

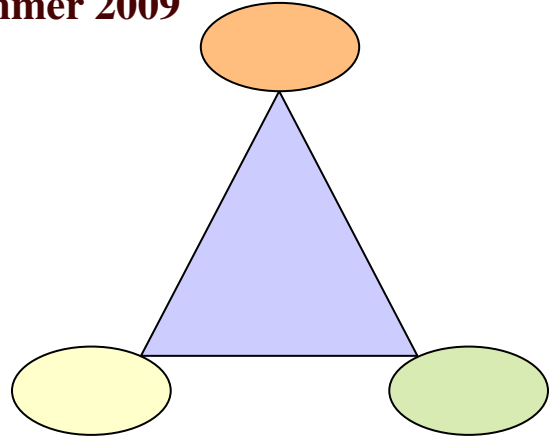
Algebra/Geometry Institute Summer 2009

Patterns in Pascal's Triangle

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School: Batesville Junior High

Grade Level: 6th



1 Teaching objective(s)

- The students will create several rows in Pascal's Triangle and explore patterns in Pascal's Triangle.

Institute Framework

- 2a: Recognize and continue a number pattern.

2 Instructional Activities

LESSON

1. Show the students the first four rows of Pascal's triangle on the overhead.
2. Ask the students what patterns they see in the arrangement of numbers?
3. Tell the students to predict the next row of numbers.
4. Allow time for students to predict.
5. Call on a student to tell what the next 2 rows will look like.
6. Explain to students that each row begins and ends with the number one. Tell students that the other numbers are found by adding consecutive pairs of numbers from the previous row. Show students the following example on the board:

$$\begin{array}{cccccc} 1 & 5 & 10 & 10 & 5 & 1 \\ 1 & 6 & 15 & 20 & 15 & 6 & 1 \end{array}$$

7. Explain to students that this is called Pascal's triangle.
8. Give students an overview of the triangle's history:

Pascal's triangle is a large array of numbers. It is infinite, so it goes on forever. There are countless patterns and relationships within the triangle and also many mathematical topics in which the numbers play a role.

Today we are going to explore some of these patterns and topics using Pascal's triangle.

ACTIVITY 1

1. Give the students a blank copy of Pascal's triangle.
2. Tell the students to complete the first twelve rows of the triangle.
3. Allow time to complete, and call on students to call out the numbers in each row.
4. Check for correct responses.
5. Tell students we will now look at some of the patterns in the triangle.

ACTIVITY 2

1. Tell students to add the numbers in each row.
2. Allow time to complete.
3. Ask students if they see a pattern in the sums of these numbers?
 - a. $1+1=2$
 - b. $1+2+1=4$
 - c. $1+3+3+1=8$
 - d. $1+4+6+4+1=16$
4. Call on students for responses.
5. Explain to students that these are all powers of 2.
6. Ask the students if any of the numbers repeat within the rows.
 - a. Check for response that the rows read the same from left to right as from right to left.
 - b. Tell students that these are called palindromes.

ACTIVITY 3

1. Give each student a bag of colored transparency circles and a large copy of Pascal's Triangle.
2. Tell the students that they will now explore the patterns that multiples create in Pascal's Triangle.
3. Assign the groups according to the following:
 - a. Table 1: multiples of 3
 - b. Table 2: multiples of 4
 - c. Table 3: multiples of 5
4. Tell the students to look at the projection screen for instructions and an example of what to do.
 - a. Tell students that they will cover all numbers that are a multiple of the number 2.
 - b. Tell students to cover these numbers with the circles provided.
 - c. Cover the numbers 2, 4, & 6 on the projector to get the students started.
 - d. Tell students to find the rest on their own.
 - e. Walk around to see that everyone knows what they are supposed to be doing.
5. Tell students to use the number that their table was assigned to and cover the numbers that are a multiple of that number.
6. After all groups are finished, have a person from each group come up and shade the numbers on the overhead.
7. Show students the different patterns the shaded areas create within the triangle.

3 Materials and Resources

A. Materials

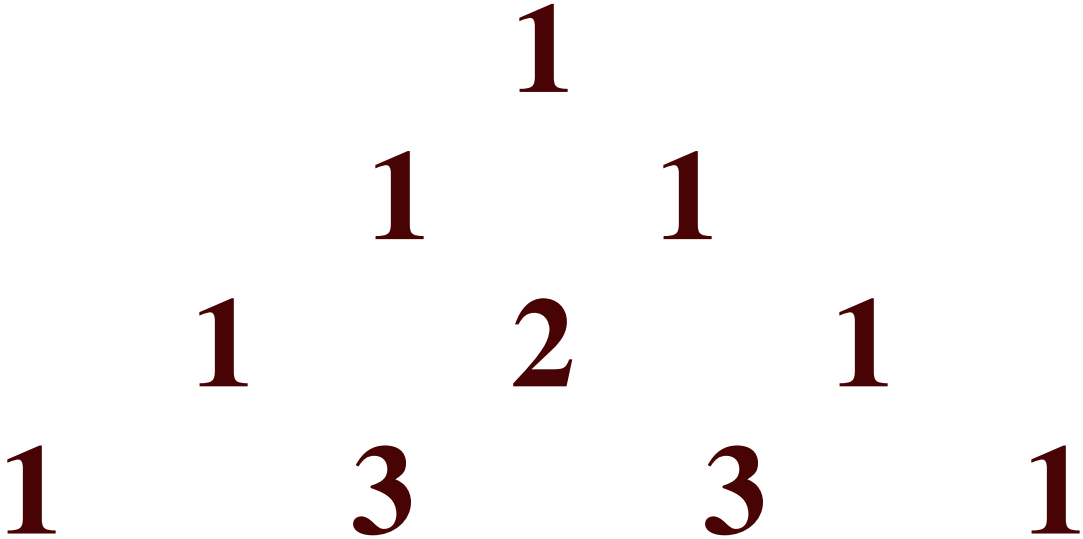
1. Overhead projector
2. Triangle transparencies
3. Worksheets
4. Pencils
5. Circle pieces

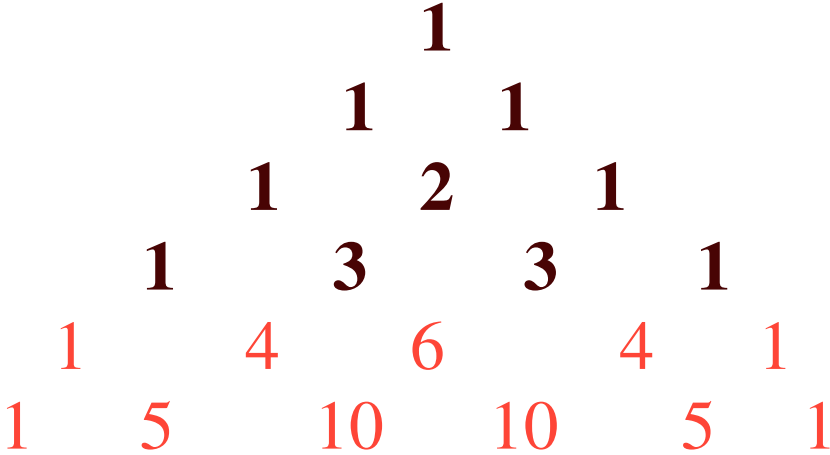
B. Resources

1. www.mathforum.com
2. *Pascal's Triangle*: Thomas M. Green & Charles Hamburg. Dale Seymour Publications, 1986; Palo Alto, CA.
3. *Visual Patterns in Pascal's Triangle*: Dale Seymour. Dale Seymour Publications, 1986; Palo Alto, CA.

4 Assessment

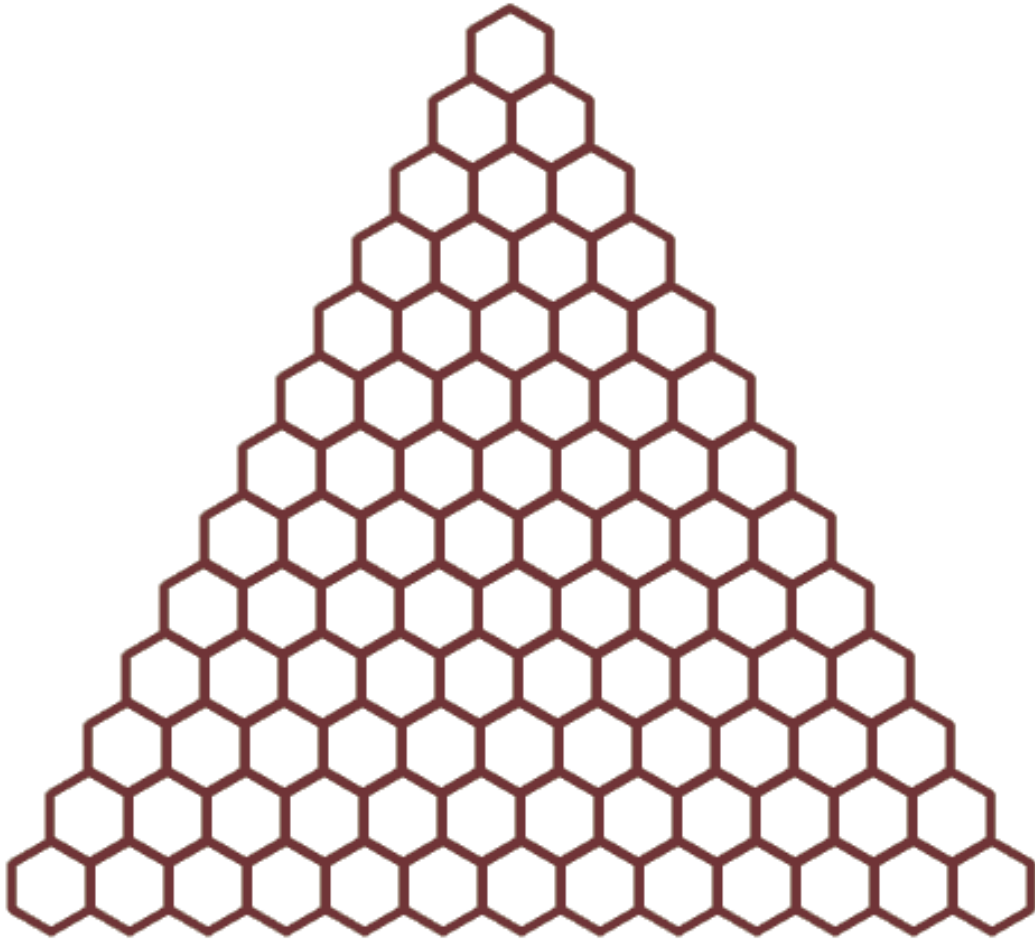
1. Completion of Pascal's Triangle
2. Describing patterns
3. Oral responses to patterns
4. Worksheet





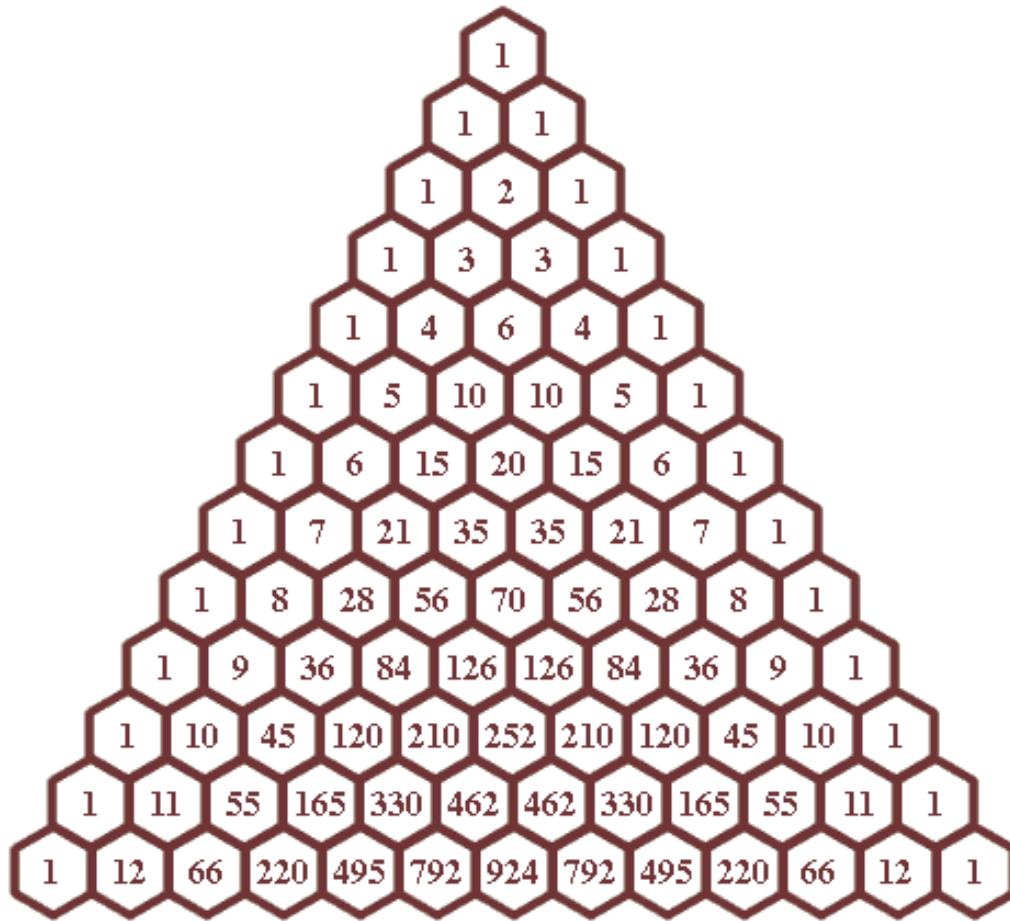
Discovering Patterns

Name _____



Discovering Patterns

Name _____



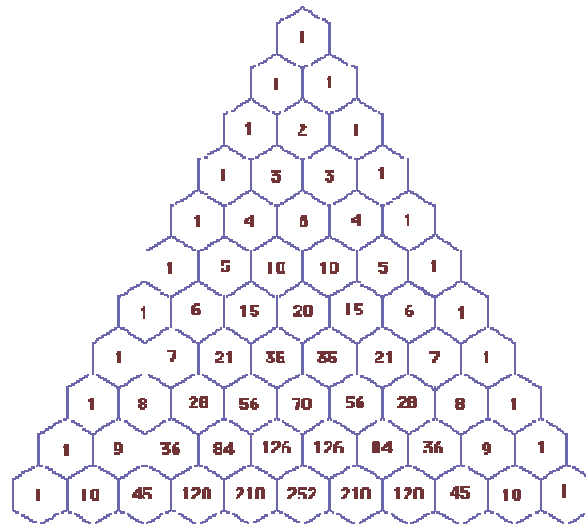
Provided by The Math Forum - <http://forum.swarthmore.edu>

NAME _____

DATE _____

Pascal's Triangle Assessment

1. What are some of the patterns in Pascal's Triangle that we talked about today?
2. The following is known as a _____.
1 4 5 8 5 4 1
3. The sum of each row of Pascal's Triangle is a power of what number?
4. Use the triangle below to find a pattern in Pascal's Triangle that we did not discuss in class. Write an explanation of the pattern you found.



Attachment 6

NAME ANSWER KEY _____

DATE _____

Pascal's Triangle Assessment

5. What are some of the patterns in Pascal's Triangle that we talked about today?

Multiples of 3, 4, & 5

Powers of 2

Palindromes in each row

6. The following is known as a palindrome.

1 4 5 8 5 4 1

7. The sum of each row of Pascal's Triangle is a power of what number?

2

8. Use the triangle below to find a pattern in Pascal's Triangle that we did not discuss in class. Write an explanation of the pattern you found. *Answers may vary.*

