Name:		<u> </u>			Date:			
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Student Exploration: Altitudes and Medians of Triangles

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

Altitudes and medians

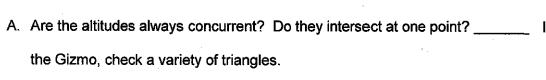
Get the Gizmo ready:

- Select Altitudes.
- · Turn on all three altitudes.



Altitude

1. An **altitude** is a line that passes through a vertex of a figure and is perpendicular to the opposite side.



- 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		
Acute			
Right			
Obtuse			



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

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

Median

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

- 4. With all three medians still showing, turn on both Gizmo rulers.
 - A. Create any triangle in the Gizmo. Use the rulers to measure the segments listed in the table below. Write the measures in the second row.

Segment	AZ	AR	BZ	BS	CZ	CT
Measure						

B. Use a calculator to write each of the following ratios as a decimal, and then as a simplified fraction of integers.

$$\frac{AZ}{AR} =$$

$$\frac{AZ}{AR} = \frac{BZ}{BS} = \frac{BZ}{BS}$$

$$\frac{CZ}{CT} =$$

- C. What do you notice? ____
- D. In the Gizmo, create another triangle and check these ratios. Complete the ratio to the right for any triangle.

- 5. The medians of $\triangle ABC$ to the right are \overline{AR} , \overline{BS} , and \overline{CT} . Use the ratio from above to answer the following questions. Show all of your work.
 - A. If AR = 12, what is AZ? B. If CZ = 9, what is CT?



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

