MAT-222-840

Name: _____

Team Problems for Chapter 10

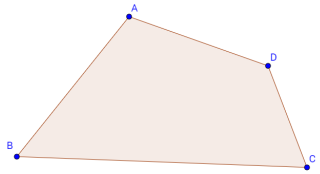
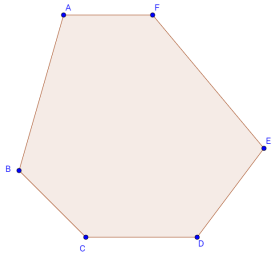
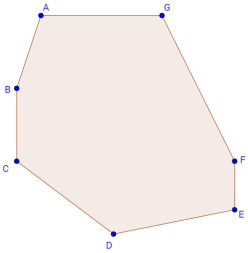
Date: _____

Problem #1: Divide and Conquer

In this problem, we will sketch out a proof of the Polygon Interior-Angle Sum Theorem. That theorem says that the sum of the measures of the interior angles of a convex n-gon is: _____

We will start with the fact that the sum of the interior angles of a triangle is 180 degrees.

In each of the polygons below, draw diagonals from the vertex A to any vertices with which A does not share an edge. For example, in the quadrilateral, draw the diagonal $\overline{AC}$. This should divide the polynomial into a number of triangles. Count up the triangles and complete the table.

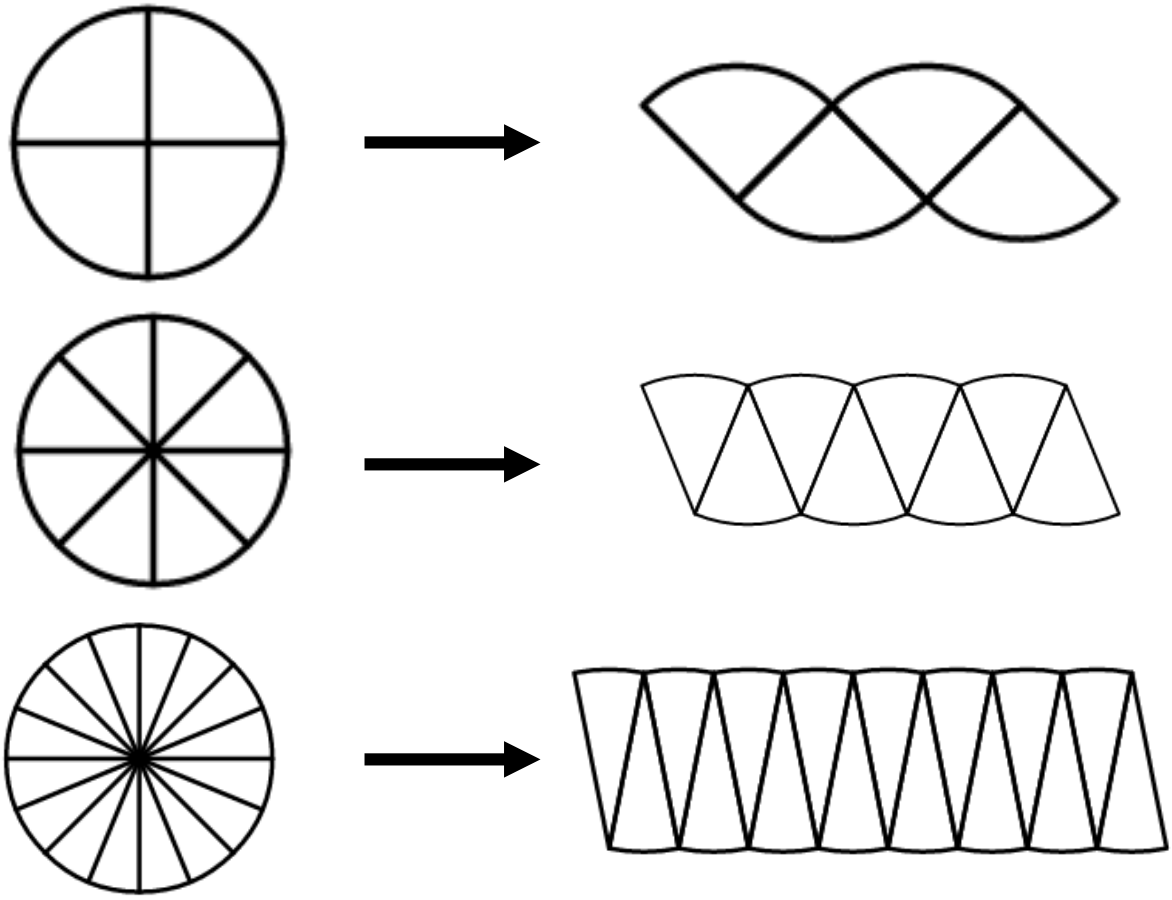
Polygon	Number of Sides	Number of triangles	**Total** number of degrees in triangles
			
			
			
			

In a polygon with n sides, drawing all diagonals from one vertex will divide the polygon into _____ triangles. Since each triangle has an interior angle sum of 180 degrees, the n-gon has an interior angle sum of

$$\underbrace{\qquad\qquad}_{\text{\# of triangles}} \times 180 \text{ degrees}$$

Problem #2: Why the Area Formula for Circles Makes Sense

1. Consider the pictures below, where the circle is cut into 4, 8, and 16 pie-pieces.



1. Visualize cutting the circle into more and more smaller pie pieces and rearranging them as above.
   - What shape would the rearranged circle become more and more like? Draw it below.

   - What would the lengths of the sides of this shape be?

   - What would the area of this shape be?

Using your answers to part 4, explain why it makes sense that a circle of radius r units has area πr^2 square units, given that the circumference of a circle of radius r is $2\pi r$.

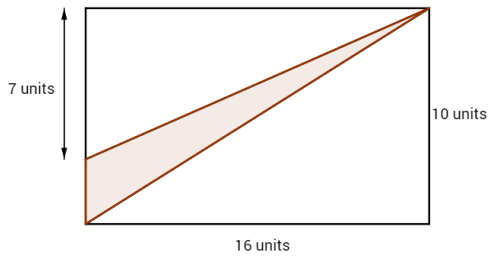
Problem #3: Similar Areas Problem-Solving

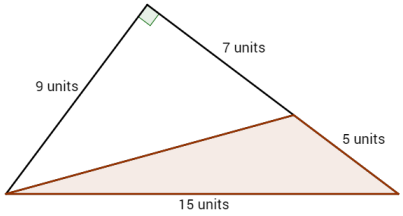
1. To plan the renovation of an art gallery, a 1/10 scale model of the Pre-Revolution French Landscape Painting Wing was made. The warm ochre paint that the design company chose to paint the walls of the model cost $3.10. If the company uses the same paint, at the same cost, to paint the walls of the gallery, how much will it cost?

2. Mrs. Henderson's neighbor just had his 1-acre property fenced in an attractive 6 foot picket for $7500. If Mrs. Henderson hires the same company to fence her 3-acre property with the same type of fence, how much will it cost her? Assume Mrs. Henderson's property and her neighbor's property are similar in shape.

Problem #4: Determining Areas

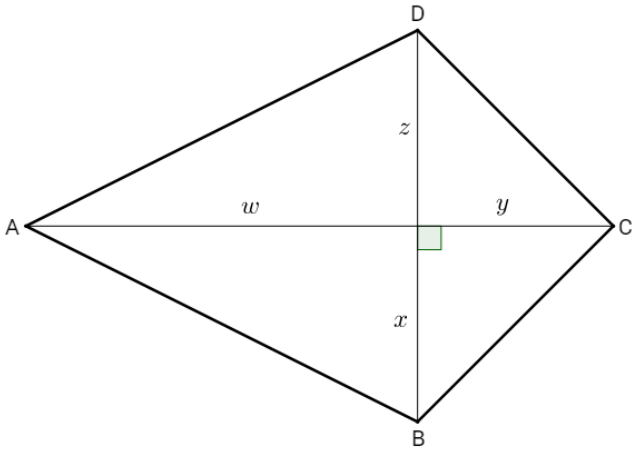
Determine each of the shaded areas below.





Problem #5: Why the Area formula for Kites makes sense

Consider the kite *ABCD* below with diagonals d_1 and d_2 drawn in. The diagonals have been divided at their point of intersection into lengths such that $d_1 = w + y$ and $d_2 = x + z$.



1. Find the area of *ABCD* by breaking it up into four triangles and adding those areas together.

2. Starting with the kite area formula $A = \frac{1}{2} d_1 d_2$, make the substitutions $d_1 = w + y$ and $d_2 = x + z$ and simplify by expanding (multiplying out).

3. Verify that your area formulas in Step 1 and Step 2 are the same.

4. Explain why this method would also verify the area formula for rhombuses is true.