

# Utah's Largest Math Event 2008-2009

## The Magic Caterpillar

### Kinder/1<sup>st</sup>/2nd Grade

#### **Standard II:**

**K Students will sort and classify objects as well as recognize and create simple patterns.**

Objective 2: Identify, duplicate, describe, and extend simple repeating and growing patterns.

**1<sup>st</sup> Students will identify and use number patterns and properties to describe and represent mathematical relationships.**

Objective 1: Recognize, describe, and represent patterns with more than one attribute.

**2<sup>nd</sup> Students will model, represent, and interpret patterns and number relationships to create and solve problems with addition and subtraction.**

Objective 1: Recognize, describe, and extend growing patterns.

#### **Intended Learning Outcomes:**

1. Develop a positive learning attitude toward mathematics.
2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
3. Reason logically, using inductive and deductive strategies and justify conclusions.
4. Communicate mathematical ideas and arguments coherently to peers, teachers, and others using the precise language and notation of mathematics.
5. Connect mathematical ideas within mathematics to other disciplines and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

#### ***Background Information***

Working with patterns is at the heart of mathematics. Exploring repeating patterns in the elementary grades lays the foundation for considering growing patterns (Van de Walle, 2000) and number sequences in the middle grades. Exploring patterns is a vehicle to provoke thinking about variables and functions. Various solution strategies and their expressions in words and with symbols naturally lead to a consideration of the equivalence of algebraic expressions. This activity is intended to promote algebraic thinking with your students.

#### ***Materials***

Copies of "The Magic Caterpillar" for each student  
Pattern blocks

#### ***Invitation to Learn***

Alice looked all round her at the flowers and the blades of grass, but she did not see anything that looked like the right thing to eat or drink under the circumstances. There was a large mushroom growing near her, about the same height as herself; and when she had looked under it, and on both sides of it, and behind it, it occurred to her that she might as well look and see what was on the top of it.

She stretched herself up on tiptoe, and peeped over the edge of the mushroom, and her eyes immediately met those of a large caterpillar, that was sitting on the top with its arms folded, and taking not the smallest notice of her or of anything else. The Caterpillar and Alice looked at each other for some time in silence: at last the Caterpillar addressed her in a languid, sleepy voice.

'Who are you?' said the Caterpillar.

This was not an encouraging opening for a conversation. Alice replied, rather shyly, 'I—I hardly know, sir, just at present-- at least I know who I WAS when I got up this morning, but I think I must have been changed several times since then.'

'What do you mean by that?' said the Caterpillar sternly. 'Explain yourself!'

‘I can’t explain myself, I’m afraid, sir’ said Alice, ‘because I’m not myself, you see.’

‘I don’t see,’ said the Caterpillar.

‘I’m afraid I can’t put it more clearly,’ Alice replied very politely, ‘for I can’t understand it myself to begin with; and being so many different sizes in a day is very confusing.’

‘It isn’t,’ said the Caterpillar.

‘Well, perhaps you haven’t found it so yet,’ said Alice; ‘but when you have to turn into a chrysalis—you will some day, you know—and then after that into a butterfly, I should think you’ll feel it a little queer, won’t you?’

‘Not a bit,’ said the Caterpillar.

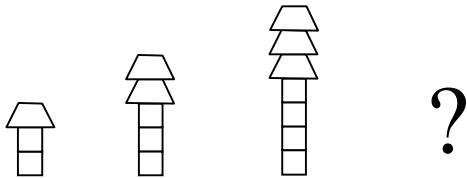
‘Well, perhaps your feelings may be different,’ said Alice; ‘all I know is, it would feel very queer to me.’

I wonder how the Caterpillar would feel if he DID keep changing sizes! Let’s explore what that would look like.

### ***Instructional Procedures***

#### **Activity 1**

Share the following with the class: an example of how the Caterpillar’s mushroom grows. You may want to have pattern blocks available for students to use as well.



Call on some students to describe what they see. Ask, “What will the next figure look like?” “How do you know?” Be sure that the students talk about the number of squares and trapezoids in each figure. To help the students generalize the relationship between the number of squares and the number of trapezoids in the figures and between the number of trapezoids and squares and the position of the figure in the pattern, ask these questions:

- How are these figures different? How are they growing?
- When the pattern continues, how many squares are there in the figure that has six trapezoids? (seven squares) Seven trapezoids? (eight squares)
- How can you find the number of squares in the figure when you know the number of trapezoids? (The number of squares is one more than the number of trapezoids.)
- How can you find the number of trapezoids in the figure when you know the number of squares? (The number of trapezoids is one less than the number of squares.)
- If there are nine shapes in all, what does the figure look like? (It has four trapezoids on top of 5 squares.)

#### **Activity 2 (Qualifying Problem for ULME)**

Activity 1 is a foundational activity for completing this activity.

Now let’s take a look at how the Caterpillar would grow. Give each student a copy of the blackline master “The Magic Caterpillar.” The students should work on their solutions individually.

Students must explain their thinking process by:

1. Producing a visual representation of the patterns.
2. Writing a description of the reasoning and justification of the process and solution.

Name:

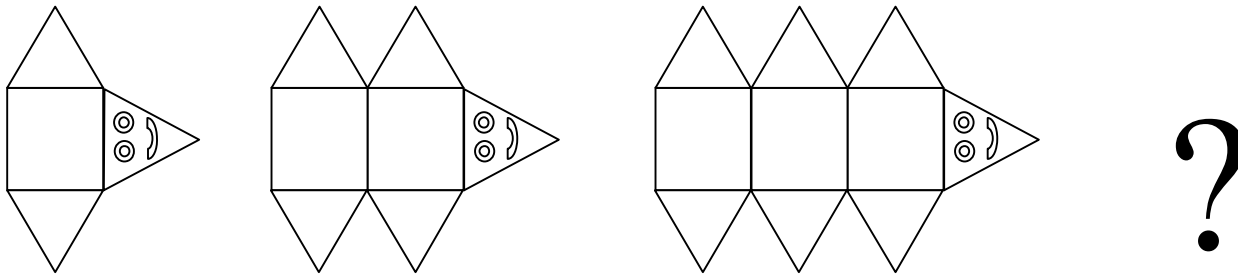
Teacher:

Grade:

# The Magic Caterpillar

## Utah's Largest Math Event (qualifier)

The shapes below show how the Caterpillar grows.



1. If this pattern continues, what will the next caterpillar look like? Draw it.

2. When there are ten squares, how many triangles are there? \_\_\_\_\_

3. How do you know? \_\_\_\_\_

4. When there are fourteen triangles, how many squares are there? \_\_\_\_\_

5. How do you know? \_\_\_\_\_