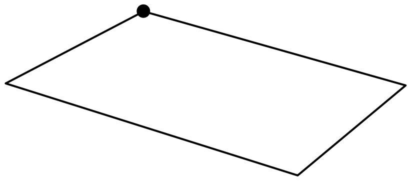
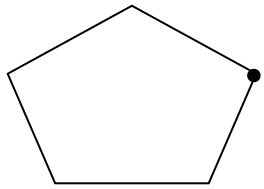
Polygon Interior Angles – Please put this work on your own paper!

The purpose of this activity is to walk you through the formula for the total interior angles of a polygon.

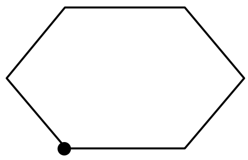
1. Sketch a quadrilateral (n = 4 sides) on your paper as shown. Note that one vertex is highlighted.
    a) Starting from exactly one vertex, draw as many diagonals as you can. Remember that a diagonal must connect two **nonconsecutive** vertices.
    b) How many diagonals can you draw?
    c) How many triangles are there?
    d) How many degrees are there in each triangle?
    e) Combining your answers in (c) and (d), how would you calculate the total degrees in the interior of a quadrilateral (n = 4 sides)?
    f) Record your results in the "quadrilateral column" of the chart.



2. Sketch a pentagon (n = 5 sides) on your paper as shown.
    a) Starting from exactly one vertex, draw as many diagonals as you can. Remember that a diagonal must connect two **nonconsecutive** vertices.
    b) How many diagonals can you draw?
    c) How many triangles are there?
    d) Based on your answer in (c), how would you calculate the total degrees in the interior of a pentagon (n = 5 sides)?
    e) Record your results in the "pentagon column" of the chart.



3. Sketch a hexagon (n = 6 sides) on your paper as shown.
    a) Starting from exactly one vertex, draw as many diagonals as you can.
    b) How many diagonals can you draw?
    c) How many triangles are there?
    d) Based on your answer in (c), how would you calculate the total degrees in the interior of a hexagon (n = 6 sides)?
    e) Record your results in the "hexagon column" of the chart.



4. <u>HEY! The questions are going to change direction now</u>!
    a) Sketch just a triangle now. (Yes, three sides).
    b) How many **<u>diagonals</u>** can you draw? Remember that a diagonal must connect two **nonconsecutive** vertices.
    c) How many total degrees are there in a triangle?
    d) Record your results in the "triangle column" of the chart.

5. Fill in your chart, which should look like the one below:

Quantity	**Triangle**	**Quadrilateral**	**Pentagon**	**Hexagon**	**Heptagon**	**....**	**40-gon**	**100-gon**	**Formula for an n-gon**
# of sides	3								
# of diagonals									
# of triangles									
total interior degrees									

6. Examine any patterns between row n (number of sides) and row d (number of diagonals). Describe, in words, the relationship between the number of sides and the number of diagonals.
7. Write an algebra formula (in the box with the double-border) representing how to calculate the number of diagonals if you know the number of sides. Your formula should have the letter "n" in the formula.
8. Examine any patterns between the number of sides and the number of triangles. Describe, in words, the relationship between the number of sides and the number of triangles.
9. Write an algebra formula (in the box with the triple-border) representing how to calculate the number of triangles if you know the number of sides. Your formula should have the letter "n" in the formula.
10. Knowing that every triangle has 180 degrees in the interior, describe in words how to calculate the total interior degrees of a polygon with any number of sides.
11. Write an algebra formula (in the box with the heavy border) representing how to calculate the total interior degrees of a polygon with n sides. Your formula should the letter "n" in the formula.

12. Now that you have all of the formulas you need, fill in all missing entries in the table: (for the heptagon, the 40-gon, and the 100-gon). You don't need to fill in the "gaps." Congratulations! You have discovered a significant formula in Geometry!