Name ______________________ Date ____________

LESSON 5.4

Study Guide

For use with pages 318–327

GOAL **Use medians and altitudes of triangles.**

Vocabulary

A **median of a triangle** is a segment from a vertex to the midpoint of the opposite side.

The point of concurrency of the three medians of a triangle is called the **centroid,** and is always inside the triangle.

An **altitude of a triangle** is the perpendicular segment from a vertex to the opposite side or to the line that contains the opposite side.

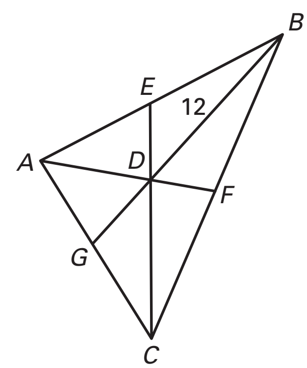
The point at which the lines containing the three altitudes of a triangle intersect is called the **orthocenter** of the triangle.

Theorem 5.8 Concurrency of Medians of a Triangle: The medians of a triangle intersect at a point that is two thirds of the distance from each vertex to the midpoint of the opposite side.

Theorem 5.9 Concurrency of Altitudes of a Triangle: The lines containing the altitudes of a triangle are concurrent.

EXAMPLE 1 Use the centroid of a triangle

In $\triangle ABC$, D is the centroid and $BD = 12$. Find DG and BG.



Solution

$BD = \frac{2}{3}BG$ Concurrency of Medians of a Triangle Theorem

$12 = \frac{2}{3}BG$ Substitute 12 for BD.

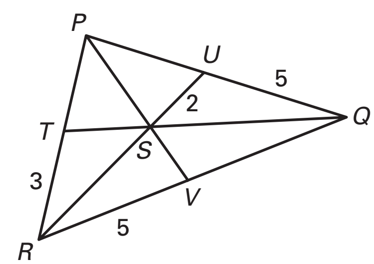
$18 = BG$ Multiply each side by the reciprocal, $\frac{3}{2}$.

Then $DG = BG - BD = 18 - 12 = 6$.

So, $DG = 6$ and $BG = 18$.

Exercises for Example 1

In $\triangle PQR$, S is the centroid, $\overline{PQ} \cong \overline{PQ}$, $UQ = 5$, $TR = 3$, and $SU = 2$.



1. Find RU and RS.
2. Find the perimeter of $\triangle PQR$.

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LESSON 5.4

Study Guide *continued*

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LESSON 5.4

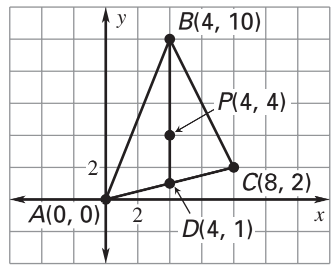
EXAMPLE 2 Find the centroid of a triangle

The vertices of $\triangle ABC$ are $A(0, 0)$, $B(4, 10)$, and $C(8, 2)$. Find the coordinates of the centroid P of $\triangle ABC$.

Solution

Sketch $\triangle ABC$. Then use the Midpoint Formula to find the midpoint D of $\overline{AC}$ and sketch median $\overline{BD}$.

$$D\left(\frac{0+8}{2}, \frac{0+2}{2}\right) = D(4, 1)$$



The centroid is two thirds of the distance from each vertex to the midpoint of the opposite side.

The distance from vertex $B(4, 10)$ to $D(4, 1)$ is $10 - 1 = 9$ units. So, the centroid is $\frac{2}{3}(9) = 6$ units down from B on $\overline{BD}$.

The coordinates of the centroid P are $(4, 10 - 6)$ or $(4, 4)$.

Exercises for Example 2

Find the coordinates of the centroid of the triangle with the given vertices.

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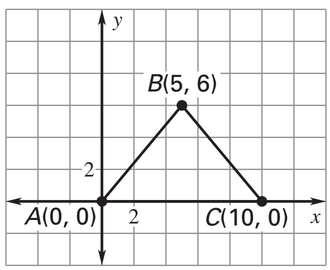

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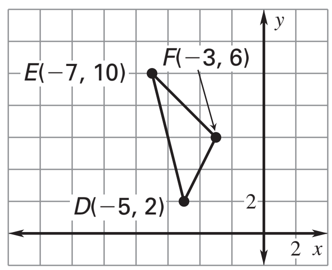

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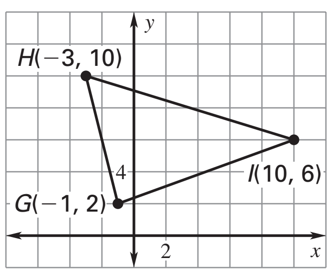

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