Name_____

**Honors Geometry**                                                    **Ch 5 Notes Packet**

## Sec 5-1:

After this section you will have completed the following Common Core State Standard(s):
- **G.CO.10: Prove theorems about triangles**
- **G.MG.3: Apply geometric methods to solve problems**

And will be improving your skills in the following Mathematical Practice(s):
1. **Make sense of problems and persevere in solving them**
3. **Construct viable arguments and critique the reasoning of others**

Specifically, you should be able to:
- **Identify and use perpendicular bisectors in triangles**
- **Identify and use angle bisectors in triangles**

**Perpendicular Bisector Thm:** If a point on the perpendicular bisector of a segment then it is_____ from the _____of the segment.
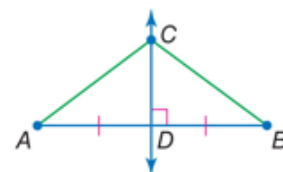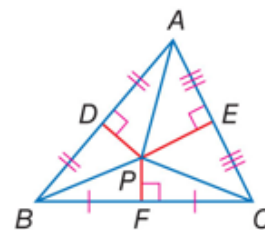
**Converse of Perpendicular Bisector Thm:** If a point is _____ from the endpoints of a segment then it is on the _____ of the segment
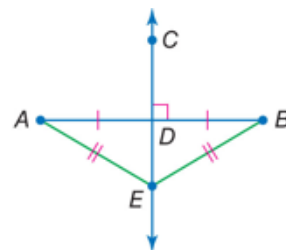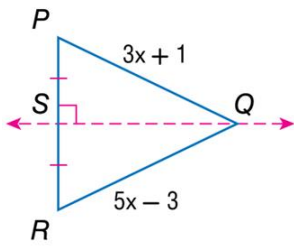
- _____ lines are three or more lines that intersect at the same point.

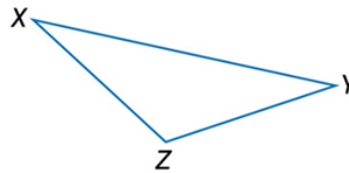**Circumcenter Thm:** The_____ _____of a triangle intersect at the _____, which is equidistant from the _____ of the triangle
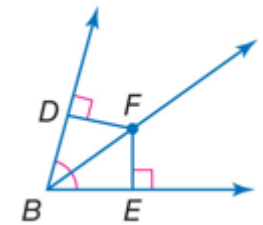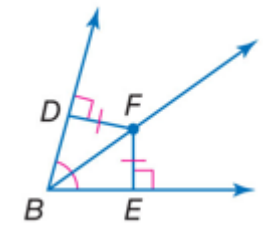
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**Examples:**

**1.**



P, 3x + 1, S ⊥, Q, 5x − 3, R

**2.** A triangular-shaped garden is shown. Can a fountain be placed at the circumcenter and still be inside the garden?
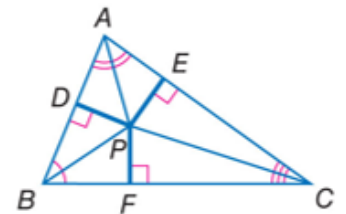


X, Y, Z

**Angle Bisector Thm:** If a point is on the bisector of an angle, then it is _____ from the _____ of the angle.



D, F, B, E

**Converse of Angle Bisector Thm:** If a point is in the interior of and angle and is _____ from the _____ of the angle, then it is on the _____ of an angle.



D, F, B, E

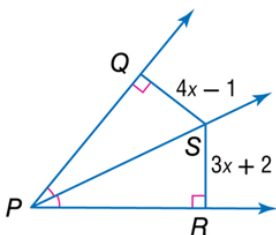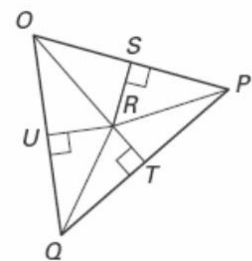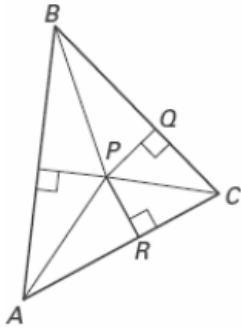**Incenter Thm:** The _____ of a triangle intersect at the _____, which is equidistant from the _____ of the triangle.



A, E, D, P, B, F, C

**Examples:**

**3.**



Q, 4x − 1, S, 3x + 2, P, R

**4.** R is the circumcenter of ΔOPQ, OS = 10, QR = 12 and PQ = 22.

Find:
OP
RP
TR
SR



O, S, R, P, U, T, Q

**5.** The angle bisectors of ΔABC meet at P,  PR = 3 and PC = 5. Find QC.



**6.** Find:

EG
ED
HD
FD
∠GDE
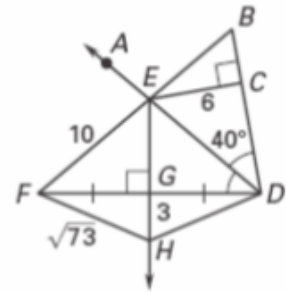


## Sec 5-2:

After this section you will have completed the following Common Core State Standard(s):

- **G.CO.10: Prove theorems about triangles**
- **G.MG.3: Apply geometric methods to solve problems**

And will be improving your skills in the following Mathematical Practice(s):

**3. Construct viable arguments and critique the reasoning of others**
**6. Attend to precision**

Specifically, you should be able to:

- **Identify and use medians in triangles**
- **Identify and use altitudes in triangles**

A _____ of a triangle connects the _____ of one side to the opposite _____.

- The centroid is the point of concurrency of the _____ of a triangle
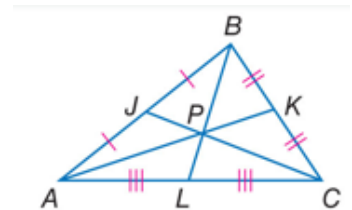


**Centroid Thm:** The _____ of a triangle intersect at the _____. The distance from vertex to the centroid of the triangle is _____ the length of the whole median. [Thus the distance from the midpoint to the centroid is _____ the length of the whole median.

- The centroid is the _____ or _____ of the triangle.

An _____ of a triangle is _____ to one side and intersects the opposite _____.

The _____ of a triangle intersect at the _____.

## Examples:

**1.** Let P be the centroid of ΔXYZ. If YP = 3x+3 and YV = 7x – 13, find x and the length of PV.
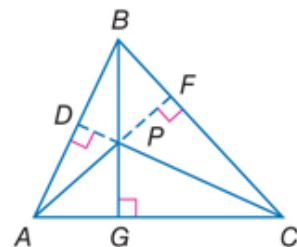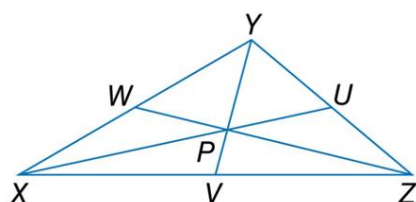
**2.** An artist is designing a sculpture that balances a triangle on top of a pole. In the artist's design on the coordinate plane, the vertices are located at (1, 4), (3, 0), and (3, 8). What are the coordinates of the point where the artist should place the pole under the triangle so that it will balance?

The vertices of ΔHIJ are H(1, 4), I(–1, –0), and J(4, 1). Find the coordinates of the orthocenter of ΔHIJ.

## ConceptSummary  Special Segments and Points in Triangles

| Name | Example | Point of Concurrency | Special Property | Example |
|---|---|---|---|---|
| perpendicular bisector | | circumcenter | The circumcenter *P* of △*ABC* is equidistant from each vertex. | |
| angle bisector | | incenter | The incenter *Q* of △*ABC* is equidistant from each side of the triangle. | |
| median | | centroid | The centroid *R* of △*ABC* is two thirds of the distance from each vertex to the midpoint of the opposite side. | |
| altitude | | orthocenter | The lines containing the altitudes of △*ABC* are concurrent at the orthocenter *S*. | |

## Sec 5-3:

After this section you will have completed the following Common Core State Standard(s):

- **G.CO.10: Prove theorems about triangles**

And will be improving your skills in the following Mathematical Practice(s):

2. **Make sense of problems and persevere in solving them**
4. **Construct viable arguments and critique the reasoning of others**

Specifically, you should be able to:

- **Apply the triangle sum theorem**
- **Apply the exterior angle theorem**

**Exterior Angle Inequality:**  The measure of an exterior angle of a triangle is greater than the measure of _____.

## Theorems involving unequal sides or angles:

The _____ side of a triangle is always across from the _____ angle, and the _____ side is always across from the _____ angle.

The _____ angle of a triangle is always across from the _____ side, and the _____ angle is always across from the _____ side.

## Examples:

## Sec 5-4:

After this section you will have completed the following Common Core State Standard(s):

- **G.CO.10: Prove theorems about triangles**

And will be improving your skills in the following Mathematical Practice(s):

- **2. Reason abstractly and quantitatively**
- **3. Construct viable arguments and critique the reasoning of others**

Specifically, you should be able to:

- **Write indirect algebraic proofs**
- **Write indirect geometric proofs**

**Indirect Proofs:**  To write an _____or proof by _____, assume the _____ of what you want to prove and show that this leads to a _____ (something that's impossible), so what you wanted to prove must be _____.

## Example:

Prove a triangle can't have more than one obtuse angle.

1. Assume…..

2. This is impossible because…..

3.  Therefore, …..

## Sec 5-5:

After this section you will have completed the following Common Core State Standard(s):
- **G.CO.10: Prove theorems about triangles**
- **G.MG.3: Apply geometric methods to solve problems**

And will be improving your skills in the following Mathematical Practice(s):
- **1. Make sense of problems and persevere in solving them**
- **2. Reason abstractly and quantitatively**

Specifically, you should be able to:
- **Use the triangle inequality theorem to identify possible triangles**
- **Prove triangle relationships using the triangle inequality theorem**

**Triangle Inequality Theorem:** The _____ of any two sides of a triangle is always _____.

## Example:

**1.** If the three sides of a triangle are 5, 11, and x, what is the range of possible values for x?

## Sec 5-6:

After this section you will have completed the following Common Core State Standard(s):
- **G.CO.10: Prove theorems about triangles**

And will be improving your skills in the following Mathematical Practice(s):
- **1. Make sense of problems and persevere in solving them**
- **2. Construct viable arguments and critique the reasoning of others**

Specifically, you should be able to:
- **Apply the hinge theorem and its converse to make comparisons in triangles**
- **Prove triangle relationships using the hinge theorem or its converse**

**The Hinge Theorem:** If two triangles have 2 pairs of congruent sides then the triangle that has the _____ will have the _____ .

**Converse of the Hinge Theorem:** If two triangles have 2 pairs of congruent sides then the triangle that has the _____ will have the _____

**Examples:**