<table>
<thead>
<tr>
<th>Name</th>
<th>Example</th>
<th>Point of Concurrency</th>
<th>Special Property</th>
<th>Example</th>
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<td>perpendicular bisector</td>
<td><img src="example1.png" alt="Example" /></td>
<td>circumcenter</td>
<td>The circumcenter $P$ of $\triangle ABC$ is equidistant from each vertex.</td>
<td><img src="example2.png" alt="Example" /></td>
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<tr>
<td>angle bisector</td>
<td><img src="example3.png" alt="Example" /></td>
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<td>The incenter $Q$ of $\triangle ABC$ is equidistant from each side of the triangle.</td>
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<td>The centroid $R$ of $\triangle ABC$ is two thirds of the distance from each vertex to the midpoint of the opposite side.</td>
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</table>
7.1 Perpendicular Bisector Theorem
If a point is on the perpendicular bisector of a segment, then it is equidistant from the endpoints of the segment.

Example: If $CD$ is a ⊥ bisector of $AB$, then $AC = BC$.

7.2 Converse of the Perpendicular Bisector Theorem
If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment.

Example: If $AE = BE$, then $E$ lies on $CD$, the ⊥ bisector of $AB$.

Theorem 7.3 Circumcenter Theorem
Words The perpendicular bisectors of a triangle intersect at a point called the circumcenter that is equidistant from the vertices of the triangle.

Example: If $P$ is the circumcenter of $\triangle ABC$, then $PB = PA = PC$.

Theorems Angle Bisectors
7.4 Angle Bisector Theorem
If a point is on the bisector of an angle, then it is equidistant from the sides of the angle.

Example: If $BF$ bisects $\angle DBE$, $FD \perp BD$, and $FE \perp BE$, then $DF = FE$.

7.5 Converse of the Angle Bisector Theorem
If a point in the interior of an angle is equidistant from the sides of the angle, then it is on the bisector of the angle.

Example: If $FD \perp BD$, $FE \perp BE$, and $DF = FE$, then $BF$ bisects $\angle DBE$. 
7.1 to 7.2 cheatsheets

**Theorem 7.6 Inceter Theorem**

**Words**
The angle bisectors of a triangle intersect at a point called the *incenter* that is equidistant from the sides of the triangle.

**Example**
If $P$ is the incenter of $\triangle ABC$, then $PD = PE = PF$.

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**Theorem 7.7 Centroid Theorem**

The medians of a triangle intersect at a point called the centroid that is two thirds of the distance from each vertex to the midpoint of the opposite side.

**Example**
If $P$ is the centroid of $\triangle ABC$, then $AP = \frac{2}{3} AK$, $BP = \frac{2}{3} BL$, and $CP = \frac{2}{3} CJ$.

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**Key Concept Orthocenter**

The lines containing the altitudes of a triangle are concurrent, intersecting at a point called the *orthocenter*.

**Example**
The lines containing altitudes $\overline{AF}$, $\overline{CD}$, and $\overline{BG}$ intersect at $P$, the orthocenter of $\triangle ABC$.

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**Theorem 7.8 Exterior Angle Inequality**

The measure of an exterior angle of a triangle is greater than the measure of either of its corresponding remote interior angles.

**Example:**
$m\angle 1 > m\angle A$
$m\angle 1 > m\angle B$
1 **Perpendicular Bisectors** A segment bisector is any segment, line, or plane that intersects a segment at its midpoint. If a bisector is also perpendicular to the segment, it is called a **perpendicular bisector**.

\[ \overline{PO} \text{ is a bisector of } \overline{AB}. \]

\[ \overline{RS} \text{ is a perpendicular bisector of } \overline{JK}. \]

1 **Medians** A **median** of a triangle is a segment with endpoints being a vertex of a triangle and the midpoint of the opposite side. Every triangle has three medians that are concurrent. The point of concurrency of the medians of a triangle is called the **centroid** and is always inside the triangle.

\[ \overline{CD} \text{ is a median of } \triangle ABC. \]

2 **Altitudes** An **altitude** of a triangle is a segment from a vertex to the line containing the opposite side and perpendicular to the line containing that side. An altitude can lie in the interior, exterior, or on the side of a triangle.

\[ \overline{BD} \text{ is an altitude from } B \text{ to } \overline{AC}. \]

Every triangle has three altitudes. If extended, the altitudes of a triangle intersect in a common point.