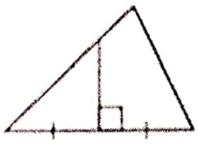
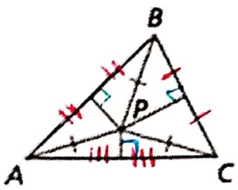
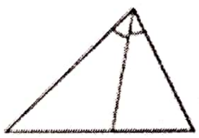
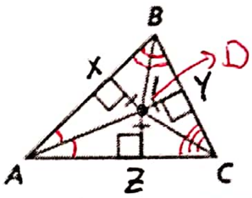
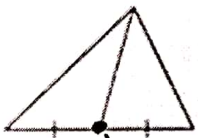
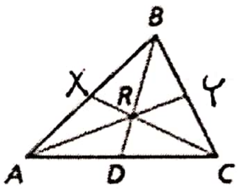
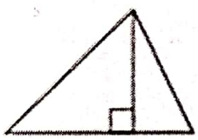
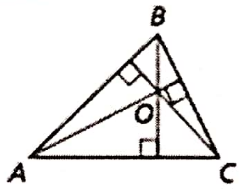
Name________________________________ Date____________ Per________

Points of Concurrency in Triangles Notes

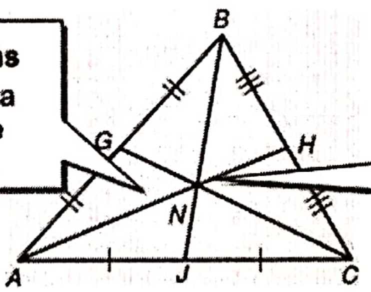
CONCEPT SUMMARY

Segments, Lines, Rays, and Points in Triangles

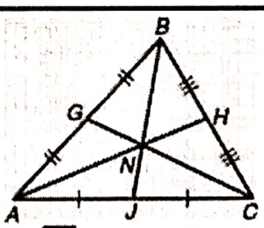
	Example	**Point of Concurrency**	**Property**	**Example**
perpendicular bisector bisects each side at 90°		circumcenter point of concurrency with perpendicular bisectors.	The circumcenter *P* of a triangle is equidistant from the vertices of the triangle. $\overline{PB} = \overline{PA} = \overline{PC}$	
angle bisector bisects each ~~vertex~~ or angle		incenter point of concurrency with angle bisectors.	The incenter *I* of a triangle is equidistant from the sides of the triangle. $\overline{DX} = \overline{DY} = \overline{DZ}$	
median connect vertex to midpoint of opposite side	 midpoint	centroid $AR = \frac{2}{3}(AY)$ $CR = \frac{2}{3}(CX)$ $BR = \frac{2}{3}(BD)$	The centroid *R* of a triangle is two thirds of the distance from each vertex to the midpoint of the opposite side.	
altitude connect vertex to opposite side at 90°		orthocenter	The lines containing the altitudes of a triangle are concurrent at the orthocenter *O*.	

Medians of Triangles

$\overline{AH}$, $\overline{BJ}$, and $\overline{CG}$ are **medians of a triangle. They each join a** vertex and the midpoint of the opposite side.



The point of intersection of the medians is called the **centroid of $\triangle ABC$.**

Theorem	**Example**
Centroid Theorem The centroid of a triangle is located $\frac{2}{3}$ of the distance from each vertex to the midpoint of the opposite side.	**Given:** $\overline{AH}$, $\overline{CG}$, and $\overline{BJ}$ are medians of $nABC$. **Conclusion:** $AN = \frac{2}{3}AH$, $CN = \frac{2}{3}CG$, $BN = \frac{2}{3}BJ$

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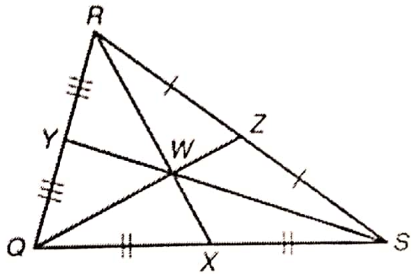
Points of Concurrency in Triangles Notes

Example: Medians of a Triangle

In ΔQRS, $RX = 48$ and $QW = 30$. Find each length.



1. RW =

$x = \frac{2}{3}(48) = 2(16)$

$= 32$

2. $WX = 48 - 32 = 16$

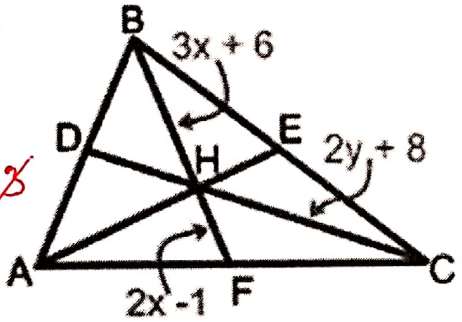
3. QZ

$\frac{3}{2}(30) = \left(\frac{2}{3}(x)\right)\frac{3}{2}$

$x = 45$

4. $WZ = 45 - 30 = 15$

$DC = 5y - 16$. Find x and y.



$BH = \frac{2}{3}(BF)$

$3(3x+6) = \left(\frac{2}{3}(5x+5)\right)3$

$9x + 18 = 10x + 10$

$-9x \qquad -9x$

$18 = x + 10$

$-10 \qquad -10$

$\boxed{x = 8}$

$BF = 3x + 6 + 2x - 1$

$= \boxed{5x + 5}$

$CH = \frac{2}{3}(CD)$

$3(2y+8) = \left(\frac{2}{3}(5y-16)\right)3$

$6y + 24 = 10y - 32$

$-6y \qquad -6y$

$24 = 4y - 32$

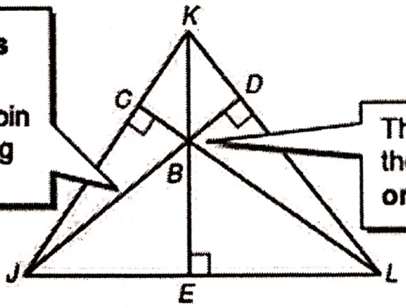
$+32 \qquad +32$

$\frac{56}{4} = \frac{4y}{4}$

$\boxed{y = 14}$

Altitudes of Triangles

$\overline{JD}$, $\overline{KE}$, and $\overline{LC}$ are altitudes of a triangle. They are perpendicular segments that join a vertex and the line containing the side opposite the vertex.



The point of intersection of the altitudes is called the **orthocenter** of ΔJKL.