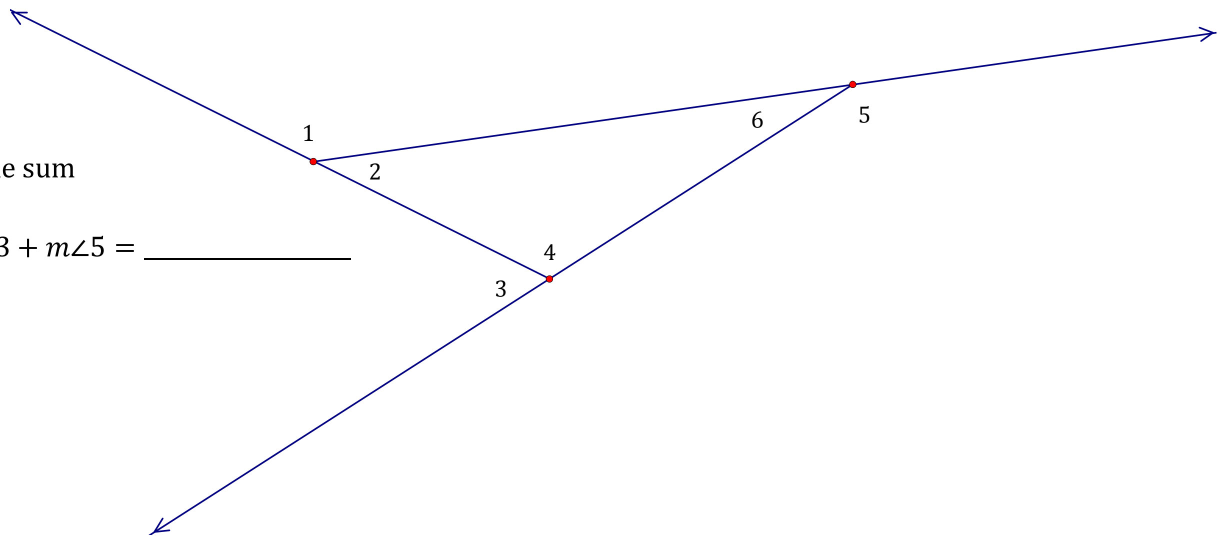
Exploring Exterior Angles

We have discovered that the sum of the interior angles of an $n - gon$ is given by the expression $(n-2)180°$. Now we will investigate the sum of all exterior angles in an $n - gon$.

Part 1: Explore

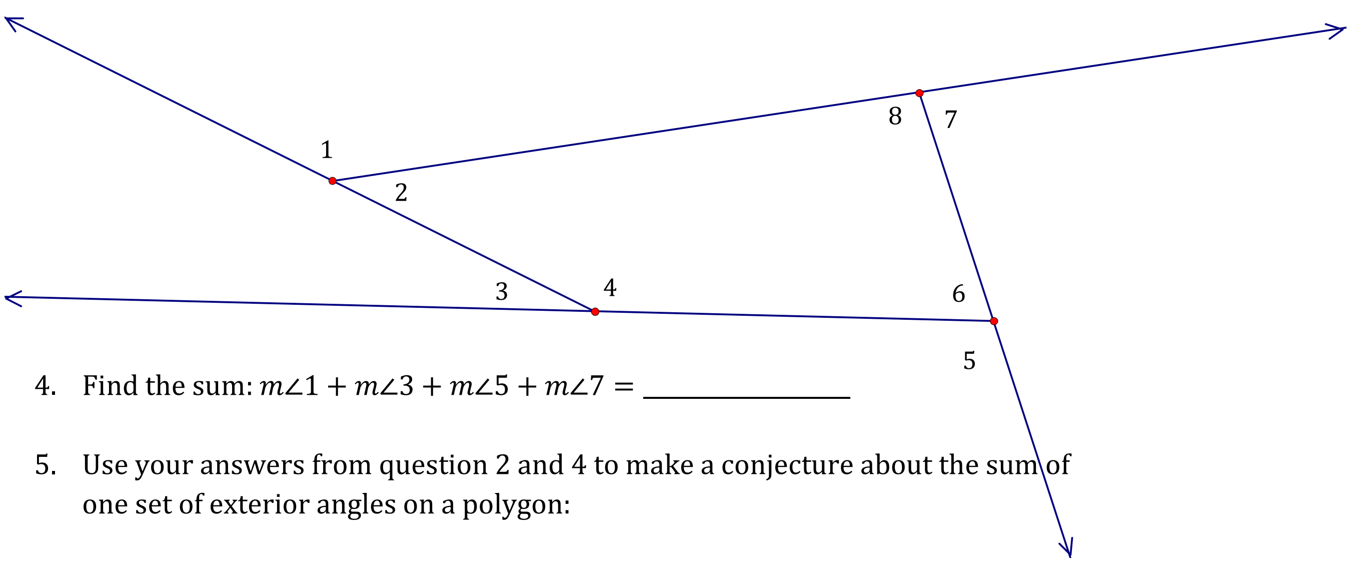
1. Measure all the exterior angles ($\angle 1, \angle 3,$ and $\angle 5$) in the triangle below.



2. Compute the sum

   $m\angle 1 + m\angle 3 + m\angle 5 =$ _______________

3. Measure all the exterior angles ($\angle 1, \angle 3, \angle 5$ and $\angle 7$) on the quadrilateral below.

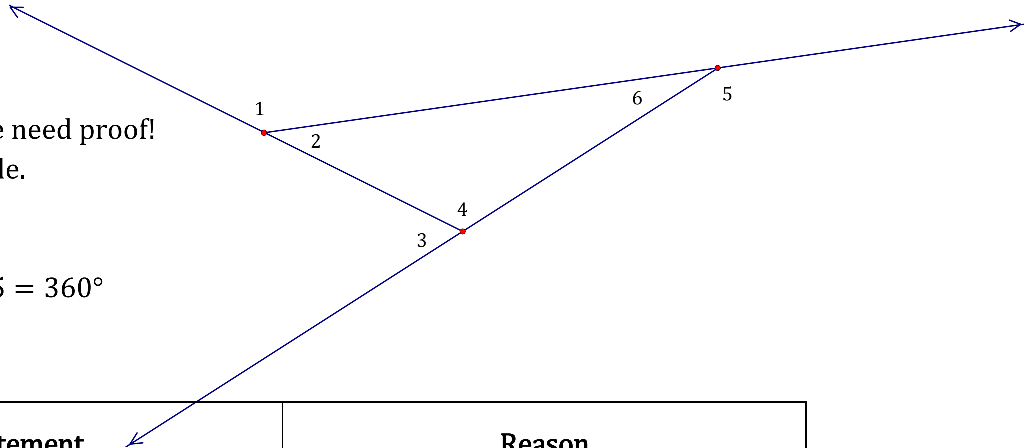


4. Find the sum: $m\angle 1 + m\angle 3 + m\angle 5 + m\angle 7 =$ _______________

5. Use your answers from question 2 and 4 to make a conjecture about the sum of one set of exterior angles on a polygon:

Part 2: Prove It!

Observations are good, but we need proof!
So, let's prove this for a triangle.



Complete the proof below to show that $m\angle 1 + m\angle 3 + m\angle 5 = 360°$

Statement	**Reason**
1. $m\angle 1 + m\angle 2 =$ _______° $m\angle 3 + m\angle 4 =$ _______° $m\angle 5 + m\angle 6 =$ _______°	1.
2. $m\angle 2 + m\angle 4 + m\angle 6 =$ _______°	2.
3. $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 + m\angle 6 =$ ___________	3.
4. $\therefore m\angle 1 + m\angle 3 + m\angle 5 = 360°$	4.

In General…

1. What is the sum of each interior angle and it's adjacent exterior angle in an $n-gon$?

2. How many of these pairs are there in an $n-gon$?

3. Write an *expression* for the sum of *all* the interior angles and one set of exterior angles in an $n-gon$:

4. Write an *expression* for the sum of *all* the interior angles of an $n-gon$:

5. Now subtract the expression in #4 from #3 to find the sum of one set of exterior angles in an $n-gon$.

Polygon exterior angle theorem:
The sum of the measures of one set of exterior angles in an $n-gon$ is __________