Searching for Patterns – More with Identity Elements

In the previous worksheet on Identity Elements of Z_n, we discovered that 0 is an additive identity and that it corresponds to solid inverted triangles in a colored Pascal triangle. Using the PascGalois program and working with Z_2, look for patterns in the solid inverted triangles. You might want to assign black to 0 and a bright color like yellow to 1. Start with just a few number of rows, for example 5 or 10, and then continue to increase the number of rows. Here are some questions that may help in your investigation:

1. Is there a pattern in the size of the solid inverted triangles as you move down the Z_2 triangle?

2. Is there a pattern in the number of solid inverted triangles as you move down the Z_2 triangle?

3. On what rows do the identity triangles begin and end? Is there a pattern?

4. How many lines appear in between the bigger identity triangles moving down the center of the Z_2 triangle?

Repeat the same investigation with a Z_3 triangle. Comparing your results, what conjectures would you make concerning the relationship between the identity triangles and the modulus?

Investigate a Z_6 triangle. Do the results support or refute your conjectures?