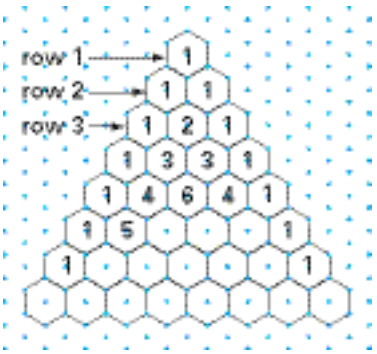
4.1 Exploring Number Patterns

You will need
- triangle dot paper
- coloured pencils
- a calculator

GOAL
Identify and describe number patterns.

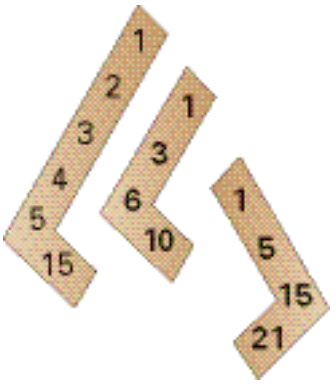
Explore the Math

In 1653, Blaise Pascal used this triangular arrangement of numbers to solve a problem.



? What patterns can you find in Pascal's triangle?

A. Copy Pascal's triangle. Find a pattern that relates the numbers in a row to the numbers in the row above. Use the pattern to fill in the missing numbers.
B. Describe a pattern in the sums of the horizontal rows.
C. Describe patterns in the diagonals.
D. Use your calculator to calculate 11^1, 11^2, 11^3, and 11^4. Record the results.
E. Describe a pattern in Pascal's triangle that relates to the powers of 11.
F. How does your pattern from step E work for the 8th row in Pascal's triangle?
G. Highlight the odd and even numbers in Pascal's triangle, using two different colours. What patterns do you see?
H. Describe how to find the "hockey stick" pattern in Pascal's triangle. Use the pictures to help you.
I. Look for other patterns in Pascal's triangle, and give them names.



Reflecting

1. Suppose that you were asked about the numbers in row 10 of Pascal's triangle.
a) Which numbers in row 10 could you fill in without knowing the numbers in the previous row? Explain how you would do this.
b) Which numbers could you not fill in unless you knew the numbers in row 9? Explain why not.

2. Describe the patterns you found in Pascal's triangle.