Exploring Exterior Angles

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

# Part 1: Explore

1. Measure all the exterior angles ($∠1, ∠3, and ∠5)$ in the triangle below.
2. Compute the sum

$m∠1+m∠3+m∠5=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$
3. Measure all the exterior angles $(∠1, ∠3, ∠5 and ∠7)$ on the quadrilateral below.
4. Find the sum: $m∠1+m∠3+m∠5+m∠7=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$
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 $m∠1+m∠3+m∠5=360°$

|  |  |
| --- | --- |
| **Statement** | **Reason** |
| 1. $m∠1+m∠2=\\_\\_\\_\\_\\_\\_\\_\\_°$$m∠3+m∠4=\\_\\_\\_\\_\\_\\_\\_\\_°$  $m∠5+m∠6=\\_\\_\\_\\_\\_\\_\\_\\_°$
2. $m∠2+m∠4+m∠6=\\_\\_\\_\\_\\_\\_\\_\\_°$
3. $m∠1+m∠2+m∠3+m∠4+m∠5+m∠6=\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_\\_$
4. $∴m∠1+m∠3+m∠5=360°$
 | 1.
2.
3.
 |

**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 \_\_\_\_\_\_\_\_\_\_