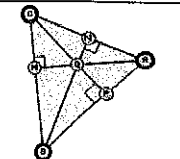


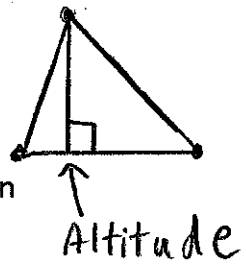
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## Student Exploration: Altitudes and Medians of Triangles

**Vocabulary:** concurrent, altitude, orthocenter, median (of a triangle), centroid

<p><b>Altitudes and medians</b></p>	<p><u>Get the Gizmo ready:</u></p> <ul style="list-style-type: none"> <li>• Select <b>Altitudes</b>.</li> <li>• Turn on all three altitudes.</li> </ul>	
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1. An **altitude** is a line that passes through a vertex of a figure and is perpendicular to the opposite side.



A. Are the altitudes always concurrent? Do they intersect at one point? \_\_\_\_\_ In the Gizmo, check a variety of triangles.

B. This point is called the **orthocenter** of a triangle. What is the point of concurrency of the altitudes of the gizmo triangle? \_\_\_\_\_

C. In the Gizmo, create a variety of triangles. Watch how the location of the orthocenter changes. Write *interior*, *exterior*, or *on* in the last column of the table to tell where the orthocenter lies in relationship to each type of triangle listed in the first column.

Type of triangle	Location of orthocenter
<b>Acute</b>	
<b>Right</b>	
<b>Obtuse</b>	

2. Be sure **Altitudes** is selected and all three altitudes are turned on.

A. Drag the vertices to create a right triangle with right  $\angle A$ . Make a labeled sketch of the right triangle in the space to the right.

B. What happens to points  $P$ ,  $N$ , and  $Q$  when a right triangle is formed? \_\_\_\_\_

C. Look at the altitudes and the legs of the right triangle. What do you notice? \_\_\_\_\_

In the Gizmo, create a variety of right triangles to check if this is always true.

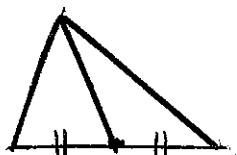
D. Think about the definition of altitude. Why do all three altitudes all meet at the right angle of the triangle? \_\_\_\_\_

3. Turn off **Altitudes** and select **Medians**. Turn on all three medians. A **median** of a triangle is a line that passes through a vertex and the midpoint of the opposite side. In the Gizmo, create a variety of triangles and watch what happens to the medians.

A. Are the medians always concurrent? Do they intersect at one point? \_\_\_\_\_

B. This point is called the **centroid** of a triangle. What is the point of concurrency of the medians of the gizmo triangle? \_\_\_\_\_

C. Is the centroid sometimes, always, or never in the interior of a triangle? \_\_\_\_\_



Median



**Assessment Questions:**

1. What is the point of concurrency of the altitudes in a triangle called?
  - A. circumcenter
  - B. incenter
  - C. orthocenter
  - D. centroid
  
2. What is the point of concurrency of the medians in a triangle called?
  - A. circumcenter
  - B. incenter
  - C. orthocenter
  - D. centroid
  
3. In which type of triangle does the orthocenter of the triangle fall outside the triangle?
  - A. equilateral
  - B. right
  - C. acute
  - D. obtuse
  
4. In this diagram, if  $Z$  is the centroid of  $\triangle ABC$  and  $CT = 15$ , what is  $ZT$ ?

- A. 5
- B. 7.5
- C. 10
- D. 30

