

# Algebra/Geometry Institute Summer 2010

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School: Em Boyd Elementary

Grade Level: 4



- 1 Teaching objective(s): (1) Analyze a given numeric pattern and generate a similar pattern. (Mississippi Mathematics Framework, 2a)  
(2) Recognize and continue a number pattern, in Pascal's triangle. (Math Institute Framework, 2a)

## 2 Instructional Activities

### Introduction:

- Teacher will ask students to tell what a pattern is.
- Teacher will explain that patterns are seen everyday all around us and give 2 simple number patterns. One to be explained by teacher and the other to be completed by the students.

teacher: 2, 4, 6, 8, 10, 12, 14, 16      rule: add 2  
students: 3, 6, 9, 12, 15, 18, 21      rule : add 3

### Activity 1

- Teacher will explain to students that today they will learn more about patterns from Pascal's triangle and then allow students to briefly look at the triangle.
- Students will be already arranged in groups of 4s or 5s. Teacher will give each group of students: a pizza crust, pizza sauce, and 3 toppings (sausage, green peppers, cheese) for the pizza. Teacher will then demonstrate to students how they can create different pizzas using 1, 2, or 3 toppings given. The number of pizzas for each number of toppings and the actual toppings will be recorded on chart and board as they are stated. Students will be asked if they "see" a pattern in the numbers of pizzas.
- The groups of students will be given an additional topping, pepperoni, for their pizzas for a total of 4 toppings. They will then be asked to find how many 4-topping pizzas, 3-topping pizzas, 2-topping pizzas, and 1-topping pizzas can be created. The actual toppings and number of pizzas for each number of toppings will be recorded on the chart. Answers will be discussed by calling attention to the "number" of pizzas on the form.
- Teacher will then display Pascal's triangle on overhead and explain that the numbers of pizzas created relate to the patterns on the triangle.

Teacher will direct students' attention to rows 3 & 4. Students will be asked to refer back to the chart created during their activity and look at the numbers of pizzas created. The numbers are on Pascal's triangle.

## Activity 2

- For a more complicated activity, the students will be posed with a question: "Would they rather be paid \$10 a day for 10 days OR be paid \$1 for the 1<sup>st</sup> day and have the previous day's pay doubled every day for 10 days? Groups will use Pascal's triangle to help them figure the more difficult total and how it helped with answering the question. The sum of a row is the amount received that day. Must show work to justify.

\$10 a day for 10 days = \$100

day	1	2	3	4	5	6	7	8	9	10
Amount row on P t*	\$1	\$2	\$4	\$8	\$16	\$32	\$64	\$128	\$256	\$512
Sum of previous days	\$1	\$3	\$7	\$15	\$31	\$63	\$127	\$255	\$511	\$1,023

\* Pascal's triangle

## Extension activities:

- Language Arts: (1) Students will give word palindromes using the Pascal triangle layout (rows 2 – 6). Teacher will explain what a palindrome is, that Pascal's Triangle is an unending palindrome of numbers, and give a 3-letter word example, "mom". Students will be given letters (on hexagon shapes) for words and asked to find the 3-, 4- 5- 6-, and 7-letter palindromes. (2) Read "One Grain of Rice" in Harcourt Trophies

## Word palindromes

dad	ewe	wow	nun
noon	deed	peep	toot
radar	kayak	level	madam
Hannah	terret	Hannah	terret
racecar	repaper	rotator	reviver

- 3 Materials and Resources
  - A. Materials
    1. overhead projector
    2. transparencies or dry erase board
    3. pizza components (crust, sauce, and toppings)
    4. chart for recording pizza topping combinations
    5. pictures of Pascal's triangle
    6. pencils
    7. scratch paper
    8. fake money(optional)
    9. For extension activity: letters(on hexagons) for word palindromes
  - B. Resources
    1. [www.mathforum.com](http://www.mathforum.com)
    2. Visual Patterns in Pascal's Triangle: Dale Seymour. Dale Seymour Publications, 1986; Palo Alto, CA; Schiller, Diane and Charles, Mary.
    3. "Moving Forward and Backward with Palindromes," *Mathematics Teaching in the Middle School*. 10 (September 2004): 76-80.
- 4 Assessment
  1. Correct completion of activities—monitored by teacher
  2. Oral responses



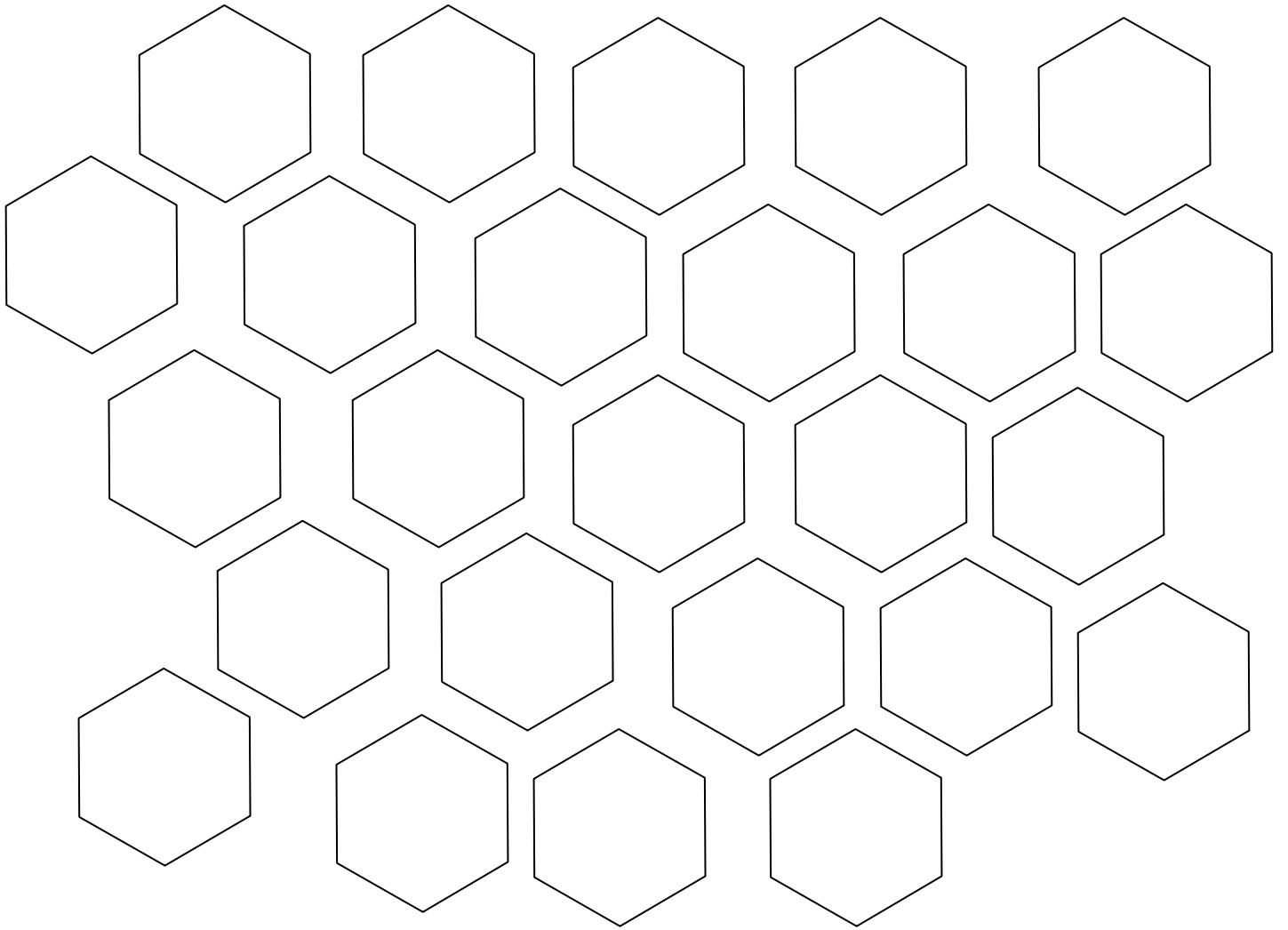
## Keys for activities

How many pizzas using up to 3 toppings

Toppings	# of pizzas	toppings
3	1	cheese, sausage, green peppers
2	3	cheese & sausage cheese & green peppers green peppers & sausage
1	3	cheese sausage green peppers

How many pizzas using up to 4 toppings

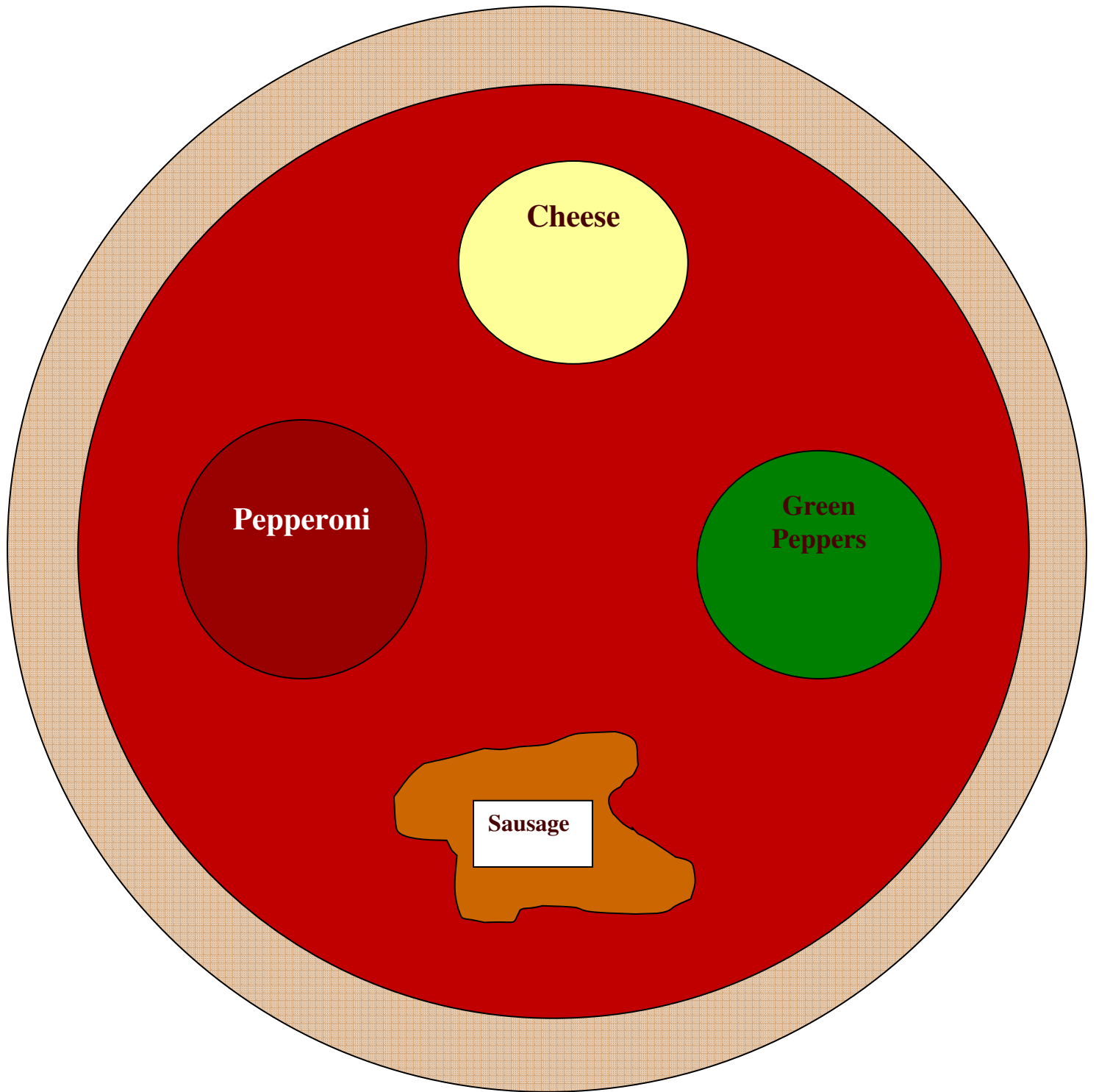
Toppings	# of pizzas	toppings
4	1	cheese, sausage, pepperoni & green peppers
3	4	cheese, green peppers, pepperoni cheese, green peppers, sausage green peppers, pepperoni, sausage cheese, pepperoni, sausage
2	6	cheese, green peppers cheese, pepperoni cheese, sausage, green peppers, pepperoni green peppers, sausage pepperoni, sausage
1	4	cheese pepperoni green peppers sausage



Each group will need 25 hexagon shapes for their palindrome words.

**IMPORTANT** hint: Be sure that when letters are written on the hexagons, the hexagon has a point at the top as shown above.

+



**Cheese**

**Pepperoni**

**Green  
Peppers**

**Sausage**

# Discovering Patterns Pascal's Triangle

