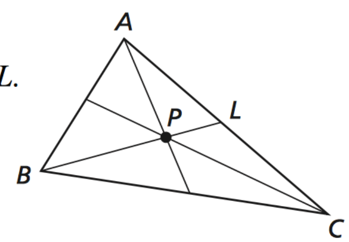
Name: Date:

6.3 Medians and Altitudes of Triangles

In Exercises 1-4, point *P* is the centroid of ΔABC. Use the given information to find the indicated measures.

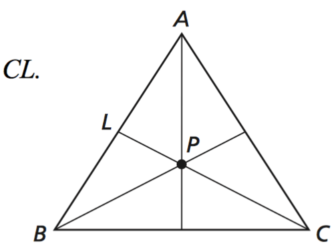
1. $BL = 12$

   Find *BP* and *PL*.



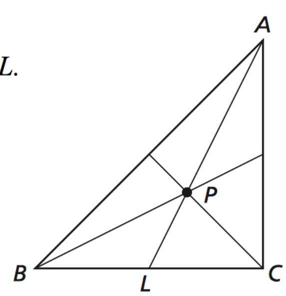
2. $CP = 16$

   Find *PL* and *CL*.



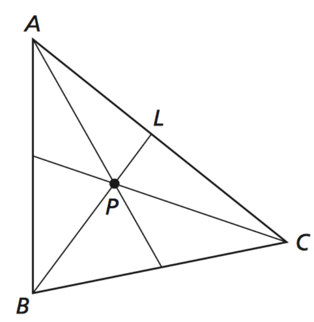
3. $AL = 27$

   Find *AP* and *PL*.



4. $BP = 102$

   Find *PL* and *BL*.

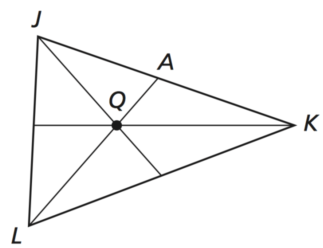


Name: Date:

In Exercises 5-7, point Q is the centroid of ΔJKL. Use the given information to find the indicated measures.

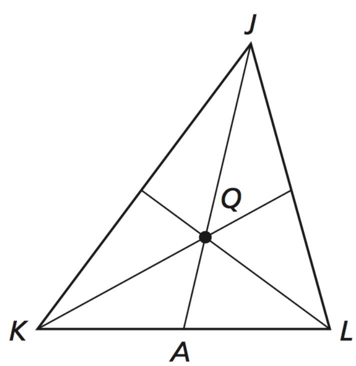
5. $AQ = 21$

Find QL and AL.



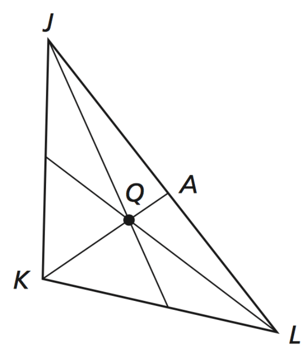
6. $JA = 72$

Find JQ and QA.



7. $KQ = 10$

Find QA and KA.

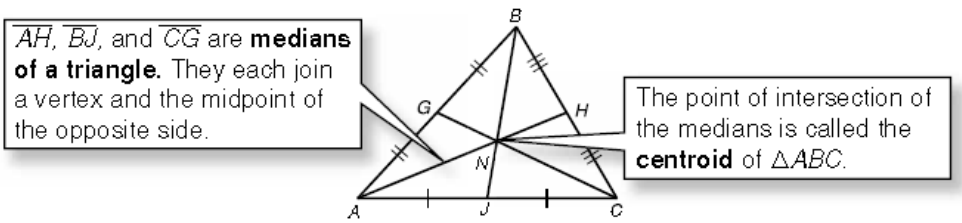


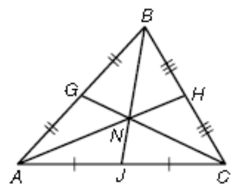
Name___________________________Period____ 5.3 Medians and Altitudes of Triangles

LESSON 5-3

Reteach

Medians and Altitudes of Triangles

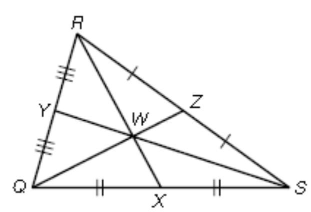


Theorem	Example
Centroid Theorem The centroid of a triangle is located $\frac{2}{3}$ of the distance from each vertex to the midpoint of the opposite side.	 **Given:** $\overline{AH}$, $\overline{CG}$, and $\overline{BJ}$ are medians of $\triangle ABC$. **Conclusion:** $AN = \frac{2}{3}AH$, $CN = \frac{2}{3}CG$,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

In $\triangle ABC$ above, suppose $AH = 18$ and $BN = 10$. You can use the Centroid Theorem to find AN and BJ.

$AN = \frac{2}{3}AH$	Centroid Thm.	$BN = \frac{2}{3}BJ$	Centroid Thm.
$AN = \frac{2}{3}(18)$	Substitute 18 for AH.	$10 = \frac{2}{3}BJ$	Substitute 10 for BN.
$AN = 12$	Simplify.	$15 = BJ$	Simplify.

In $\triangle QRS$, $RX = 48$ and $QW = 30$. Find each length.



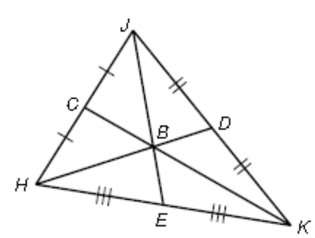
1. RW ____________________

2. WX ____________________

3. QZ ____________________

4. WZ ____________________

In $\triangle HJK$, $HD = 21$ and $BK = 18$. Find each length.



5. HB ____________________

6. BD ____________________

7. CK ____________________

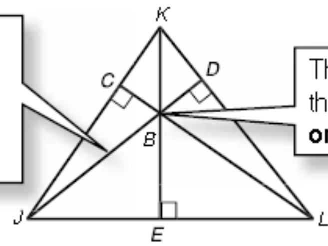
8. CB ____________________

LESSON 5-3

Reteach

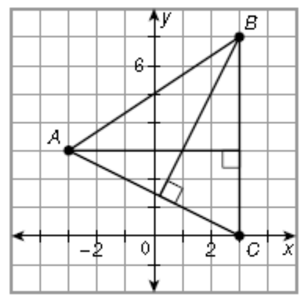
Medians and Altitudes of Triangles continued

$\overline{JD}$, $\overline{KE}$, 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 $\triangle JKL$.

Find the orthocenter of $\triangle ABC$ with vertices $A(-3, 3)$, $B(3, 7)$, and $C(3, 0)$.



Step 1 Graph the triangle.

Step 2 Find equations of the lines containing two altitudes.

The altitude from A to $\overline{BC}$ is the horizontal line $y = 3$.

The slope of $\overleftrightarrow{AC} = \frac{0 - 3}{3 - (-3)} = -\frac{1}{2}$, so the slope of the altitude from B to $\overline{AC}$ is 2. The altitude must pass through $B(3, 7)$.

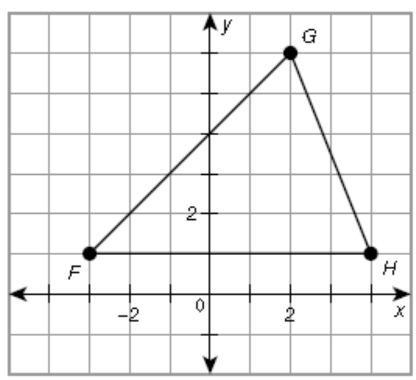
$y - y_1 = m(x - x_1)$ Point-slope form

$y - 7 = 2(x - 3)$ Substitute 2 for m and the coordinates of $B(3, 7)$ for (x_1, y_1).

$y = 2x + 1$ Simplify.

Step 3 Solving the system of equations $y = 3$ and $y = 2x + 1$, you find that the coordinates of the orthocenter are (1, 3).

Triangle *FGH* has coordinates $F(-3, 1)$, $G(2, 6)$, and $H(4, 1)$.



9. Find an equation of the line containing the altitude from G to $\overline{FH}$.

____

10. Find an equation of the line containing the altitude from H to $\overline{FG}$.

____

11. Solve the system of equations from Exercises 9 and 10 to find the coordinates of the orthocenter.

____

Find the orthocenter of the triangle with the given vertices.

12. $N(-1, 0)$, $P(1, 8)$, $Q(5, 0)$

____

13. $R(-1, 4)$, $S(5, -2)$, $T(-1, -6)$

____