

Title: Butterfly Growing Patterns

Brief Overview:

In this unit, the students will analyze real-world problems involving growing patterns in order to identify their functional relationships. They will begin with identifying growing patterns and will extend these patterns. They will also complete charts and function tables.

NCTM Content Standard/National Science Education Standard:

- Algebra: Understand Patterns, Relations, and Functions
- Recognize, describe and extend patterns, such as sequences of shapes and numbers
 - Analyze how growing patterns are generated
 - Apply information to create a function table

Grade/Level:

Grades 1/2

Duration/Length:

The unit consists of three one-hour lessons including one summative assessment.

Student Outcomes:

- Students will:
- Identify growing patterns
 - Create examples of growing patterns using pattern blocks
 - Interpret data in order create a class function table
 - Complete a function table and explain the rule that it follows in written form

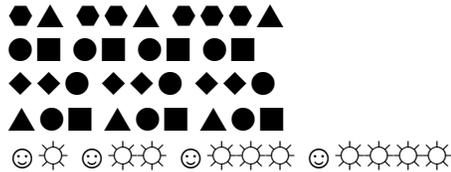
Materials and Resources:

- Pattern blocks (for teacher and students)
- Overhead projector
- Vis a vis markers
- Sentence strips or strips of construction paper
- Markers or crayons
- Chart paper
- Pipe cleaners
- Masking tape
- Shoe box
- Glue

Development/Procedures:

Lesson 1

Preassessment and Launch – Building on the students’ prior knowledge of patterns, display the following patterns on a sentence strip or strips of construction paper:



Have students describe what is happening in each of the patterns.

Have the students think-pair-share ways that they can classify these patterns in two groups. Lead a discussion about the reasons that the students used to create the two groups.

- *Do any of these patterns look similar?* Yes. Both the hexagon and triangle and the happy face and sun patterns are adding on or growing. The other three patterns repeat.

Help students see that they could classify the patterns into two groups: patterns that repeat and patterns that grow. Ask for student volunteers to place the patterns into the two groups. Have student volunteers define the word pattern. Guide students to the definition: *A pattern is a sequence or order of objects that repeat or grow.* Explain that each one of the parts making up the pattern is called a *term*. Have the students tell how many terms are used in each pattern. Post the definitions for *pattern* and *term* on chart paper.

Teacher Facilitation – Explain to the students that patterns follow a rule. *A rule is finding the relationship between numbers or objects in a pattern.* Add the definition to the chart paper. Have students model a repeating pattern using the students as the terms: (Ex.: girl, boy, girl, boy, girl, boy, etc.). Model another pattern in which the terms grow. For example: girl, boy, girl, boy, boy, girl, boy, boy, boy. Give the students time to think, pair, share, discussing the similarities and differences of the two patterns.

- *If we would use letters to represent the terms in the pattern, what would they be?* G, B, G, B, G, B (Pattern 1). G, B, G, B, B, G, B, B, B (Pattern 2).
- *Are these patterns the same or are they different?* They are different because the first pattern is repeating and the second pattern is growing.
- *Do these two patterns follow the same rule?* (No)

- *Why?* {The first pattern repeats and has the core (the smallest repeating unit) of girl, boy. The second pattern grows and has no core.}

The teacher makes this pattern on the overhead projector:



- *What shape goes in the blank space?* (Square)
- *Why is a square the next term in the pattern?* (A square is the next term because the pattern is increasing one square for each triangle.)
- *What is the rule?* (The rule is to continue to add one more square to each triangle in the pattern.)

Student Application – Allow students time to use their pattern blocks to copy the pattern from the overhead. Be sure that the students extend the pattern at least two times. Model a different growing pattern on the overhead projector and have the students copy and repeat it. Model a growing pattern that decreases on the overhead projector such as:



Have the students copy the pattern and complete it. Have students draw their own growing pattern on the sentence strips or construction paper. Write on the board: *Explain the rule that your pattern follows.* Give the students time to write their explanations in their journals. (*Approximately 5 minutes*). Allow students to share their writings.

Embedded Assessment – Display the students’ work and discuss their journal responses. Look to see if the patterns that students created are truly growing patterns and not repeating patterns. Their journal writings should explain the rule that their pattern follows.

Reteaching - Pull a small group of students and model a growing pattern using pattern blocks. Use the pattern:



Have students orally explain the pattern. Have the students write the growing pattern in their journal. Allow them to make their own growing patterns with a partner.

Extension - Pull a small group of students and have them work with a partner to continue the growing pattern. Have students describe the rule that the pattern follows.

Lesson 2

Preassessment - Review student-created patterns from yesterday.

- *What are the differences between a repeating pattern and a growing pattern? A repeating pattern has a core of a set number of terms that repeat. In a growing pattern, one or more of the terms expands.*
- *Can you give an example of a growing pattern?*

Launch – In preparation for the creation of a class function table at the end of the lesson, make a pictorial function table to represent the number of eyes for the number of people. Use chart paper in a shape of a T and label the columns, “Number of People” and “Number of Eyes”. Use Teacher Resource Sheets # 1, 2, and 3 to illustrate that one person has two eyes; two people have four eyes, etc. Please see Teacher Resource Sheet # 4 for an example. Have volunteers come to the front of the class and count by two’s.

- *Describe what is happening.* Every time we add one person, we add two eyes.

Teacher Facilitation – Pass out a pipe cleaner for each student. Have students shape it into a “v” shape so that it looks like a set of antennae. Create a function table on chart paper in a shape of a T and label the columns, “Number of Butterflies” and “Number of Antennae”. (Please see Teacher Resource Sheet # 5 for an example). Under the “Number of Butterflies” column, glue the butterflies from Teacher Resource Sheet # 6. Have the students tape their antennae to the appropriate section of the function table. Be sure to go in increasing order so the students visualize the growing pattern.

Student Application – Have students copy the function table into their journals.

- *Do you see a pattern between the number of butterflies that we have with the number of antennae? (Yes, I noticed that for each butterfly that we counted, we counted two antennae.)*
- *How did the pipe cleaners help you to count the number of antennae per butterfly? (I skip counted by two’s.)*
- *Do the numbers increase or decrease? Why? (The numbers increased because we added more butterflies.)*
- *Why do the numbers increase by two each time? (Each butterfly has two antennae. Therefore, when we add another butterfly, we have to add two more antennae to the second column)*
- *What is the rule? (The rule is that for each butterfly that we add, we need to add two more antennae.)*

Embedded Assessment – Lead a discussion to establish the relationship between the increasing number of butterflies and the number of antennae. Observe students.

Reteaching - Place a picture of a butterfly into a shoebox or small box (Please use Teacher Resource Sheet # 6). Have students attach a set of pipe cleaner antennae to the picture. As the student takes the butterfly out of the box have the student

say: *One butterfly goes into the box and two antennae come out.* Repeat the process allowing each student to have a turn. Make a group function table showing the number of butterflies compared to the number of eyes for each butterfly.

Extension - Have the students predict how many antennae ten butterflies would have. (20) Ask them to explain how they were able to come up with the answer. Next, have them predict how many antennae fifteen butterflies would have. (30) Have them create a function table continuing counting by twos.

Lesson 3

Preassessment and Launch – Review the class function table and the rule it follows. Make sure that the students understand that as the number of butterflies increase, the number of antennae increases by 2.

Teacher Facilitation - The students will complete Student Resource Sheet 1, “Butterfly Questions” that incorporates the information from the function table completed in Lesson 2. (Please see Teacher Resource Sheet # 7 for answers).

- *How did you use the information in the function table to complete your worksheet?* (I followed the rule that the function table used.)
- *What was the rule?* (The rule was adding 2 each time I added a new butterfly.)
- *If you did not have any pictures, what other way could you use to complete your function table?* (Each time I needed to add another butterfly, I would need to increase the total number of antennae by 2.)
- *Explain how a function table works.* (Every function table shows a rule. Our function table shows that we were skip counting by twos.)

Student Application – Using the class pictorial function table from yesterday, have the students create their own function table using numbers instead of pictures. Model how to transfer the information from pictures to numbers.

Embedded Assessment – Observe to be sure that students are making the function table correctly, using numbers instead of pictures, and following the rule.

Summative Assessment:

Have the students complete the BCR (Student Resource Sheet # 2). Briefly discuss the scoring rubric that the students have been using throughout the year. (See Teacher Resource Sheet # 8 for the answers and Teacher Resource Sheet # 9 for the rubric).

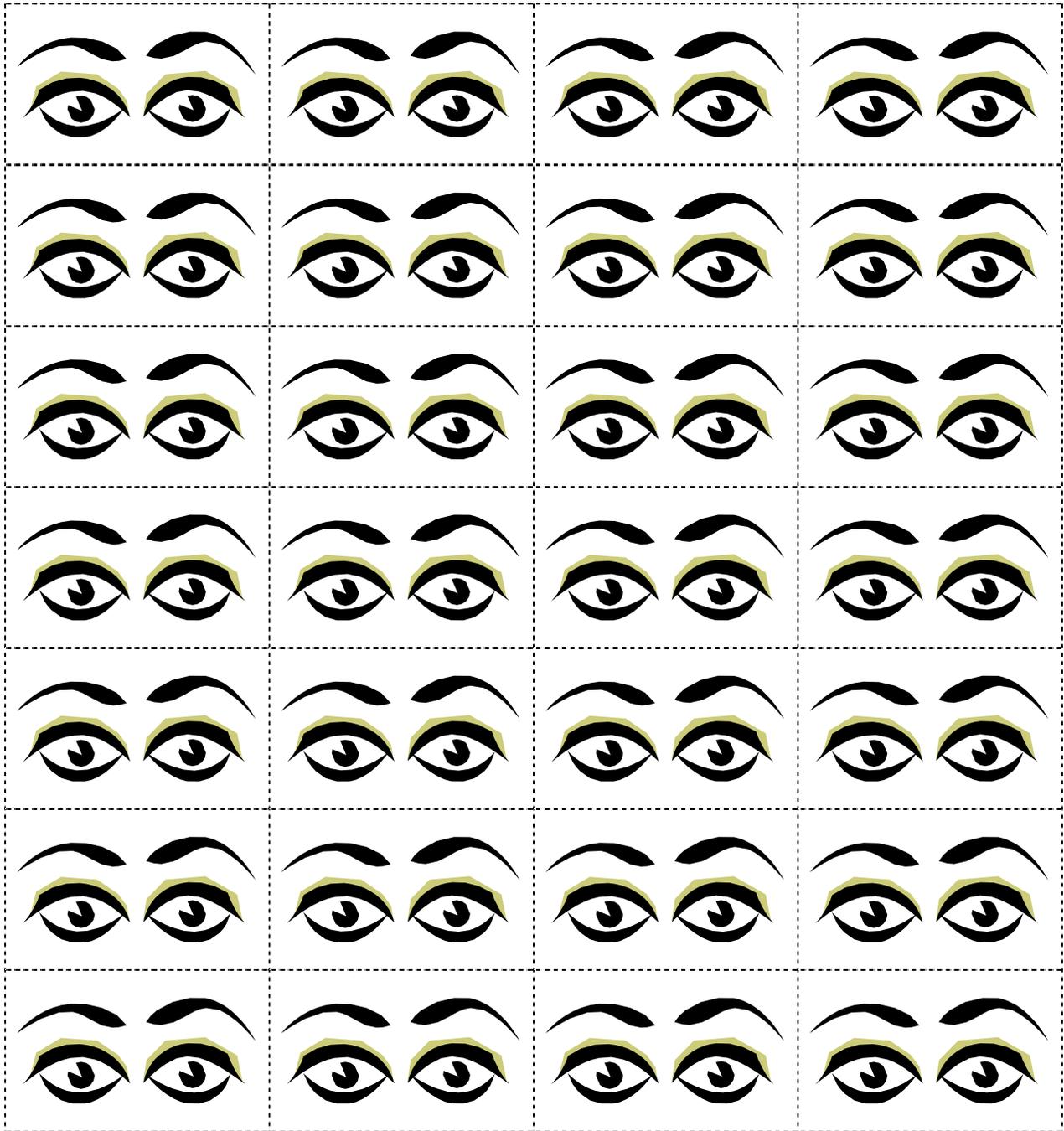
Reteaching – After the BCR’s are graded, pull students who scored poorly and review strategies for solving the BCR.

Extension - After the BCR’s are graded, pull the students who scored well and have them substitute new numbers and complete a new function table.

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Prince George's County Teacher Resource Sheet 1 -Eyes









Class Created Function Table Guide

Number of Students	Number of Eyes
1	2
2	4
3	6
4	8
5	10

* On the class table, the “Number of Students” and the “Number of Eyes” will be represented with pictures.

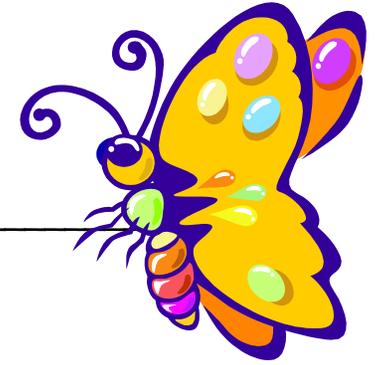
Class Created Function Table Guide

Number of Butterflies	Number of Antennae
1	V
2	VV
3	VVV
4	VVVV
5	VVVVV

* V = pipe cleaners or number of antennae

Number of Butterflies	Number of Antennae
1	2
2	4
3	6
4	8
5	10





Name _____ Date _____

Directions: Use your function table to answer questions 1 - 5.

How many antennae does 1 butterfly have?

How many antennae do 2 butterflies have?

How many antennae do 3 butterflies have?

How many antennae do 4 butterflies have?

How many antennae do 5 butterflies have?





Name _____ Date _____

Directions: Use your function table to answer questions 1 - 5.

How many antennae does 1 butterfly have? 2

How many antennae do 2 butterflies have? 4

How many antennae do 3 butterflies have? 6

How many antennae do 4 butterflies have? 8

How many antennae do 5 butterflies have? 10



Brief Constructed Response

The students in Miss Brown's class are studying butterflies. They created a function table that showed the number of wings for each butterfly.

Number of Butterflies	Number of Wings
1	4
2	8
3	<input type="checkbox"/>
4	<input type="checkbox"/>
5	<input type="checkbox"/>

Step A

Complete the function table.

Step B

Use what you know about function tables to explain how you determined your answer is correct. Use words and/or numbers in your explanation.

Brief Constructed Response

The students in Miss Brown's class are studying butterflies. They created a function table that showed the number of wings for each butterfly.

Number of Butterflies	Number of Wings
1	4
2	8
3	12
4	16
5	20

Step A

Complete the function table.

Step B

Use what you know about function tables to explain how you determined your answer is correct. Use words and/or numbers in your explanation.

I know that function tables follow a rule. This function table's rule is counting by fours because each butterfly has four wings. As the number of butterflies increase by one, the number of wings increase by four. The answer is for 3 butterflies, there are 12 wings, for 4 butterflies, there are 16 wings, and for 5 butterflies, there are 20 wings.