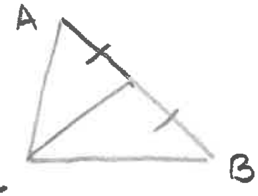
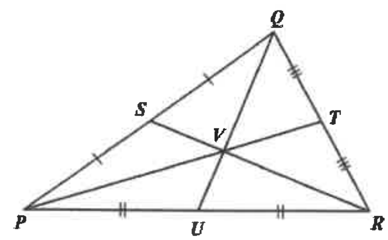
Median: a segment with endpoints being a vertex of a triangle and the midpoint of the opposite side



Centroid: The point of concurrency of the medians of a triangle

<table>
<tr>
<td>Centroid Theorem</td>
<td>The medians of a triangle intersect at a point called the centroid that is two thirds of the distance from each vertex to the midpoint of the opposite side</td>
<td>
$PV = \frac{2}{3}PT$ $\quad QV = \frac{2}{3}RS$
$QV = \frac{2}{3}QU$</td>
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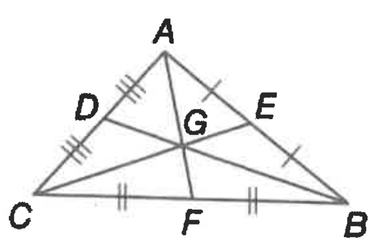
</table>

1. In $\triangle ABC$ $CG = 4$. Find $GE =$



$CG = \frac{2}{3}CE$

$4 = \frac{2}{3}CE$

$\frac{12}{2} = CE$

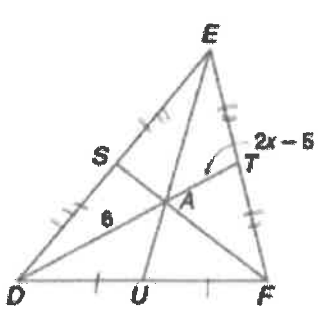
$6 = CE$

$CG + GE = CE$

$4 + GE = 6$

$\boxed{GE = 2}$

2. Points S, T, and U are the midpoints of $\overline{DF}$, $\overline{FE}$, $\overline{DE}$. Find the value of x



$AD = \frac{2}{3}DT$

$6 = \frac{2}{3}DT$

$\frac{18}{2} = DT$

$9 = DT$

$AD + AT = DT$

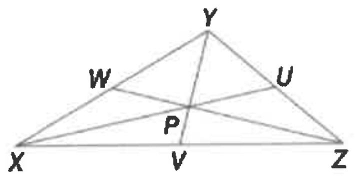
$6 + 2x - 5 = 9$

$2x - 5 = 3$

$2x = 8$

$\boxed{x = 4}$

3. In $\triangle XYZ$, $YV = 12$ and P is the centroid. Find $YP = ?$ and $PV = ?$

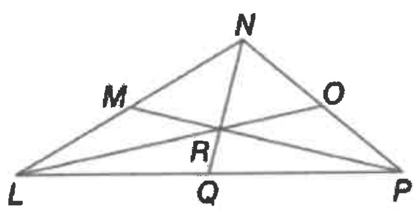


$YP = \frac{2}{3} YV$

$= \frac{2}{3}(12)$

$\boxed{YP = 8}$ $\boxed{PV = 4}$

4. In $\triangle LNP$, R is the centroid and $LO = 30$. Find $LR = ?$ and $RO = ?$

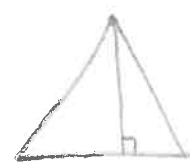


$LR = \frac{2}{3} LO$

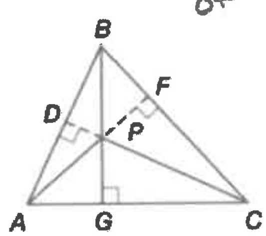
$LR = \frac{2}{3}(30)$

$\boxed{LR = 20}$ $\boxed{RO = 10}$

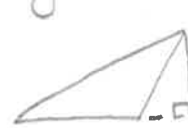
Altitude: a segment from a vertex to the line containing the opposite side and perpendicular to the line containing that side



Orthocenter:
point of concurrency of the altitudes



could be outside triangle

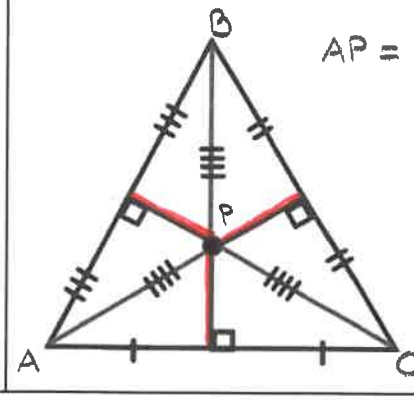


altitude

• P is the orthocenter

P is circumenter

* perpendicular bisectors

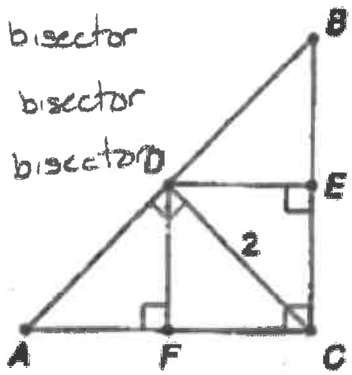
Circumcenter Theorem	The vertices of a triangle are equidistant from the circumcenter.	 AP = BP = CP

3. D is the circumcenter of ΔABC, $DC = 2$, $AC = BC$. Find DA and AB:

DE is ⊥ bisector

DF is ⊥ bisector

DC is ⊥ bisector



from circumcenter to vertices equal

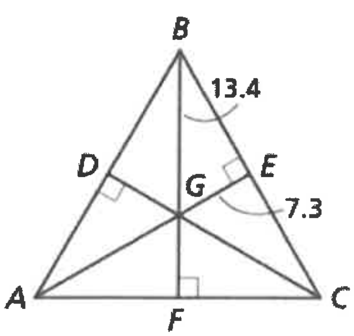
AD = DB = CD

AD = DB = 2

$\boxed{\begin{array}{l} AD = 2 \\ AB = 4 \end{array}}$

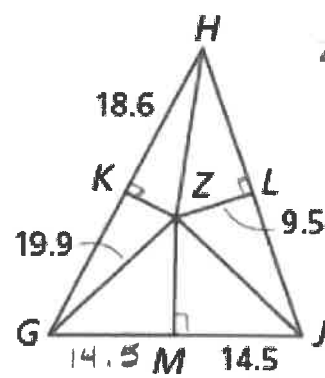
4. G is the circumcenter of ΔABC.

Find $GC =$ 13.4



5. Z is the circumcenter of ΔGJH.

Find $GM =$ 14.5

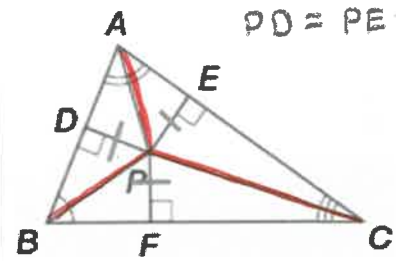


Z circumcenter

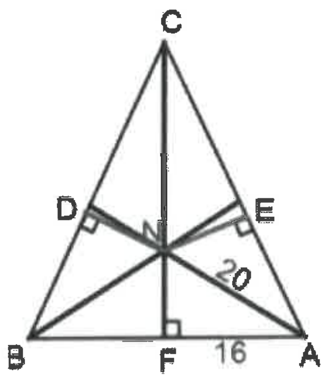
so ZM ⊥ bisector

GM = MJ

angle bisectors

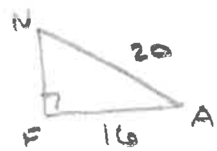
Incenter Theorem	The incenter of a triangle is equidistant from the sides of the triangle.	PD = PE = PF 

6. N is the incenter of the triangle. Find ND:



ND = NF = NE

Find NF using pythagorean thm

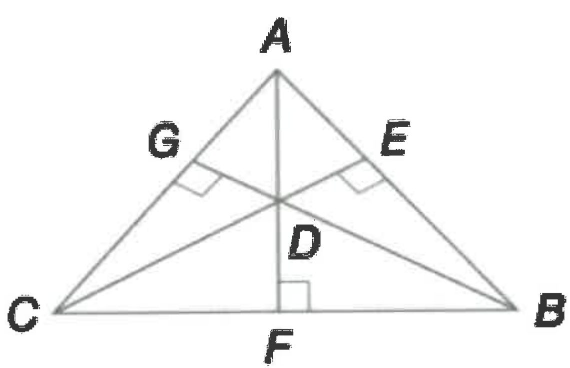


$(NF)^2 + 16^2 = 20^2$

NF = 12

$\boxed{ND = 12}$

7. In the figure point D is the incenter. Determine which segments are congruent to $\overline{DG}$.



DG = DE = DF