

Geometry: Concurrent Lines, Medians, and Altitudes

altitude	centroid	circumcenter	concurrent
incenter	median	orthocenter	point of concurrency

Part 1: Vocabulary (pages 256-259)

- When three or more lines intersect in one point, they are _____.
- The point at which the lines intersect is the _____.
- The point of concurrency of the perpendicular bisectors of a triangle is called the _____ of the triangle.
- The point of concurrency of the angle bisectors of a triangle is called the _____ of the triangle.
- A(n) _____ of a triangle is a segment whose endpoints are a vertex and the midpoint of the opposite side.
- In a triangle, the point of concurrency of the medians is the _____.
- A(n) _____ of a triangle is the perpendicular segment from a vertex to the line containing the opposite side.
- The lines containing the altitudes of a triangle are concurrent at the _____ of a triangle.

Part 2: Circumcenter of the Triangle

- Open **THM5PT6**.
- Drag point **C** to six different locations and copy the lengths of segments \overline{AD} , \overline{BD} , and \overline{CD} in the table below. The **hand tool** is already activated when you open **THM5PT6**. These lengths measure the distance from the **circumcenter** to the vertices of the triangle.

Location	1	2	3	4	5	6
Length \overline{AD}						
Length \overline{BD}						
Length \overline{CD}						

Explorations:

- The perpendicular bisectors of the sides of a triangle are concurrent at a point _____ from the vertices.

Part 3: Incenter of the Triangle

- Open **THM5PT7**.
- Drag point **B** to six different locations and copy the lengths of segments \overline{DE} , \overline{DF} and \overline{DG} in the table below. The **hand tool** is already activated when you open **THM5PT7**. The lengths of segments \overline{DE} , \overline{DF} and \overline{DG} are the distance from the **incenter** to the sides of the triangle. This is a distance from a point (the incenter) to a line (sides of the triangles).

Location	1	2	3	4	5	6
Length \overline{DE}						
Length \overline{DF}						
Length \overline{DG}						

Explorations:

- The bisectors of the angles of a triangle are concurrent at a point _____ from the sides.

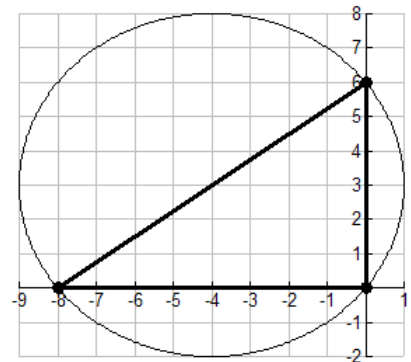
11. Turn to page 257 in your book and copy Theorem 5-6.

Theorem 5-6 _____

12. Turn to page 257 in your book and copy Theorem 5-7.

Theorem 5-7 _____

13. **Finding the Circumcenter:** Find the center of the circle that you can circumscribe about the triangle with vertices (0,0), (-8,0), and (0,6).



Part 4: Centroid of a Triangle

- Open **THM5PT8**.
- Drag point **B** to six different locations and copy the lengths of segments \overline{AD} , \overline{DF} , \overline{AF} , and AD / DF in the table below. The **hand tool** is already activated when you open **THM5PT8**. These lengths measure the distance from the **centroid** to the **midpoints** of the triangle.

Location	1	2	3	4	5	6
Length \overline{AD}						
Length \overline{DF}						
Length \overline{AF}						
AD / DF						

Explorations:

14. In **THM5PT8** when you move point **B**, what calculation remains constant?

15. If $\frac{AD}{AF} = \frac{2}{3}$ ($\approx .67$), then $AD =$ _____.

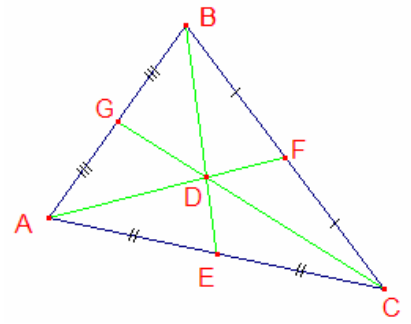
16. The medians of a triangle are concurrent at a point that is two thirds the distance from each vertex to the _____ of the opposite side.

17. Turn to page 258 in your book and copy Theorem 5-8 (including picture in the box provided).

Theorem 5-8 _____



18. **Finding Lengths of Medians:** D is the centroid of $\triangle ABC$ and $DA = 8$. Find DF and AF.



DF = _____ AF = _____

Part 5: Centroid of a Triangle

- Open **THM5PT9**.
- Point **D** is the **Orthocenter** of the triangle.

Explorations:

19. Turn to page 258 in your book and copy Theorem 5-9.

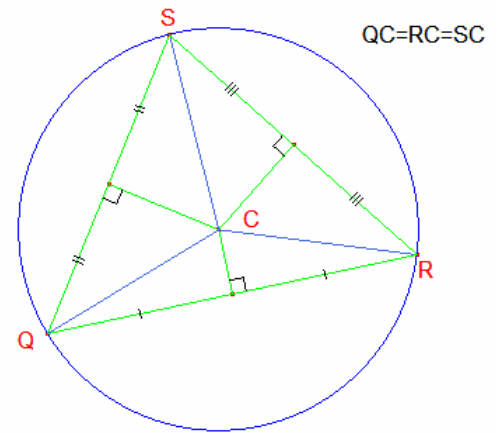
Theorem 5-9 _____

20. What is an acute triangle?
21. What is a right triangle?
22. What is an obtuse triangle?
23. Using **THM5PT6**, **THM5PT7**, **THM5PT8**, and **THM5PT9** fill out the following table. Think about acute, right, and obtuse triangles and use **inside**, **on**, or **outside** to describe the locations of the **circumcenter**, **incenter**, **centroid**, and **orthocenter**. You will have to open each file and create the three types of triangles by moving the vertices of your triangle.

	Circumcenter	Incenter	Centroid	Orthocenter
Acute Triangle				
Right Triangle				
Obtuse Triangle				

Part 6: Circles

24. Using the figure to the right, points **Q**, **R**, and **S** are _____ from point **C**, the _____ of the triangle. The circle is **circumscribed about** the triangle.



25. Using the figure to the right, points **X**, **Y**, and **Z** are _____ from point **I**, the _____ of the triangle. The circle is **inscribed in** the triangle.

