

Title: Do it Again! Repeating Patterns*

Brief Overview:

Students will be able to understand patterns, relations, and functions by describing, extending and making generalizations about geometric patterns. Students will identify and build repeating patterns and recognize growing patterns that are the basis for algebra.

NCTM Content Standard/National Science Education Standard:

Algebra- Understand patterns, relations and functions.

Identify, describe, extend, analyze and create a non-numeric growing or repeating pattern.

Grade/Level:

Grade level: 4/5

Duration/Length:

The unit consists of three 50-minute lessons and a summative assessment.

Student Outcomes:

Students will:

- Identify, describe, extend, analyze and create a non-numeric repeating pattern.

Materials and Resources:

- Chart paper
- Markers
- Pattern blocks
- Snap cubes
- Graph paper
- Pencils
- Overhead/transparencies
- Direction block handout
- Scissors
- Glue/glue stick
- String

Development/Procedures:

Lesson 1 Repeat It

Pre-assessment:

Write the following questions on chart paper, boards or overhead.

- A. What is a pattern?
- B. Where can we find patterns?

Launch:

Teacher will read, Patterns by David Kirkby. After reading chapter one, the students will be able to describe a pattern and be able to tell where patterns are found. Teacher will advise the class that they will be discussing patterns. Return to the pre-assessment questions. Allow time for responses.

Students Response:

- A. *A pattern is a sequence of or order of objects that repeat or grow.*
- B. *Wallpaper, houses, hairstyles, flowers, animals, classrooms etc.*

Teacher Facilitation:

Introduce the vocabulary: Term, core, pattern, and repeating. Students will explain and identify the core of several patterns. (**Teacher Resource Sheet # 1**)

1. (AAABB)
2. ©®®® (AABC)
3. (ABAC)

Students will be able to identify that the core of the pattern repeats itself. The unit will also provide the students the ability to identify the missing or next term.

Student Application:

After modeling and informal assessments, students will be able to create a model by working in cooperative groups. The responsibilities of the group members are: group leader, presenter and materials manager. Each group will work with pattern sheet, construction paper, markers and paper. The materials manager will be responsible for getting the supplies from the back table. The group leader will keep track of time; keep the tone regulated at the workstations, and assist his/her team. Have students complete the activity on Student Resource Sheets 1 & 2.

A. The reporter will report their findings to the class. (3-5 mins. per group)

The class will be able to identify the following questions.

1. What is the core? (*Reporter will explain and show the core in the pattern.*)

2. What are the terms of the pattern? (*Reporter will explain and show the terms of his/her pattern.*)

3. What happens at the end of the first core? (*The reporter should determine that it is repeated.*)

B. The students will be asked to complete the BCR on Student Resource Sheet #3. Answers can be found on Teacher Resource Sheet # 5.

Embedded Assessment:

The teacher will assess the students. The teacher will look to see if the students were able to identify the core and term. The teacher will also assess the BCR and observe patterns created.

Reteaching:

Review vocabulary terms. The teacher will have the definition on the front of the chart and call on volunteers to guess the term. **(See Teacher Resource Sheet # 3)** The students will identify the core and terms of the pattern by creating a model.

Extension:

Students will solve the following problems by using manipulatives.

1. Find a repeating pattern in your classroom and reproduce it using graph paper using three cores.

2. Create a pattern using hexagons, square, trapezoids, and parallelograms. How many hexagons will be in the pattern if you repeat the pattern ten (10) times? Be sure to use at least 2 hexagons in the core. The square and parallelogram must be side by side.

Lesson 2 Build It Again!

Preassessment:

Students will give an example of a growing pattern and will be able to identify and explain the core and terms of a repeating pattern. 2. The teacher may ask the students to create a non-verbal pattern using their

bodies. (Allow 5-10 min. time) The students will be asked to decipher the repeating core.

*Review vocabulary (**Use Teacher Resource Sheet #3**)

Launch:

From the prior lesson, the teacher will display the projects on the board and ask the students to classify them according to likeness. For example: *They may group them according to the size of the core or shapes.* The teacher may ask the class to vote on the best project and ask the class to identify the core and terms. Then, the students will duplicate the pattern on paper.

Teacher Facilitation:

From the best display, the teacher will identify the pattern from the model. (*Tell if the core follows an AABB pattern etc.*) From the other projects, the teacher will identify the pattern symbolically and label them below the display on the chalkboard. Next, the teacher will have prewritten directions on 4 cards, (1 step will be on each card). The teacher will then lay the directions on the overhead. The teacher will create a pattern by ordering the directions. The teacher can use snap cubes and or pattern blocks to show the model. The teacher will determine the symbolism of the model by stating if it's an AB, ABC, ABBA model etc. The teacher will give each group a set of directions on cardstock. The students will be responsible for placing the directions in sequential order and create the pattern according to the instructions.

Student Application:

The teacher will have the students work in cooperative groups of four-five. The materials will be distributed. The precut directions on the cards will be given and the teacher will challenge the students to determine what comes next, and so forth. (order) The students must write and record the answers so that they may compare their findings to other groups.

The instructions below will be cut and labeled on the overhead.

For example: Card 1.

1. Use 3 shapes; one of your shapes must be a square.
2. The square must be in the center of your core.
3. The train must curve.
4. The core must repeat 4 times.

Answer:

(other possible answers)

Each group will be instructed to rotate to the tables and work cooperatively to solve the set of directions. (Student Resource Sheet #4)

After the final rotation, the teacher will select a volunteer from each station to explain the model. The students must identify the term and core and identify the repeating section (core).

Embedded Assessment

The teacher will walk around to see if the students understand the core and distribute the Writing Steps for Repeating Patterns worksheet. **(Student Resource Sheet # 5a & 5b)**

Reteaching:

The teacher will choose one of the patterns developed in class. The teacher will review the terms in a core and what it means symbolically. From the pattern, the teacher will ask what is stamped repeatedly.

Extension:

The teacher will direct the students back to the tables and instruct the students to write a set of 4 directions using pattern blocks or snap cubes to create a pattern. (Allow time) The directions will be placed at each table.

Lesson 3 What Number is in the Hundredth Block?

Preassessment-

Students will be shown an example of a repeating pattern using blocks on the overhead. The teacher will ask the students the following question. If the pattern were to be continued what would be the next block?

Launch-

The teacher will review the prior day's lesson and display a pattern on the overhead and have the students predict what the next shape/figure would be and then determine the 10th figure in the patterns.

Teacher Facilitation-

The teacher will choose one the patterns developed in class. The teacher will review the terms in a core and what it means symbolically. From the pattern, the teacher will ask what is stamped repeatedly.

Students will be asked to determine how many blocks will there be. Students will be directed to make this pattern: red, red, blue, green, red, red, blue, green. When there are 14 blue blocks, how many green and how many red blocks will there be? Make a recording of your work and explain how you figured the number of green and red blocks.

*Distribute to each pair: **pattern** blocks (9 of each color, red, blue and green), paper, and pencil for recording on the worksheet. (**Student Resource Sheet # 6**)

* Model the pattern on the overhead projector  (overlapping side by side)

* **Ask:** If the pattern continued, when there are 12 shapes, how many pentagons will be red? How many will be green triangles? How do you know? Allow response time. What is the core? How many terms do you see?

*Show this pattern on the projector: red, red, blue, green, red, red, blue, green.

*Ask - If the pattern continued, when there are 14 blue blocks, how many will be red? How many will be green? How do you know? Make a recording of your work and explain how you know the number of red and of green blocks.

***** If students discover that they don't or may not have enough blocks, ask them to develop creative ways to solve the problem. (Cut paper, draw pictures, etc.)*

*Some students may find a solution by drawing or making marks to represent the blocks

RRBG RRBG RRBG RRBG RRBG RRBG RRBG RRBG

Answer: 28 Red 13 green

The teacher should 1.determine if the students were able to correctly state that number of red and green blocks when there are 14 blue blocks. 2. Did the students clearly explain how he figured the number of red and green blocks?

Student Application-

Teacher will provide each student with some (red and yellow tokens). Using the repeating pattern created on the board, students will be asked to determine which color token will be the hundredth block. Teacher will ask students questions to determine if a rule can be applied to predict which color would come next.

* Each group will write and draw the strategy used to make the determinations.

Students will be instructed to write in their journals. (**Student Resource Sheet # 7**)

Journal Writing

- a. Describe a situation where patterns can help make predictions.
- b. Is there more than one way to find a solution to today's question? Explain your thinking.

Embedded Assessment-

The teacher will walk around to each group making initial observations and answering questions. To determine the students understanding of the lesson, the teacher will have each group explain what strategy they use to decide which shape/figure would be the hundredth block.

Reteaching-

Students having difficulty will work in a small group with two students that have mastered the concept. Students will work with pattern blocks to create an AB pattern to determine what the hundredth block would be. The teacher will review the pattern with the group to check for understanding.

Extension-

Students will continue with the wrapping activity and decide what would be the next shape/ figure in the 200th and 300th place. Each group will write the strategy used to make the determinations.

Summative Assessment:

Students will be able to complete a series of activities that comprises the Summative Assessment (Student Resource Sheet # 8). See the Teacher Resource Sheet # 4 for the answers.

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EXAMPLE 1



(AAABB)

EXAMPLE 2



EXAMPLE 3



Repeating Patterns

NAME _____

DATE _____

DIRECTIONS: Choose pictures from the pattern sheet and make a pattern. Cut out the shapes/symbols and glue them to your paper. Your pattern must have three cores. Underline the core in red crayon. On the line below the box, indicate how many terms are in the core.

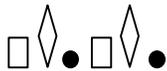


Brief Constructed Response

You are helping your father complete a bathroom project for your summer job. Your dad wants you to complete the bathroom tile in the following pattern.

Step A

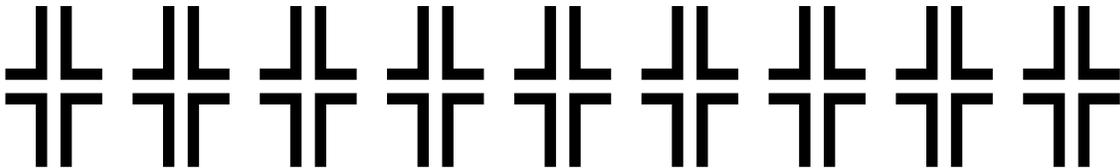
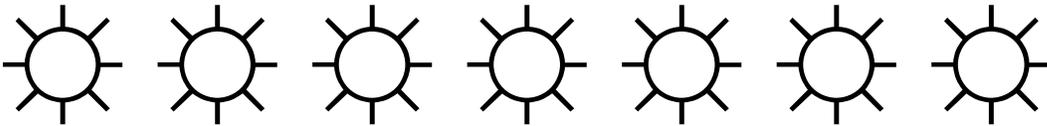
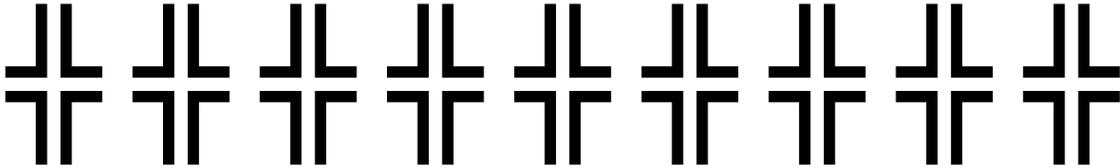
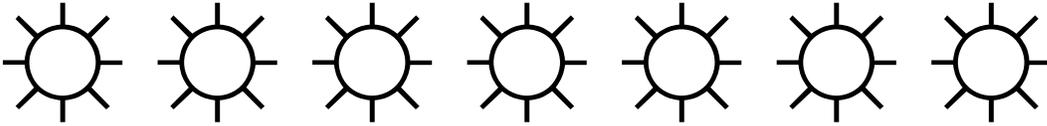
Extend the pattern for 3 more terms.



Step B

Use what you know about patterns to explain why your answer is correct. Use words and/or numbers in your explanation.

Pattern Shapes



Directions: Make a repeating pattern.

Make a line of blocks in a pattern.



A

Use three different colors.



A

The parallelogram must be after the hexagon.



A

It must be three times as many squares than any other shape.



A

Directions: Make a repeating pattern.

Use three orange squares.



B

One shape must be a hexagon.



B

You must have five terms in the core.



B

The square must be next to a parallelogram.



B

Directions: Make a repeating pattern.

<p>Make a repeating pattern using 3 terms.</p>  <p style="text-align: right;">C</p>	<p>Do not put a square next to a triangle.</p>  <p style="text-align: right;">C</p>
<p>The hexagon must be next to the square.</p>  <p style="text-align: right;">C</p>	<p>Use at least one triangle in the core.</p>  <p style="text-align: right;">C</p>

Directions: Make a repeating pattern.

Make a repeating pattern using seven terms in a curve.



D

The parallelogram must be the second term.



D

Use one trapezoid.



D

The triangle should be the first term.



D

Writing Steps for Repeating Patterns

*Materials needed: string, glue, paper, pattern blocks **OR** snap cubes, direction cut out sheet, answer sheet, marker*

A.

1. Cut out the squares on the dotted line.
2. Choose the materials that you'll work with (pattern blocks or snap cubes) and get them from the materials table.
3. Each team member must write a direction.
4. Follow the steps of the directions that you've written.
5. Place a piece of string around the core.
6. Each team member must review your project and make the necessary changes. If the team agrees that the project is correct, remove the string and wait to rotate.

B.

1. Copy your repeating pattern on the paper provided and circle your core with a marker

2. Write the symbolism of the pattern below the box.
(For example: if the pattern is AABB)

Writing Steps for Repeating Patterns

Name _____ Date _____

1.

2.

3.

4.

A sequence or order
of objects that repeat
or grow.

Each place or position
in the sequence.

To do, experience, or
produce again.

The basic or most
important part; the
essence.

CORE

TERM

PATTERN

REPEATING



How Many Blocks?

Name _____

Date _____

Directions: Use your pattern blocks to make this pattern: red, red, blue, green, red, red, blue, green. When there are 14 blue blocks, how many green and how many red blocks will there be? Make a recording of your work in the box and explain how you figured the number of green and red blocks.

Materials Needed: Pattern Blocks (9 of each color), recording materials

Record your answers on the lines below.



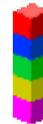
Journal Reflections:

1. Describe a situation where patterns can help make predictions.
2. Is there more than one way to find a solution to today's question? Explain your thinking.

Name _____ Date _____



Repeating Patterns Summative Assessment



1. Look at the pattern below. Determine the core, (circle). How many terms are in the core and what are the next three terms?

Terms in the core _____

□ □ ††† ∫ □ □ ††† _____

2. Look at the above pattern. What type of pattern is it? (symbolism)
Answer in a complete sentence.

3. Create a repeating pattern using 5 terms in a core. The pattern must repeat 3 times and determine the symbolism.

4. Which of the following is the best choice to describe the next term in the pattern? Circle your answer.

$\Omega \Delta \Sigma \partial \Omega \Delta \Sigma \partial \Omega \Delta \Sigma \partial$

A. Ω B. Σ C. ∂ D. Δ

5. What is a pattern? _____

6. Define the term: *core* _____

7. After viewing this pattern. What would the tenth term be?

$&*(&*($ _____

Brief Constructed Response

Teacher Resource Sheet # 4

Name _____ Date _____

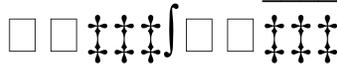


Repeating Patterns Summative Assessment



8. Look at the pattern below. Determine the core, (circle) How many terms are in the core and what are the next three terms?

Terms in the core _____ 6 _____



9. Look at the above pattern. What type of pattern is it? (symbolism)
Answer in a complete sentence.

The above pattern is an AABBBC pattern.

10. Create a repeating pattern using 5 terms in a core. The pattern must repeat 3 times and determine the symbolism.

Answers may vary

11. Which of the following is the best choice to describe the next term in the pattern? Circle your answer.

$\Omega \Delta \Sigma \partial \Omega \Delta \Sigma \partial \Omega \Delta \Sigma \partial$

A. Ω B. Σ C. ∂ D. Δ

12. What is a pattern? A pattern is a sequence of things that order or grow.

13. Define the term: core *The essential or most important part.*

14. After viewing this pattern. What would the tenth term be? $&*(&*(&$