MAT-222-840

Activities for Chapter 5

Name: Solutions

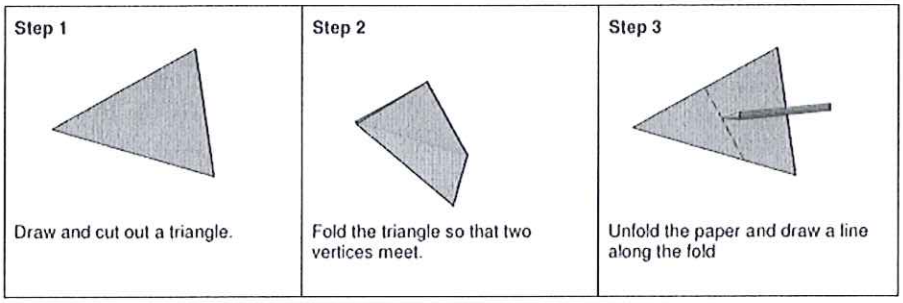
Spring 2017

Date: _____

Activity 1: Triangle Centers by Folding

For this activity, your team will need 3 pieces of paper, scissors, and a colored pencil.

Make sure each team member does some cutting and folding in this activity.



1. Among your team members, draw and cut out three triangles: one acute, one right, and one obtuse.
2. Starting with one side of the acute triangle, fold the triangle so that two vertices meet.
3. Unfold the paper and draw a line along the fold.
4. Which of the following does this line represent for this triangle?
   a. Perpendicular bisector
   b. Angle bisector
   c. Altitude
   d. Median
5. Repeat steps 2-3 for the other two sides of the acute triangle.
6. Mark the point where the fold-lines meet. What is this point called?

   Circumcenter

7. Measure the distance from the point of concurrency of the fold-lines to each vertex of the triangle. What do you observe?

   The circumcenter is equidistant to each vertex.

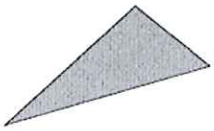
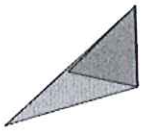
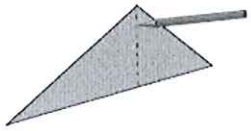
8. Repeat steps 2-7 for the right triangle and obtuse triangle. You should get the same result each time. Why does this happen?

   Correction: I get the same result for the right triangle, but the obtuse triangle's circumcenter is not on the triangle. These lines should be concurrent at a point equidistant from each vertex because of the circumscribed circle formed by the circumcenter.

Activity 2: Triangle Centers by Folding (Part 2)

For this activity, your team will need 3 pieces of paper, scissors, and a colored pencil.

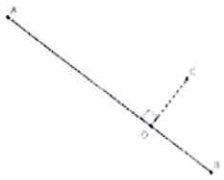
Make sure each team member does some cutting and folding in this activity.

Step 1	Step 2	Step 3
		
Draw and cut out a triangle.	Fold the triangle so that two sides meet.	Unfold the paper and draw a line along the fold

1. Among your team members, draw and cut out three triangles: one acute, one right, and one obtuse.
2. Starting with one side of the acute triangle, fold the triangle so that two sides meet.
3. Unfold the paper and draw a line along the fold.
4. Which of the following does this line represent for this triangle?
   a. Perpendicular bisector
   b. Angle bisector
   c. Altitude
   d. Median
5. Repeat steps 2-3 for the other two vertices of the acute triangle.
6. Mark the point where the fold-lines meet. What is this point called?

Incenter

7. Measure the perpendicular distance from the point of concurrency of the fold-lines to each side of the triangle. (*See picture.*) What do you observe?



To find the *perpendicular distance* from point C to $\overline{AB}$, find the point D so that $\overline{CD} \perp \overline{AB}$.

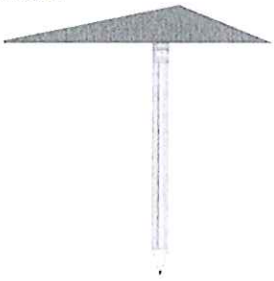
Same perpendicular distance to all 3 sides.

9. Repeat steps 2-7 for the right triangle and obtuse triangle. You should get the same result each time. Why does this happen?

Same result because the incenter is the center of the inscribed circle. The perpendicular distance we found in 7. is the radius of this circle.

Activity 3: Balancing Act

For this activity, you will need three 5x8" index cards, scissors, and a pencil with a flat end.



1. Draw and cut out three triangles (acute, right, and obtuse).
2. Balance the acute triangle on the flat end of the pencil, as shown.
3. Mark the balancing point on the acute triangle.
4. Repeat steps 2-3 for the right and obtuse triangles.
5. Starting with the acute triangle, mark the midpoint of each of the three sides, and draw the three **medians**, line segments connecting the midpoint of each side to the opposite vertex.
6. Your medians should be **concurrent**. What is the name of their point of concurrency?

   centroid

7. What do you observe about the point of concurrency and the balancing point?

   They are the same!

8. In previous activities, you found that some triangle centers can lie outside of the triangle. Based on your observations, do you think that this activity's center could lie outside of the triangle? Why or why not?

   Nope! A triangle has to balance on a point inside that triangle.

Activity 4: Inside or out?

Based on your observations in the previous activities, fill in each box of the table with "Inside," "On," or "Outside," depending on if the center lies inside, outside, or on the border of the triangle.

	Circumcenter	*Incenter*	*Orthocenter*	*Centroid*
Acute	Inside	Inside	Inside	Inside
Right	On	Inside	On	Inside
Obtuse	Outside	Inside	Outside	Inside

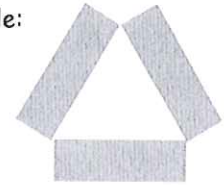
Activity 8: Making triangles with Cuisenaire rods

For this activity, you will need a set of Cuisenaire rods and a set of dice.

Take turns in your group following the procedure:

1. Roll all three dice.
2. Select Cuisenaire rods of those lengths.
3. If you can, make a triangle out of those rods.
4. Fill in the appropriate row of the table below.
5. Continue until you have filled all of the rows of the table. *(Make sure you have at least 2 examples in which you CAN make a triangle, and 2 examples in which you CANNOT.)*

For example:
I rolled ⚃ ⚃ ⚃, so I selected three lime green Cuisenaire rods and made the triangle:



Numbers rolled	***Can you make a triangle?***	***Why or why not? Support your answer with an inequality statement.***
6, 4, 3	Yes	$3+4=7>6$, $6+4=10>3$, $6+3=9>4$
3, 3, 5	Yes	$3+3=6>5$, $3+5=8>3$, $3+5=8>3$
5, 2, 1	No	$1+2=3 \not> 5$.
3, 3, 6	No	$3+3=6 \not> 6$.