

## Four Triangle Project

Timeframe: About 4 days

Organization: Groups of 2 students

Materials: One or Two 4 x 4 squares per each team  
Sixty-four 4 x 4 right triangles per team (to complete all shapes)  
One 2 x 2 right triangle per person (for test)  
Large Ziploc bags  
Black pens or markers

### **Activity 1: Describe the square, cut 4 x 4 squares**

1. Distribute 4 x 4 squares
2. Discuss all properties of the square:  
quadrilateral, parallelogram, rhombus, rectangle  
4 vertices, 4 sides, 4 angles  
right (90 degree) angles  
all sides the same length  
sum of the angles = 360 degrees

The next two items can either be done or just discussed depending on the number of squares available.

3. Mark the length of each side with the variable "x" to show the unknown length  
Discuss that the perimeter of the square would be 4 times x  $P = 4x$
4. Label each interior angle with 90 degrees (total of 360 degrees)
5. On a second (or first) square cut on the diagonal forming two right triangles
6. Discuss all of the properties of the triangle:  
right, isosceles triangle  
3 vertices, 3 sides, 3 angles  
one right (90 degree) angle, two acute (45 degree) angles  
sum of angles = 180 degrees
7. Label the two congruent sides with the variable "x" and the new longer side as "y"  
Discuss that the perimeter of the triangle.  $P = 2x + y$
8. Label the angles 45, 45, and 90 degrees (total of 180 degrees)
9. This is now the official HANDY DANDY Measuring Tool

### Activity 2: Create “2 triangle” shapes

1. The students must create all different shapes possible utilizing two 4 x 4 triangles. Sides must match – a “y” cannot be lined up with a “x”  
Model how to use the handy dandy measuring tool to measure sides and angles
2. For each shape created they should label:
  - a. each side with its length in terms of x and y
  - b. each angle (explain interior angles)  
demonstrate how to measure angles made up of two or more triangles
  - c. in the middle state the perimeter of the shape
  - d. in the middle state the sum of the angles of the shape
  - e. in the middle state the number of sides on the shape
3. **There are 3 different shapes that can be created.**
4. Have the students record the information (2c,d,e plus shape names [pentagon, hexagon, etc.]) in their math spirals

| TRIANGLES | SIDES | SHAPE NAME | PERIMETER     | SUM OF ANGLES               |
|-----------|-------|------------|---------------|-----------------------------|
| 2         | 3     | triangle   | $P = 2x + 2y$ | Sum of $\angle = 180^\circ$ |

### Activity 3: Create “3 triangle” shapes

1. The students must create all different shapes possible utilizing three 4 x 4 triangles. Sides must match – a “y” cannot be lined up with an “x”
2. **There are 4 different shapes that can be created.**
3. All other activities are the same as activity 2 above.
4. Record all information in math spirals.

### Activity 4: Create “4 triangle” shapes

1. The students must create all different shapes possible utilizing four 4 x 4 triangles. Sides must match – a “y” cannot be lined up with a “x”
2. Before a shape is taped together check by rotating and reflecting to make sure that your shape is not a duplicate
3. **There are 14 different shapes that can be created.**
4. All other activities are the same as activity 2 above.
5. Record all information in math spirals.
6. Based on all the information recorded in their math spiral, ask the students to look for patterns among the numbers (specifically between the number of sides and the sum of angles)
7. Extension: If a shape had “n” sides how could we find the sum of the angles? What formula can be made up to find this total?  $S = (n - 2) \cdot 180$

**Activity 5: Create a geometric/polygon animal**

1. Trace 12 or more shapes on construction paper to create a new polygon animal.
2. The animal must have at least 8 sides.
3. Label the side measurements and find the perimeter.
4. Label the angle measurements and find the sum of the angles.
5. Add any details to turn your polygon into an animal.
6. Add background details.
7. Add a title to the paper.

**Evaluation:**

1. Completed shapes in Ziploc bags
2. Review of math spiral
3. Completed polygon animal
4. Test containing shapes (smaller) for the students to measure utilizing handy dandy measuring tools

Literature Connection: The Greedy Triangle, Marilyn Burns

|   |          | Sides | Specific shape | Perimeter | Sum of Angles |
|---|----------|-------|----------------|-----------|---------------|
| 1 | Square   |       | Square         |           |               |
| 2 | Triangle |       |                |           |               |

|    | Made With   | Sides | Specific shape | Perimeter | Sum of Angles |
|----|-------------|-------|----------------|-----------|---------------|
| 3  | 2 Triangles |       |                |           |               |
| 4  | 2 Triangles |       |                |           |               |
| 5  | 2 Triangles |       |                |           |               |
| 6  | 3 Triangles |       |                |           |               |
| 7  | 3 Triangles |       |                |           |               |
| 8  | 3 Triangles |       |                |           |               |
| 9  | 3 Triangles |       |                |           |               |
| 10 | 4 Triangles |       |                |           |               |
| 11 | 4 Triangles |       |                |           |               |
| 12 | 4 Triangles |       |                |           |               |
| 13 | 4 Triangles |       |                |           |               |
| 14 | 4 Triangles |       |                |           |               |
| 15 | 4 Triangles |       |                |           |               |
| 16 | 4 Triangles |       |                |           |               |
| 17 | 4 Triangles |       |                |           |               |
| 18 | 4 Triangles |       |                |           |               |
| 19 | 4 Triangles |       |                |           |               |
| 20 | 4 Triangles |       |                |           |               |
| 21 | 4 Triangles |       |                |           |               |
| 22 | 4 Triangles |       |                |           |               |
| 23 | 4 Triangles |       |                |           |               |

What pattern or rule do you notice between the number of sides on a shape and the sum of the angles?