

Title: Patchwork Pattern

Brief Overview:

Students will develop the understanding that patterns are sequences that repeat or change in an orderly way. They will recognize that patterns can be seen as well as heard. Throughout the unit, the learners will use key vocabulary terms related to repeating patterns. Students will learn to predict and extend the sequence of patterns. Lastly, they will create their own repeating patterns to meet given requirements.

NCTM Content Standard:

Algebra

Understand patterns, relations, and functions

- Recognize, describe, and extend patterns such as sequences of sounds and shapes or simple numeric patterns, and translate from one representation to another.

Grade/Level:

2nd to 3rd grades

Duration/Length:

4-5 days for 60 minutes daily

Student Outcomes:

Students will:

- Identify and describe repeating patterns.
- Identify the core and terms of various repeating patterns.
- Extend given patterns with manipulatives and/or drawings.
- Create repeating patterns.

Materials and Resources:

Lesson 1

The Keeping Quilt, by Patricia Polacco

Teacher Resource Sheet 1 (made into an overhead)

Student Resource Sheet 1 (1 copy for each student)

Student Resource Sheet 2 (1 copy for each student; cut and put in an individual envelope)

Pattern blocks or Teacher Resource Sheet 2 (copies for pairs)

Teacher Resource Sheet 3 mounted on index cards

Student Resource Sheet 3 (1 set of cards cut prior to lesson per 3 or 4 students and overhead)

Student Resource Sheet 4 (1 cube made prior to lesson per 3 or 4 students)

Student math journals
Student Resource Sheet 5 (1 half sheet copy for each student)
Teacher Resource Sheet 4 – observation checklist
Optional-
Quilts, fabrics, wallpaper, wrapping paper, etc.
<http://dlstewart.com/clipart.htm>

Lesson 2

Overhead color tiles or use snap cubes
Math journals
Crayons
1 hula-hoop or rope/string
Index cards numbered 1-10
Snap cubes
Student Resource Sheet 6 (1 copy per pairs and overhead)
Student Resource Sheet 7 (1 copy per pairs; cut and put in an individual bag and overhead)
Student Resource Sheet 8 (1 copy for each student)
Teacher Resource Sheet 4 – observation checklist

Lesson 3

Math journals
Crayons
Teacher Resource Sheet 3 made into overhead
Student Resource Sheet 9 (1 set of cards cut prior to lesson per 3 or 4 students)
Snap cubes
Student Resource Sheet 10 (1 copy for each student)
 $\frac{1}{2}$ 9x12 construction paper
Tape
12x18 construction paper (1 for each)
9x12 construction paper cut in 8 rectangles of various colors
Glue
Student Resource Sheet 11 (1 copy for each student)
Teacher Resource Sheet 4 – observation checklist

Development/Procedures:

Lesson 1

Preassessment –

- Students will independently sort examples of non-repeating patterns and repeating patterns using the Student Resource Sheet 2 to place on the Student Resource Sheet 1 (pattern mat).

- Have a class discussion about the examples and non-examples of repeating patterns. Discuss the students' reasoning for their classifications.

Launch –

- Read aloud The Keeping Quilt, by Patricia Polacco.
- During and after the reading of the story, ask the following questions:
 - *Do you see any repeating patterns?*
 - *What colors do you see that repeat on the quilt?*
 - *What shapes repeat?*
 - *Which fabric patterns repeat?*
- Have students try to point out patterns found anywhere in the classroom.
- Discuss the patterns found in the classroom and on students' clothing.
- Display pictures of quilts or show actual quilts and discuss the patterns found in these examples. You may use Teacher Resource Sheet 1 or <http://dlstewart.com/clipart.htm>.

Teacher Facilitation –

- On the overhead display a simple ABC repeating pattern such as hexagon, triangle, and square using overhead pattern blocks or Teacher Resource Sheet 2 (geometric shapes). Be sure to repeat the pattern 2-3 times to show the repetition.
- Ask: *What shapes are repeating?* (hexagon, triangle, square)
- Explain that patterns are sequences that repeat or change in an orderly way.
- Explain to the students that in this particular pattern, the **core** is the hexagon, triangle, and square (ABC) that repeat throughout the pattern.
- Explain that the core has three **terms**, which are the hexagon, triangle, square (one of each). Each object in the pattern is considered a term.
- Display index cards of Teacher Resource Sheet 3 (vocabulary cards/diagram) to explain the vocabulary words: core and term.
- Label the terms as ABC.
- Model ABB (yellow, red, red) repeating pattern on the overhead. Make sure it repeats two to three times. Ask the following questions:
 - *What is the core?*
 - *How many terms are in the core?*
 - *How many terms are in the whole pattern?*
- Be sure to label the terms as ABB.
- Next, display an ABBC repeating pattern and ask the above questions again.
- Again, be sure to label the repeating pattern ABBC.

Student Application –

- Divide students into groups of three or four.
- Provide each group with one Student Resource Sheet 3 (samples of repeating patterns) and Student Resource Sheet 4 (pre-made math question cube).
- Explain to the students that they will be playing a pattern game and that they need to follow the directions.
- Display the following directions visually on the overhead or chalkboard and explain following the instructions.
 1. Pick a pattern. (The patterns are numbered one through four.)
 2. Roll the cube.
 3. Read the question on the cube that faces upward.
 4. Discuss the answer to the question in your groups.
 5. Every group member will answer the question in his or her math journals.
- Display an overhead of Student Resource Sheet 3 and discuss some of the student responses to the questions about the four patterns.
- Distribute Student Resource Sheet 5 to assess students' understanding of the concept.
- Revisit lesson objective to conclude the lesson for today.

Embedded Assessment –

- Teacher observes students working cooperatively. Teacher monitors for understanding of key vocabulary terms and records observations on Teacher Resource Sheet 4 (Observation Checklist).

Reteaching/Extension –

- Teacher will re-teach a group or whole class depending on levels of understanding by creating a basic AB (red, blue) pattern using snap cubes. Have the students copy the pattern. Explain that the **core** is red/blue. Point to the two cubes and stress that the **core** repeats, which makes it a repeating pattern. Explain that there are two terms in the core and that there are 6 terms in the whole pattern. Model counting the terms.
- Students who have mastered the concept can be asked to determine the next several terms from the student application patterns. In addition, have students draw the extended terms.

Lesson 2

Preassessment –

- Display a repeating ABC pattern on the overhead using overhead color tiles. If no overhead color tiles are available, display a repeating pattern in a train of colored snap cubes. For example, green, blue, red. Be sure to have the pattern repeat at least three times.
- Have students respond to given questions about the pattern in their math journals.
- Display the following questions on the board or overhead:

1. Draw the core using crayons.
 2. How many terms are in the core?
 3. How many terms are in the whole pattern?
- Discuss the responses to the journal questions.

Launch –

- Discuss with the students that patterns can be seen all around us: in quilts, fabrics, wallpaper, etc. Patterns can also be used to predict what comes next in a sequence. Explain to the students that they will be making predictions on how to extend repeating patterns.
- Discuss that a pattern can be something that you hear as well as see.
- Demonstrate a pattern using movement such as clap, clap, snap, ____ (AAB). Have students do the motions with the teacher and then ask the following questions:
 - *What would come next? (Clap)*
 - *Why do you think the next term would be a clap?*
- The students should respond that the core is clap, clap, snap, so if the pattern ended with a snap a clap should follow.
- Based on students' responses, continue extending the pattern.
- Next, have three girls and four boys come to the front of the room.
- Arrange the students in the following repeating pattern (ABB): girl, boy, boy, girl, boy, boy, girl.
- Give each student in the pattern a sequential number on an index card. Explain that these are your terms.
- Place a hula-hoop or use a string to create a circle for the next person.
- Ask the students to extend the pattern one term. Take a class vote for either a boy or girl to be the next term based on the pattern.
- After students have responded to the question, provide the answer. (Boy)
- Ask a boy to stand in the hula-hoop to extend the pattern. Explain to the students that the boy is the eighth term and give him a number card.
- Ask: *Who will be the ninth term?* (Boy)
- Based on students' responses, continue extending the pattern.
- Have the students return to their seats.

Teacher Facilitation –

- Explain to the students that they are going to be making some more predictions using repeating patterns.
- Have the students take out their math journals.
- Display the repeating pattern from the pre-assessment.
- Pair students together.
- Distribute red, green, and blue snap cubes.
- Have students copy the pattern from the overhead using the snap cubes.
- Model for the students how to number each cube in the pattern in their math journals. See the diagram below.

- Explain that the number represents the term, which is the location of the object in the pattern. See diagram below.
- Ask: *What term would come next in the given pattern? Why?* (green, blue, red, green, blue, red, green, blue, ____)



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

- Extend the pattern to the ninth term (red).
- If students respond to the “why” question by identifying the color, lead them to make a connection to the core.
- Ask: *What would the eleventh term be?*
- Students will respond by holding up the correct color snap cube that they think is the 11th term (Blue).
- Ask: *How did you figure it out?*
- Have a class discussion on the various ways on how students solved the problem.
- Ask: *What would be the fifteenth term? Why?* (Red)
- Be sure students explain their answers, using the vocabulary words correctly.

Student Application –

- Group students in pairs.
- Distribute the Student Resource Sheets 6 and 7. (Pattern strips should already be cut and placed in bags for pairs.)
- Explain to the students that there are six pattern strips in their bags and stress that they will only use three of them. Explain to the students that they need to choose the strip that will correctly extend the repeating patterns on the sheet.
- Display an overhead of Student Resource Sheets 6 and 7. Go over the answers to Student Resource Sheets 6 and 7. Discuss their responses.
- Distribute Student Resource Sheet 8 to assess individual students’ understanding.

Embedded Assessment –

- Teacher observes students working cooperatively.
- Teacher monitors students while they complete Student Resource Sheets 6 and 7 and checks for comprehension of skills. Use Teacher Resource Sheet 4 to record observations.

Reteaching/Extension –

- For students who may need re-teaching and/or extension with extending patterns, have students on the following website:
<http://www.shodor.org/interactivate/activities/patterns.index.html>

Lesson 3

Preassessment –

- Display Teacher Resource Sheet 3 on the overhead.
- Have students extend the given patterns with four terms and have a discussion about why their answers are correct.

Launch –

- Divide students into groups of three or four.
- Provide each group with Student Resource Sheet 9 (pattern cards) and snap cubes.
- Explain to the students that they will need to follow the guidelines on each pattern card to construct one repeating pattern using the snap cubes.
- After students have followed all the directions, pass out construction paper, so students can draw their patterns.

Teacher Facilitation –

- Display students' drawings of patterns on the board.
- Discuss the similarities and differences between the patterns.
- Model a repeated pattern using Student Resource Sheet 10 on the overhead and overhead color tiles. Explain they may have only two colors and three terms in the pattern. For example, use green, green, red (AAB) as your pattern.
- Demonstrate on the overhead how to continue the pattern across the 9 columns on the grid and then continue the pattern onto the following row of the grid.
- Be sure to mention that they should not start the pattern all over again. They should continue the pattern onto the next row.
- Have students create their own pattern using snap cubes and have them place the cubes on the snap cube grid paper in a repeating pattern with the same guidelines that were modeled:
 1. Pick only two colors.
 2. Use only three terms in your core.
 3. Be sure to continue the repeating pattern onto at least two rows of the grid paper.
- After students have completed their patterns, have a class discussion about their patterns. Ask the following questions:
 - *Do you see vertical stripes in your pattern?*
 - *Do you see diagonals in your patterns?*

Student Application –

- Explain to the students that they will be creating a patchwork placemat. (The teacher may laminate the placemats.)

- Show the 12x18 construction paper that will be used as the background of their placemat.
- Next, display the color rectangles that will be used to make a repeating pattern and cover the whole construction paper. Each student will be using a total of sixteen rectangles.
- Instruct students that they can only use three colors and four terms in their core.
- Model using a yellow, green, blue, yellow (ABCA) repeating pattern on the teacher's placemat.
- Explain and demonstrate that they will continue the pattern on the placemat until the whole placemat is covered.
- Model how to make the placemat. Instruct the students that they will need to raise their hand when they have finished laying out their pattern before they can glue the rectangles onto the construction paper.
- Distribute construction paper and color rectangles to each student and let them create their own patchwork placemat.
- Revisit daily objective to conclude the lesson

Embedded Assessment –

- Teacher will observe and monitor the students working on their placemats to check for understanding. Use Teacher Resource Sheet 4 to record observations.

Reteaching/Extension –

- For students who may need re-teaching and/or extension on the skill, have students practice creating their own patterns on the following website:
<http://pbskids.org/cyberchase/games/patterns/patterns.html>

Summative Assessment:

A summative assessment (Student Resource Sheet 11) will be given at the conclusion of lesson 3 to determine students' overall understanding of the concept of repeating patterns. It will include identifying the core of a pattern, determining the number of terms in a core and pattern, and extending a pattern. In addition, the summative will include a brief constructed response where the student will need to predict what the unknown term will be in a repeating pattern and explain their reasoning. Answer Key may be found on Teacher Resource Sheet 5.

Authors:

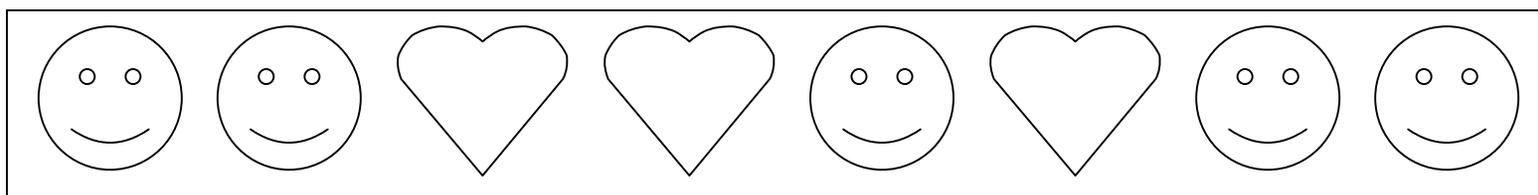
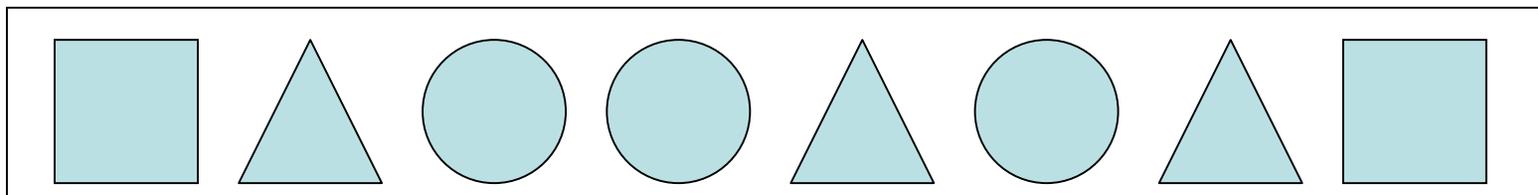
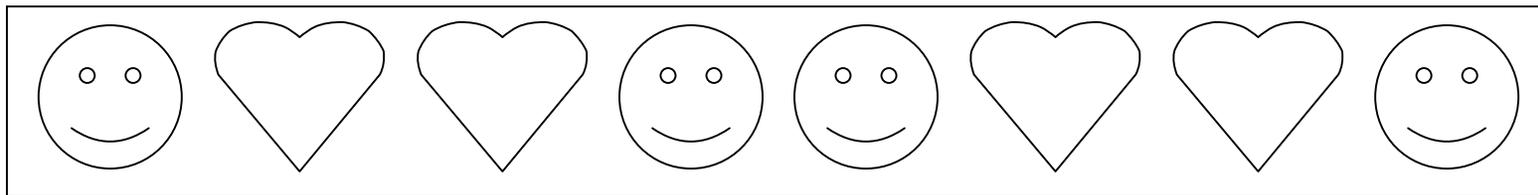
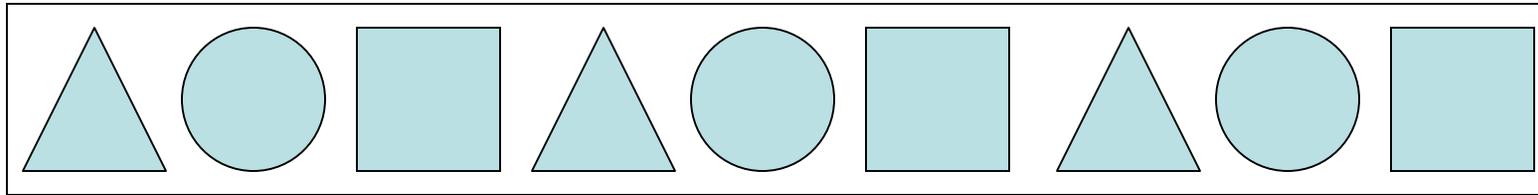
Ann Kratz
Beacon Heights Elementary
Prince George's County Public Schools

Jennifer Hetzer
Deer Park Elementary School
Baltimore County Public Schools

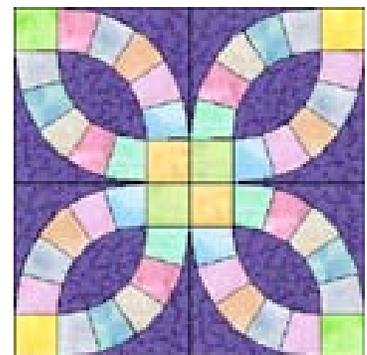
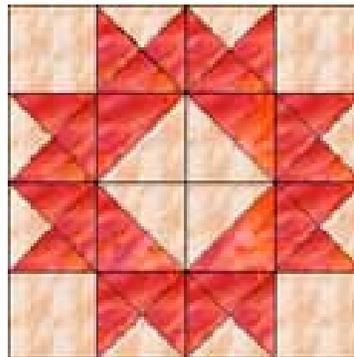
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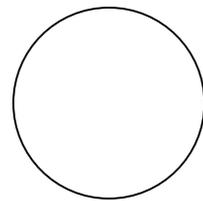
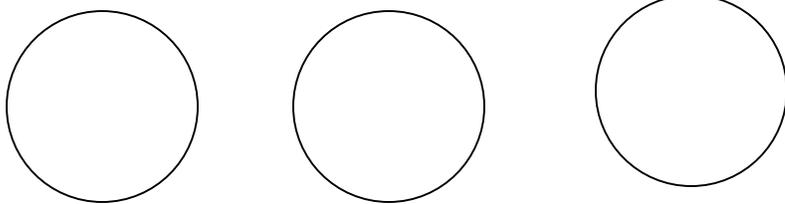
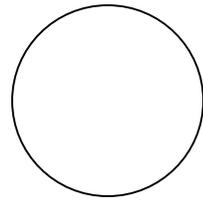
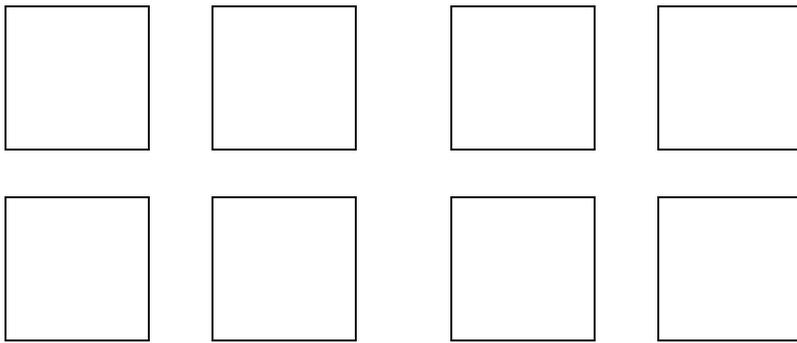
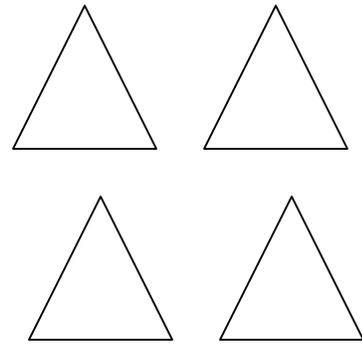
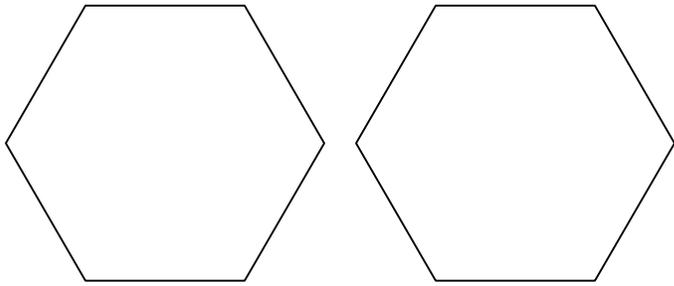
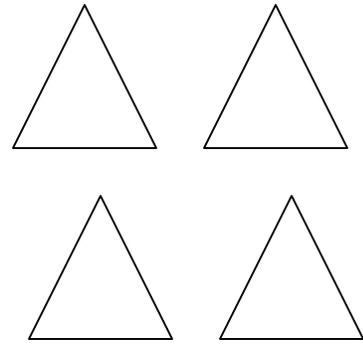
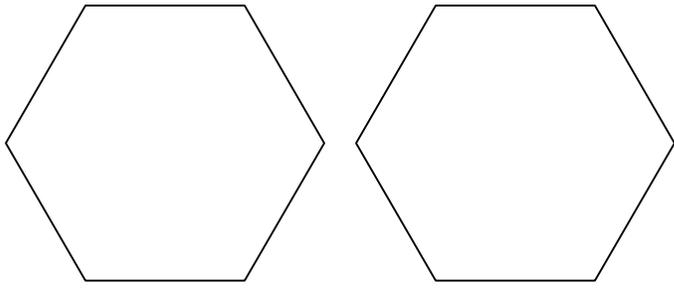
Repeating Patterns

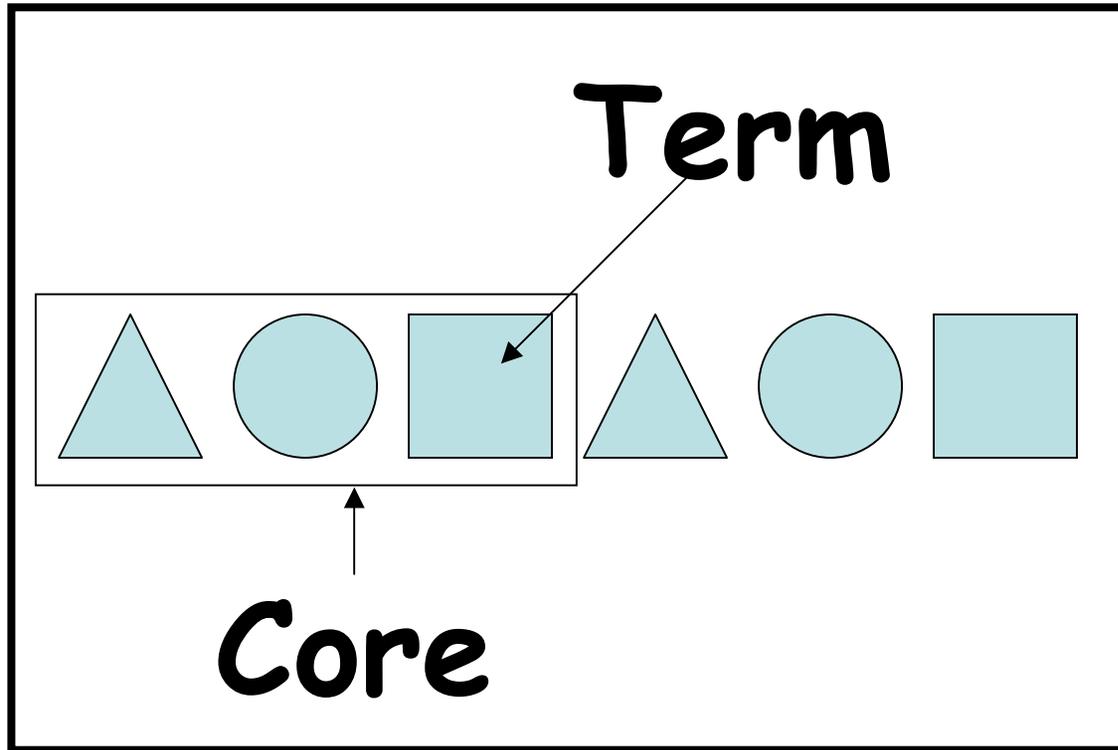
Not Repeating Patterns



Sample Quilt Patterns







Term

Core

Pattern 1



Pattern 2

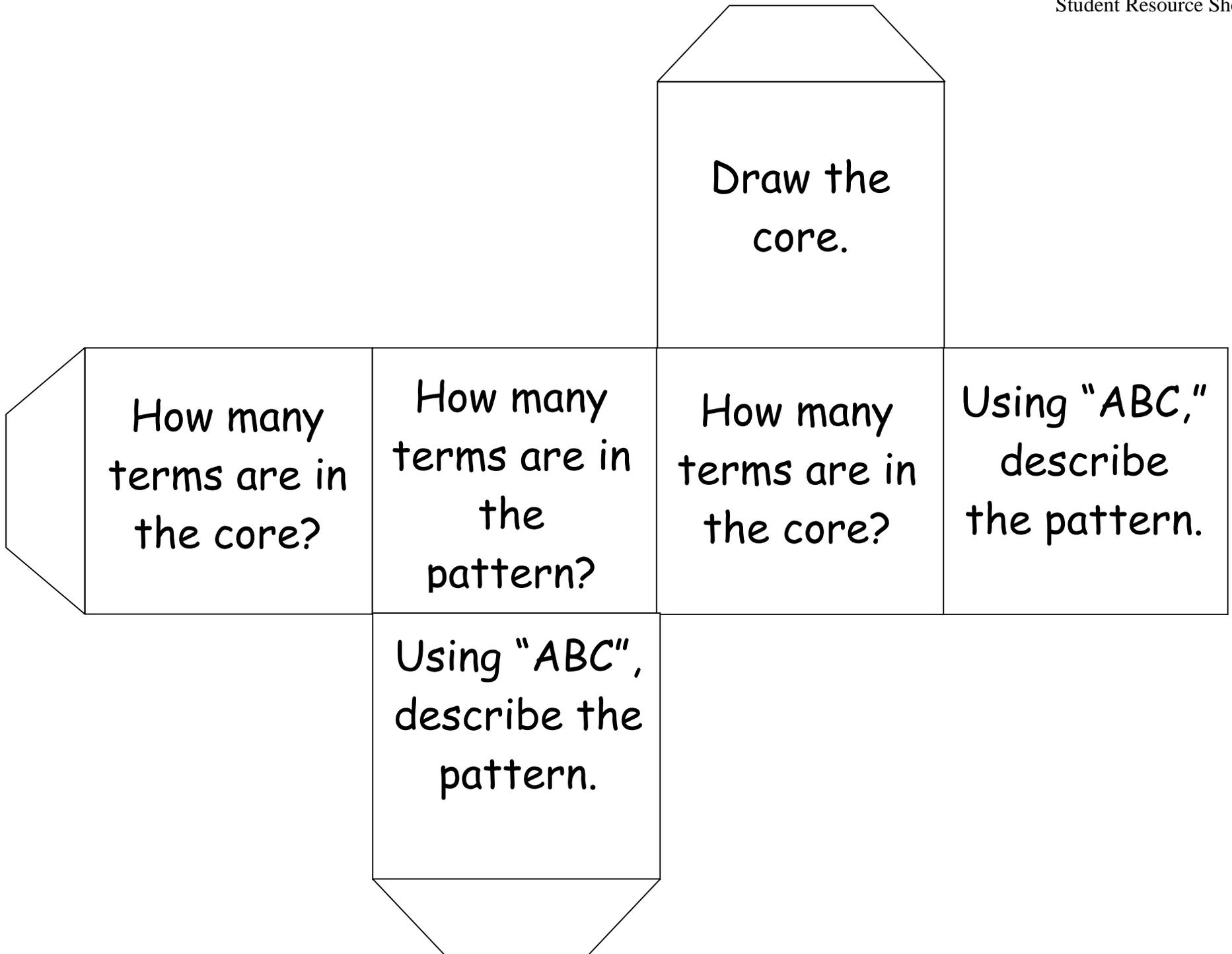


Pattern 3



Pattern 4





Day 1 Patchwork



1. Circle the core.
2. How many terms are in the core?

3. How many terms are in the whole pattern?

Name: _____ Date: _____

Day 1 Patchwork



1. Circle the core.
2. How many terms are in the core? _____
3. How many terms are in the whole pattern? _____

Name: _____ Date: _____

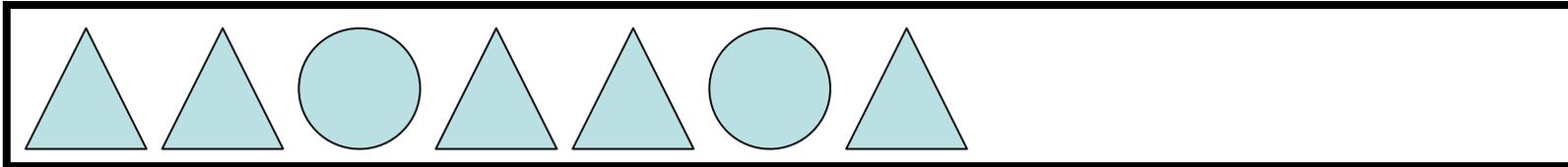
Teacher Observational Checklist

Criteria	Names of Students																			
Copies repeated patterns																				
Extends repeated patterns																				
Creates repeated patterns																				
Using math vocabulary																				

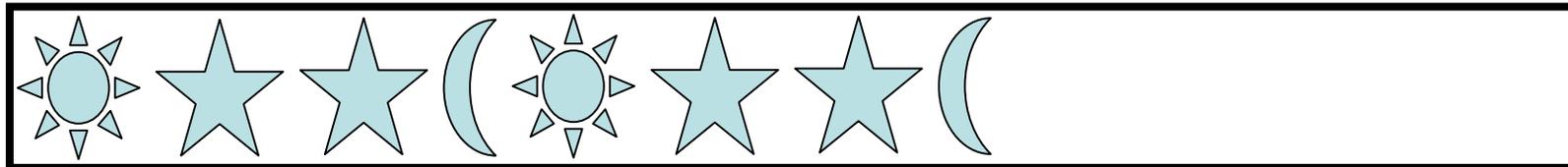
Teacher Notes / Anecdotal Records



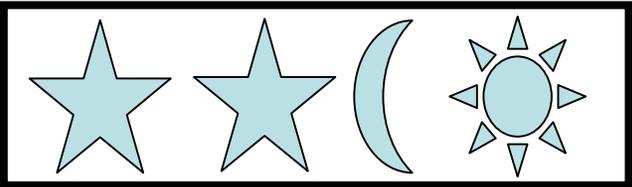
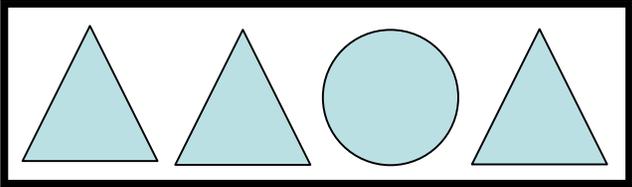
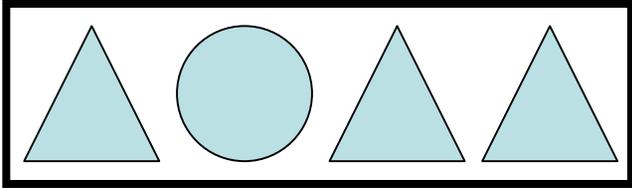
Patch It Up!



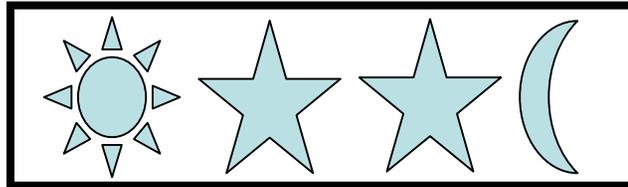
AABC AABC AABC



Cut and place in bags for "Patch It Up" activity.



ABCAABC

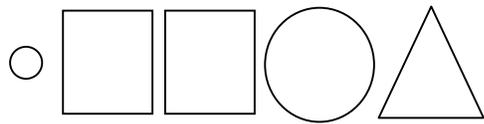
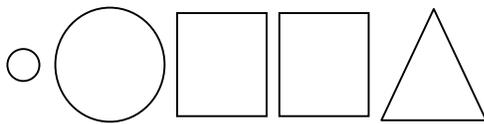
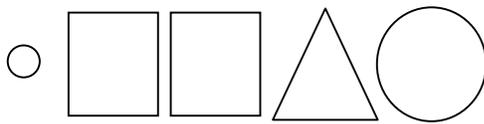
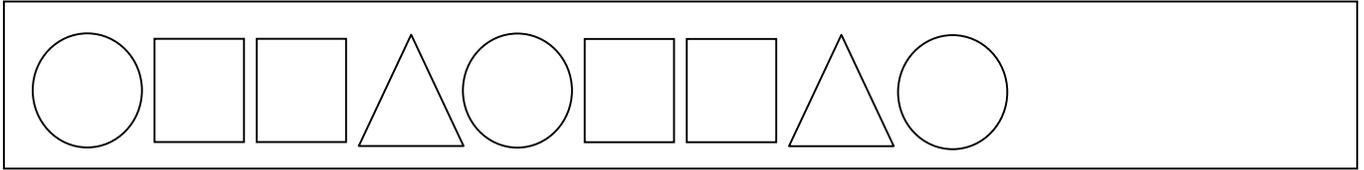


AABCAAB

Day 2 Patchwork



1. Extend the pattern the next four terms. Fill in the circle for the answer you choose.



ABCCABCCAB

2. What would the 14th term be for this pattern? Why? _____

Name: _____ Date: _____

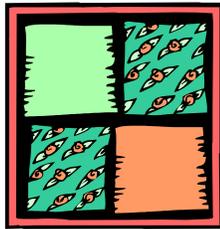


Copy the patterns below into your math journal. Extend each pattern with 4 terms. Be prepared to discuss why your answers are correct.

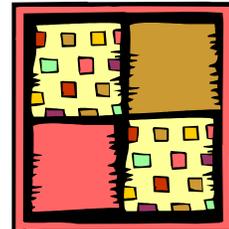
1. $\diamond \triangle \triangle \infty \diamond \triangle \triangle \infty \diamond$

2. $\square \blacklozenge \pencil \blacklozenge \square \blacklozenge \pencil \blacklozenge \square \blacklozenge$

Use red, blue and orange snap cubes to create a repeating pattern.



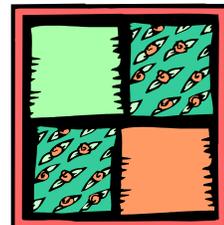
There are two blue cubes in each core.



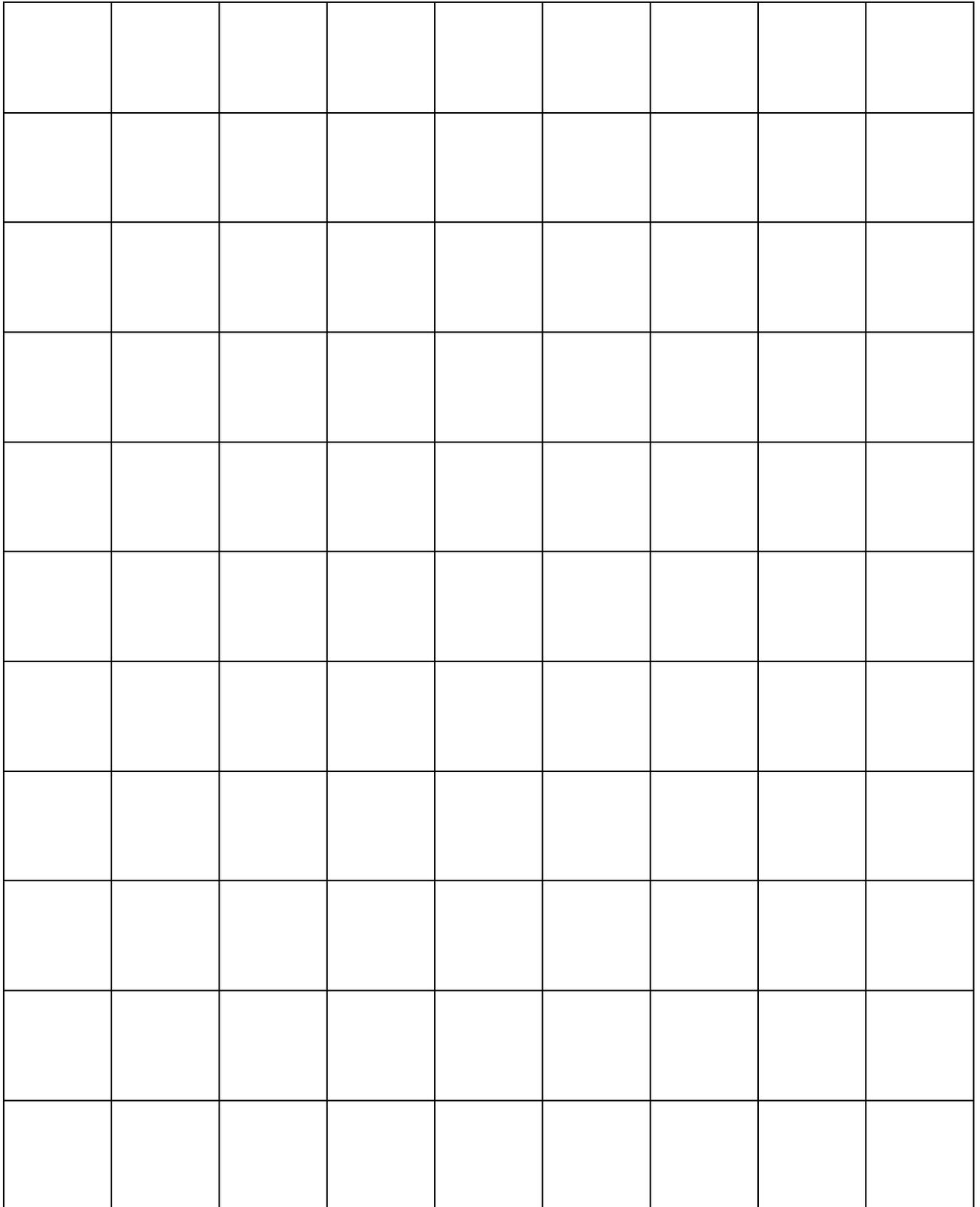
The orange shape will be the first term.



There are four terms in the core.



Grid Paper



Patchwork Patterns Assessment

Name: _____ Date: _____

Circle the core in the patterns below.

1. ❖ □ □ ❖ □ □ ❖ □ □ ❖

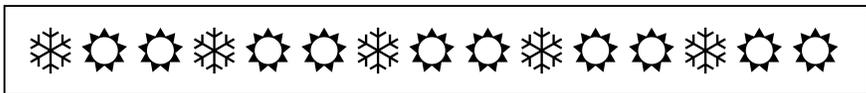
2. ● ★ ★ ● ● ★ ★ ● ● ★ ★ ● ● ★ ★ ● ● ★ ★

Extend each pattern with four terms.

3. ○ □ □ △ ○ □ □ △ ○ □ □ △ ○ _____

4. ☺ ♡ ♡ ☺ ☺ ♡ ♡ ☺ ☺ ♡ ♡ ☺ ♡ ♡ _____

Use the pattern below to answer questions 5-6.



5. How many terms are in the core? _____

6. How many terms are in the whole pattern? _____

Brief Constructed Response



Word Box

Paper

Envelope

Mailbox

Extend

Term

Core

Part A

What is the 14th term in this pattern?

Part B

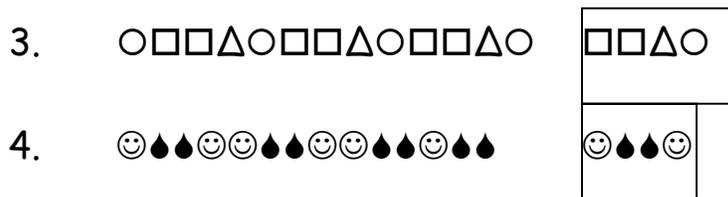
Use what you know about repeating patterns to explain why your answer is correct. Use number and/or words in your explanation.

Patchwork Pattern Assessment/ Answer Key

Circle the core in the patterns below.



Extend each pattern with four terms.



Use the pattern below to answer questions 5-6.



5. How many terms are in the core? 3

6. How many terms are in the whole pattern? 15

Brief Constructed Response



Word Box

Paper

Envelope

Mailbox

Extend

Term

Core

Part A

What is the 14th term in this pattern?

_____Paper_____

Part B

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

I know that in repeating patterns the core repeats. The core is paper, paper, envelope, and mailbox. I drew the terms to extend the pattern to the 14th term. The 14th term is the paper.

**MSA Brief Constructed Response “Kid Speak”
Mathematics Rubric
Grades 1 through 8**

Score	
2	<p>My answer shows I completely understood the problem and how to solve it:</p> <ul style="list-style-type: none">• I used a very good, complete strategy to correctly solve the problem.• I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well-organized and logical.• I applied what I know about math to correctly solve the problem.• I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.
1	<p>My answer shows I understood most of the problem and how to solve it:</p> <ul style="list-style-type: none">• I used a strategy to find a solution that was partly correct.• I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well-organized or logical.• I partly applied what I know about math to solve the problem.• I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.
0	<p>My answer shows I didn't understand the problem and how to solve it:</p> <ul style="list-style-type: none">• I wasn't able to use a good strategy to solve the problem.• My strategy wasn't related to what was asked.• I didn't apply what I know about math to solve the problem.• I left the answer blank.