{3} AE$ $\quad GE = \frac{1}{3}[15]$ **GE = 5**

Find the coordinates of centroid P in $\triangle ABC$.

9. A(-1,2)
B(5,6)
C(5,-2)

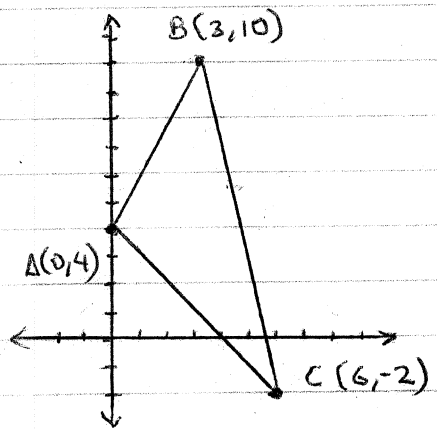


① Find midpoint of any side.
for AB: $\left(\frac{-1+5}{2}, \frac{2+-2}{2}\right) = \left(\frac{4}{2}, \frac{0}{2}\right)$
Midpoint of AC is (2,0)

② What does it take to get from this midpoint (2,0) to the opposite vertex (5,6)?
+3 to right; + 6 up

③ The centroid is $\frac{1}{3}$ this distance, or +1 to right; +2 up.
From (2,0) +1 right, +2 up puts centroid at (3,2)

10. A(0,4)
B(3,10)
C(6,-2)



① Midpoint of any side.
for AB: $\left(\frac{0+3}{2}, \frac{4+10}{2}\right) = (1.5, 7)$
Midpoint of AB is (1.5, 7)

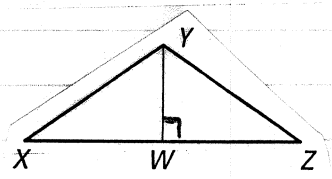
② What does it take to get from the midpoint (1.5, 7) to opposite vertex (6, -2)
+ 4.5 to right; 9 down

③ Centroid is $\frac{1}{3}$ this distance. $\frac{1}{3} \times 4.5 = 1.5$ to right
$\frac{1}{3} \times 9 = 3$ down

From (1.5, 7) 1.5 to right, 3 down puts the centroid at (3, 4)

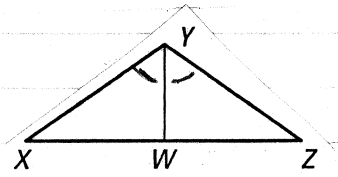
Use the diagram and given information to determine the relationship of $\overline{YW}$ to $\triangle XYZ$. [⊥ bisector, ∠ bisector, median, altitude. Its possible for more than one answer.]

17. $\overline{YW} \perp \overline{XZ}$



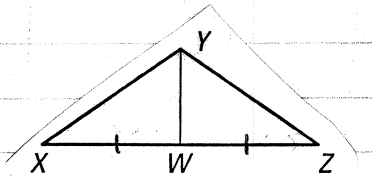
$\overline{YW}$ is a Altitude only

18. $\angle XYW \cong \angle ZYW$



$\overline{YW}$ is an ∠ bisector only

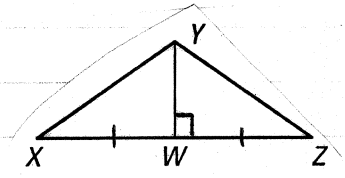
19. $\overline{XW} \cong \overline{ZW}$



$\overline{YW}$ is a median only

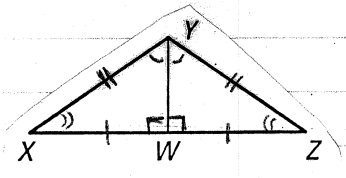
[It may look perpendicular, but that info is not given]

20. $\overline{YW} \perp \overline{XZ}$ and $\overline{XW} \cong \overline{ZW}$



Since $\overline{YW} \cong \overline{YW}$, reflexive prop, $\triangle XYW \cong \triangle ZYW$. $\overline{YW}$ is a ⊥ bisector, ∠ bisector, median, and altitude

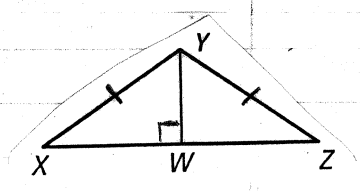
21. $\triangle XYW \cong \triangle ZYW$



[More explicit results as compared to # 20]

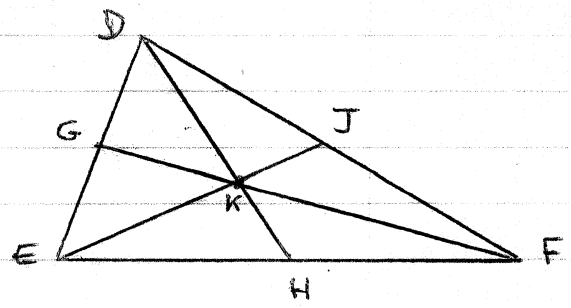
$\overline{YW}$ is a ⊥ bisector, ∠ bisector, median, and an altitude

22. $\overline{YW} \perp \overline{XZ}$ and $\overline{XY} \cong \overline{ZY}$



The two $\triangle$'s are congruent, this time by H-L. Thus, $\overline{YW}$ is a ⊥ bisector, ∠ bisector, median, and an altitude

Copy and complete the statement for $\triangle DEF$ with medians $\overline{DH}$, $\overline{EJ}$, $\overline{FG}$, and centroid K.

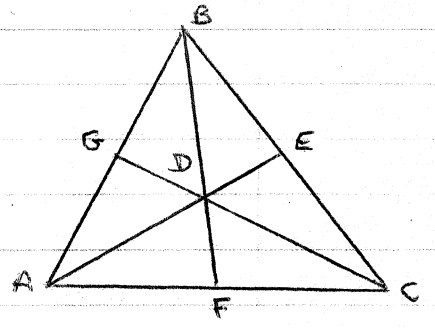


25. $EJ = \underline{3}\ KJ$

26. $DK = \underline{2}\ KH$

27. $FG = \underline{\frac{3}{2}}\ KF$

ALGEBRA Point D is the centroid of $\triangle ABC$. Use given information to find the value of x.



33. $BD = 4x + 5$ and $BF = 9x$

$BD = \frac{2}{3} BF$

$4x + 5 = \frac{2}{3}(9x)$

$4x + 5 = 6x$

$5 = 2x$

$\boxed{x = \frac{5}{2}}$

34 $GD = 2x - 8$ and $GC = 3x + 3$

$3\,GD = GC$

$3(2x - 8) = 3x + 3$

$6x - 24 = 3x + 3$

$3x = 27$

$\boxed{x = 9}$

35. $AD = 5x$ and $DE = 3x - 2$

$AD = 2\,DE$

$5x = 2(3x - 2)$

$5x = 6x - 4$

$\boxed{4 = x}$