Incenter and Centroid Investigations Name: ____ A#___

Part 1: Incenter

1. Pick one angle of your triangle. Use your protractor to find the angle measure.
2. Draw a ray that divides the angle measure into two congruent angles. Extend the ray all the way to the end of the paper.
3. Repeat steps 1 and 2 for the other two angles.
4. What type of triangle do you have (acute, right, or obtuse)?

5. You just created angle bisectors for each angle of your triangle. What do you notice about the angle bisectors?

6. Label the point of intersection A. Is the point of intersection inside your triangle, outside your triangle, or on your triangle?

7. Draw in 3 segments connecting point A to each side of the triangle. Each segment should be perpendicular to the side.
8. The distance from a point to a line is defined as the measure of a segment perpendicular to the line that connects it to the point. Measure the distance from point A to the three sides of your triangle. Record those measures below. What do you notice about these measures?

9. Use the compass to draw a circle using point A as the center and the distance from step 8 as your radius.
10. What do you notice about the relationship between the circle and the triangle you had?

Part 2: Centroid

1. What type of triangle do you have (acute, right, or obtuse)?

2. Pick one side of your triangle. Use your ruler to find the midpoint of that side.
3. Draw a ray that extends from the midpoint of that side to the opposite vertex of the triangle.
4. Repeat steps 1 and 2 for the other two side.
5. You just created medians for each side of your triangle. What do you notice about the medians?

6. Label the point of intersection A. Is the point of intersection inside your triangle, outside your triangle, or on your triangle?

7. Place point A on the tip of a pencil or pen. Can you balance the triangle?

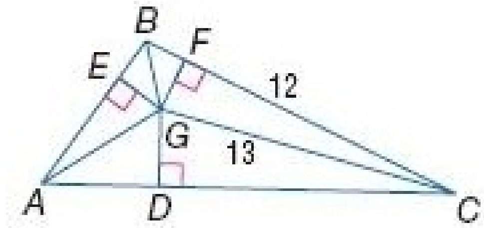
8. For each median measure the distance from A to the vertex and from A to the midpoint used to create that median. What do you notice?

A to vertex __________ A to midpoint ____________
A to vertex __________ A to midpoint ____________
A to vertex __________ A to midpoint ____________

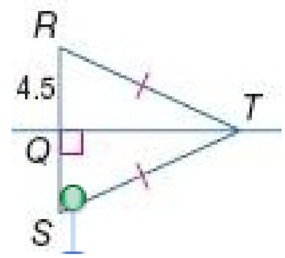
Practice:

1.

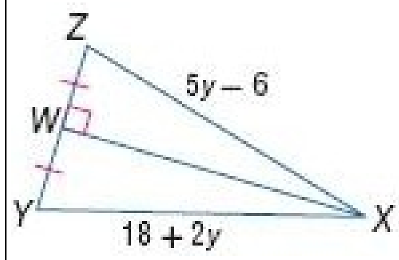
Find EG if G is the incenter of ΔABC .



2.
Find the measure of RS.

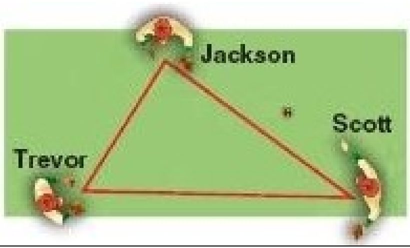


3. Find the measure of XZ



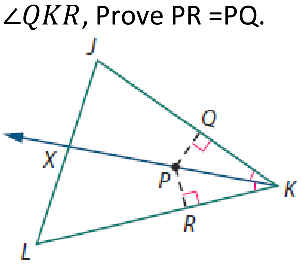
4.

BASEBALL Jackson, Trevor, and Scott are warming up before a baseball game. One of their warm-up drills requires three players to form a triangle, with one player in the middle. Where should the fourth player stand so that he is the same distance from the other three players?



We discovered that we can create the incenter of a triangle by finding the point of concurrency of all the angle bisectors. We also saw that the incenter is equidistant from all of the sides of the triangle. This idea can be generalized to show that any point on an angle bisector is equidistance from the sides of the angle. Fill in the blanks of the following proof to show this is true.

Given $\overrightarrow{KX}$ is an angle bisector of $\angle QKR$, Prove PR =PQ.



Statements	Reasons
$\overrightarrow{KX}$ is an angle bisector of $\angle QKR$	
$m\angle QKP = m\angle RKP$	
	Definition of Congruence
$\overline{PK} \cong \overline{PK}$	
$m\angle PRK = 90°$ $m\angle PQK = 90°$	
$m\angle PRK = m\angle PQK$	
	Definition of Congruence
$\Delta PRK \cong \Delta PQK$	
	CPCTC
PR=PQ	