Title: Attributes and Patterns

Brief Overview:

The students will recognize and use a Venn Diagram to sort shapes based on similar attributes. Repeating patterns will be recognized, extended, completed and created. The core and the terms in the pattern will be identified. Students will predict future terms in a pattern.

NCTM Content Standard/National Science Education Standard:

Understand patterns, relations, and functions;

- Sort, classify, and order objects by size, number, and other properties;
- 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:

Second grade

Duration/Length:

Three 60-minute class periods

Student Outcomes:

- Students will be able to sort and classify leaves and shapes by size, number, and other properties in order to describe common attributes.
- Students will be able to create an AB, ABB, ABC, and an ABBC pattern in order to label and extend the pattern (visual).
- Students will predict what will come next in a repeating pattern in order to identify future terms in the pattern (numerical and visual).

Materials and Resources:

Lesson 1

- Bins of leaves in varying colors, shapes, and/or sizes for each table group
- 2 hoops
- Large chart paper
- Large chart paper with labeled circle for each student group (Label reads: "Blue Shapes")
- Large chart paper with labeled Venn Diagram for each student group (Labels read: "Yellow Objects", "Yellow Objects with 5 Sides", and "Objects with 5 Sides")
- Bins of pattern blocks in a variety of colors and shapes

- Index cards with labels (Labels read: “Objects with 4 Sides”, “Objects with 3 Sides”, “Orange Objects”, and “Orange Objects with 3 Sides”)
- Teacher Resource 1: Observation Checklist
- Student Resource 1: Venn Diagram Sort
- Student Resource 2: Pictures for Venn Diagram Sort (copy onto a variety of colored paper)

Lesson 2

- Teacher Resource 2: Large Pumpkin, Apple, Leaf Pictures (make duplicates)
- Student Resource 3: Small Pumpkin, Apple, Leaf Pictures (make duplicates)
- Bins containing already cut pictures from Student Resource 03: Small Pumpkin, Apple, Leaf Pictures for each table group
- Sentence Strips (1 per student)
- Glue sticks (1 per student)
- Teacher Resource 3: ABC Pattern Scoring Rubric
- Student Resource 4: Grid Paper Patterns

Lesson 3

- Overhead snap cubes
- Teacher Resource 4: Snap Cube Values
- Bins of snap cubes for each table group
- Student Resource 5: ABBC Pattern Sheet (1 per student)
- Bins of crayons for each table group
- Teacher Resource 5: ABBC Pattern Sheet Scoring Rubric

Summative Assessment

- Student Resource 6: Attributes and Patterns Quiz
- Student Resource 7: Make a Bookmark
- Teacher Resource 6: Bookmark Shapes (copy onto a variety of colored paper)
- Teacher Resource7: Attributes and Patterns Quiz Answer Key
- Teacher Resource 8: Bookmark Shapes Scoring Rubric

Development/Procedures:

Lesson 1

Pre-assessment – Embedded in the launch activity.

Launch – Leaf Sort

- Distribute bins of leaves to each table group.
- Have the students select a handful of leaves.
- Instruct students to sort their leaves into two groups.
- Ask: *"How did you group your leaves?"* (*Example: These leaves are yellow and these leaves are not yellow.)* Introduce the term *attribute* (a special feature of an object).
- Ask: *"Did anybody group their leaves in a different way?" (These leaves have 5 or more points and these leaves have less than 5 points.)*
- Instruct the students to sort their leaves in a different way than before.
- Discuss the attributes of the new leaf groupings.

Teacher Facilitation 1 – Attributes

- Bring students to an area of the room where a hoop has already been set up on top of chart paper. Hide the label, "*Objects with Four Sides*" by placing it face down under the edge of the hoop. Objects with four sides should already be placed inside the hoop. Objects that have fewer than or more than four sides should already be placed on the chart paper outside the hoop.
- Tell students, *"Objects that are placed inside the hoop share one attribute. The objects that are outside of the hoop do not have that attribute."*
- Ask students: *"What attribute do you think is shared by the shapes within the hoop?"* Guide students as needed to realize that all of the objects within the hoop have four sides.
- Ask students, *"What is different about the shapes that are outside of the hoop? Why are they not in the hoop?"* (*They do not have four corners*. *All of the objects that are in the hoop need to have 4 corners.)*

Student Application 1 – Attributes

- Distribute chart paper with one large labeled circle to pairs of students. The label reads, *"Blue Shapes"*.
- Distribute bins of pattern blocks to each pair of students.
- Direct students to read the label on their circle and select shapes that they will then place inside or outside the circle.
- Ask a student to explain his/her reason for placing an object inside or outside of the circle. *(Example: I put the blue square inside the circle because it is blue.)*

Teacher Facilitation 2 – Venn Diagram

- Bring students to an area of the room where two overlapping hoops (Venn Diagram) have been set up on top of chart paper. Hide the labels, *"Objects with Three Sides," "Orange Objects"* and *"Orange Objects with Three Sides"* by placing them face down under the edges of the hoops. Objects with three sides should already be placed inside one hoop. Objects that are orange should already be placed in the second hoop.

Orange objects that have three corners should already be placed in the space where the two hoops overlap.

- Tell students: *"Objects that are placed inside the first hoop have one attribute in common (objects with three sides). The objects that are placed inside the second hoop have a different common attribute (orange objects) from those objects placed in the first hoop. The objects in the space where the two hoops overlap share the common attributes (orange objects with three sides) from the two hoops. The objects that are outside of the Venn Diagram do not have an attribute from either hoop."*
- Ask students: *"What attribute do you think is shared by the shapes within the first hoop?"* Guide students as needed to realize that all of the objects within the first hoop have three corners.
- Ask students: *"What attribute do you think is shared by the shapes within the second hoop?"* Guide students as needed to realize that all of the objects within the second hoop are orange.
- Ask students: *"Why are some objects placed in the space where the two hoops overlap?*" Guide students as needed to realize that those objects share both attributes (*they are orange and have three sides*).
- Ask students: *"What is different about the shapes that are outside of the Venn Diagram? Why are they not in the Venn Diagram?"* (They are not orange and they do not have three sides.)

Student Application 2 – Venn Diagram

- Distribute chart paper with one large labeled Venn Diagram to pairs of students. The labels read, "*Yellow Objects*," "*Objects with Five Sides*" and "*Yellow Objects with Five Sides*."
- Direct students to continue to use the bins of pattern blocks that they used earlier during Student Application 1.
- Direct students to read the labels on their Venn Diagram and select shapes that they will then place inside or outside the Venn Diagram.
- Ask a student to explain his/her reason for placing an object inside or outside of the Venn Diagram and for where they placed it on the Venn Diagram.

Embedded Assessment –

- Observe students while they are sorting their objects on the Venn Diagram in Student Application 2.
- Record observations on Teacher Resource 1: Observation Checklist.

Reteaching

- For those who have not completely understood the lesson, review the one hoop concept taught in Teacher Facilitation 1 in a small group setting.

Extension

- Distribute Student Resource 1: Venn Diagram Sort

- Distribute Student Resource 2: Pictures for Venn Diagram Sort.
- Direct students to cut apart the pictures from Student Resource 2: Pictures for Venn Diagram Sort and sort them based on common attributes on the Venn Diagram.

Lesson 2
Pre-assessment – Embedded in the Launch Activity

Launch

- Direct students to stand in an open area in a circle formation.
- Tell the students that you will be doing something that repeats. (This defines a pattern.)
- Introduce the auditory pattern by stomping once and then clapping once. Repeat this several times. Direct students to join in the verbalization of the pattern with you when they recognize the pattern.
- When most or all of the students have joined in, begin verbalizing the pattern, saying, *"Stomp, clap, stomp, clap, ..."* .

Teacher Facilitation 1

- Write the auditory pattern on the board that was presented in the launch. *(Stomp, clap, stomp, clap, stomp, clap).*
- Underneath the written pattern, identify the *core (stomp, clap)* and inform the students that this is the unit, or collection of terms that repeats.
- Inform the students that each object in the core is referred to as a *term*. In our pattern core we have *"stomp"* and *"clap"* as the two terms in the core.
- Ask the students to look at the pattern that is written on the board. Ask, *"How many times do you see the core repeated in the pattern?"(3 times- the core plus the two more presentations of it).*
- Inform the students that one way to label a pattern is with letters.
- Direct students to look at the board where the auditory pattern is written.
- Label the core of the pattern by placing an "A" above the word *stomp* and a "B" above the word *clap*.
- Direct students to look at the "A" above *stomp*. Tell students that the "A" now replaces the word *stomp* so we can label all of the *stomps* with "A".
- Direct students to look at the "B" above *clap*. Tell students that the "B" now replaces the word *clap* so we can label all of the *claps* with "B".
- Ask students: *"If we were to continue the pattern, what letter do you think would come next?" (A)* Continue making predictions and extending the pattern as needed.
- Tell students: *"Let's try making a different AB pattern."*
- Teacher displays a pumpkin followed by an apple on the board. (Use duplicate copies from Teacher Resource 2: Large Pumpkin, Apple, Leaf Pictures.)
- Inform students that this is the core of the pattern. Place another pumpkin and another apple on the board.

- Ask students: *"What do you think will come next?" (Pumpkin) "What will come after the pumpkin?" (Apple)*
- Label the pattern above the core AB and ask students what the remainder of the pattern should be labeled. *(ABAB)*

Student Application 1

- Distribute bins containing the already cut pictures from Student Resource 3: Small Pumpkin, Apple, and Leaf Pictures to each table group.
- Direct students to copy the AB pattern shown on the board.
- Ask students, *"How can you make another AB pattern using different pictures?" (Example: pumpkin, leaf, pumpkin, leaf)*
- Direct students to make their own AB pattern using the pictures from the bin.
- Direct students to leave their pattern on their desk and "take a gallery walk" around the room to observe the work of their classmates.
- Ask a student to identify patterns that were similar. Call on multiple students as needed. *(Example: Mine is similar to my friend's pattern because I have apple, leaf, apple, leaf and my friend has leaf, apple, leaf, apple. They are both a repeating AB pattern.)*

Teacher Facilitator 2

- Inform the students: *"We are now going to change our pattern by introducing a third term."*
- Display a pumpkin followed by an apple and then a leaf on the board.
- Inform students that this is the core of the pattern. Place another pumpkin, another apple, and another leaf on the board following the core.
- Ask students: *"What do you think will come next?" (Pumpkin) "What will come after the pumpkin?" (Apple) "What will come after the apple?" (Leaf)*
- Label the pattern above the core ABC and ask students what the remainder of the pattern should be labeled. *(ABCABC)*

Student Application 2

- Direct students to copy the ABC pattern shown on the board.
- Ask students: *"How can you make another ABC pattern using different pictures?"* (*e.g. apple, pumpkin, leaf, apple, pumpkin, leaf*)
- Direct students to make their own ABC pattern using the pictures from the bin. Remind students that their pattern needs to repeat three times.
- Distribute sentence strips and glue sticks.
- Direct students to place their pictures on a sentence strip.
- Direct students to obtain teacher approval prior to gluing their pattern onto the sentence strip.
- Direct students to label the core and the repeating terms in their pattern.
- Ask a student to share his/her pattern by holding the sentence strip in the air. Have the student discuss his/her pattern. Ask other students if they have a pattern that is similar. Have students describe how their patterns

are similar. *(Example: My friend's pattern is similar to mine because in my core I have apple, pumpkin, leaf and my friend has apple, leaf, pumpkin. We both have an ABC pattern that repeats.)*

Embedded Assessment-

- Observe students while they are making their AB and ABC patterns.
- Score the ABC sentence strip pattern using the Teacher Resource 3: ABC Pattern Scoring Rubric.

Reteaching

- For those who have not completely understood the lesson, review the AB pattern taught in Teacher Facilitation 1.

Extension

- Distribute Student Resource 4: Grid Paper Patterns.
- "Making Grid Patterns" web site: http://standards.nctm.org/document/eexamples/chap4/4.1/index.htm#applet

Lesson 3

Pre-assessment – Embedded in the Launch Activity

Launch

- Direct students to stand in an open area in a circle formation.
- Tell the students that you will make a repeating auditory pattern.
- Introduce the auditory pattern by stomping once and then clapping twice. Invite students to join in with you when they recognize the pattern.
- When most or all of the students have joined in, begin verbalizing the pattern, saying, *"Stomp, clap, clap, stomp, clap, clap…"* Direct the students to join in with you when they recognize the pattern.
- Ask students, *"How would you describe the core of the pattern using letters like we did yesterday?" (ABB)*

Teacher Facilitation

- Use overhead snap cubes to display an ABB pattern *(yellow, blue, blue)* that repeats three times.
- Ask students to identify the core, the number of terms in the core, and the number of times it repeats. *(core- yellow, blue, blue; three terms in the core; repeats three times)*
- Distribute bins of snap cubes to each table group.
- Direct students to copy the ABB pattern shown on the overhead by using the snap cubes on their desks.
- Display Teacher Resource 4: Snap Cube Values. (Display Teacher Resource 4 as an overhead, copy it onto chart paper, or provide copies for

each student.) Use the chart to record a number value below the colored snap cubes. (*So, yellow, blue, blue becomes 5, 3, 3.)* Guide the students to understand that we are using numbers to describe the ABB pattern in a different way.

- Use overhead snap cubes to display an ABBC pattern *(yellow, blue, blue, dark green)* that repeats three times.
- Ask students to identify the core, the number of terms in the core, and the number of times it repeats. *(core- yellow, blue, blue, dark green; 4 terms in the core; repeats three times)*
- Refer to Teacher Resource 4: Snap Cube Values. Use the chart to record a number value below the colored snap cubes. (*So yellow, blue, blue, dark green becomes 5, 3, 3, 0.)* Guide the students again to understand that we are using numbers to describe the ABBC pattern in a different way.
- Remove the snap cubes from the overhead so that only the number pattern is displayed.
- Ask students: *"If we were to continue the pattern, what would be the next three terms?" (yellow, blue, blue becomes 5, 3, 3,)*

Student Application-Student Resource Activity

- Direct students to use the snap cubes to make their own ABBC pattern that repeats three times.
- Distribute Student Resource 5: ABBC Pattern Sheet and crayons.
- Direct students to record their ABBC pattern by coloring it onto Student Resource 5: ABBC Pattern Sheet.
- Direct students to label the terms with either an A, B, or C above their pattern.
- Direct students to use Teacher Resource 4: Snap Cube Values to record number values below each term in the pattern.
- Direct students to label the core in their pattern.
- Direct students to predict what the 17^{th} term would be in their pattern. Guide students to realize that there are 12 terms in the pattern thus far. Direct students to record their prediction on Student Resource 5: ABBC Pattern Sheet.

Embedded Assessment

- Observe students while they are making and labeling their ABBC patterns during Student Application.
- Score the Student Resource 5: ABBC Pattern Sheet using Teacher Resource 5: ABBC Pattern Sheet Scoring Rubric.

Reteaching

- For those who have not completely understood the lesson, review the ABBC pattern taught in Teacher Facilitation.

Extension

- "Continue the Pattern" website: www.nlvm.usu.edu/en/nav/frames_asid_184_g_1_t_2.html

Summative Assessment:

- Distribute Student Resource 6: Attributes and Patterns Quiz for students to complete.
- Distribute Student Resource 7: Make a Bookmark and Teacher Resource 6: Bookmark Shapes for students to complete.
- Score the above assignments using Teacher Resource 7: Attributes and Patterns Quiz Answer Key and Teacher Resource 8: Bookmark Shapes Scoring Rubric

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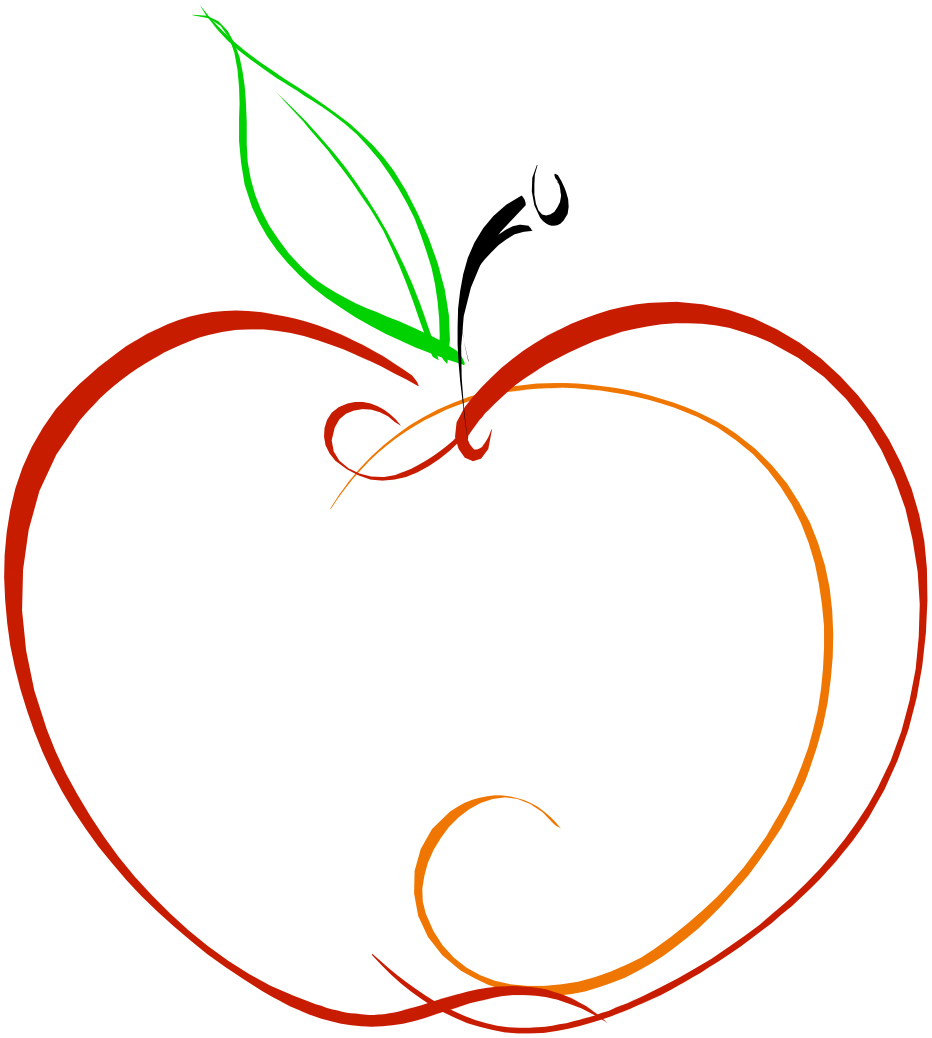
Appendix A: Teacher Resources Teacher Resource 1

Observation Checklist

Student Name	Identified objects with five corners	Identified yellow objects with five corners	Identified yellow objects	Identified objects that were neither yellow nor five cornered

Teacher Resource 2

Large Pumpkin, Apple, Leaf Pictures



Teacher Resource 3

ABC Pattern Scoring Rubric

Student Name	Created an ABC pattern	Repeated the pattern 3 times	Labeled the core	Labeled the repeating terms

Snap Cube Values

Snap Cube Color	Value
Dark Green	0
Red	1
White	2
Blue	3
Black	4
Yellow	5
Light Green	6
Brown	7
Purple	8
Orange	9

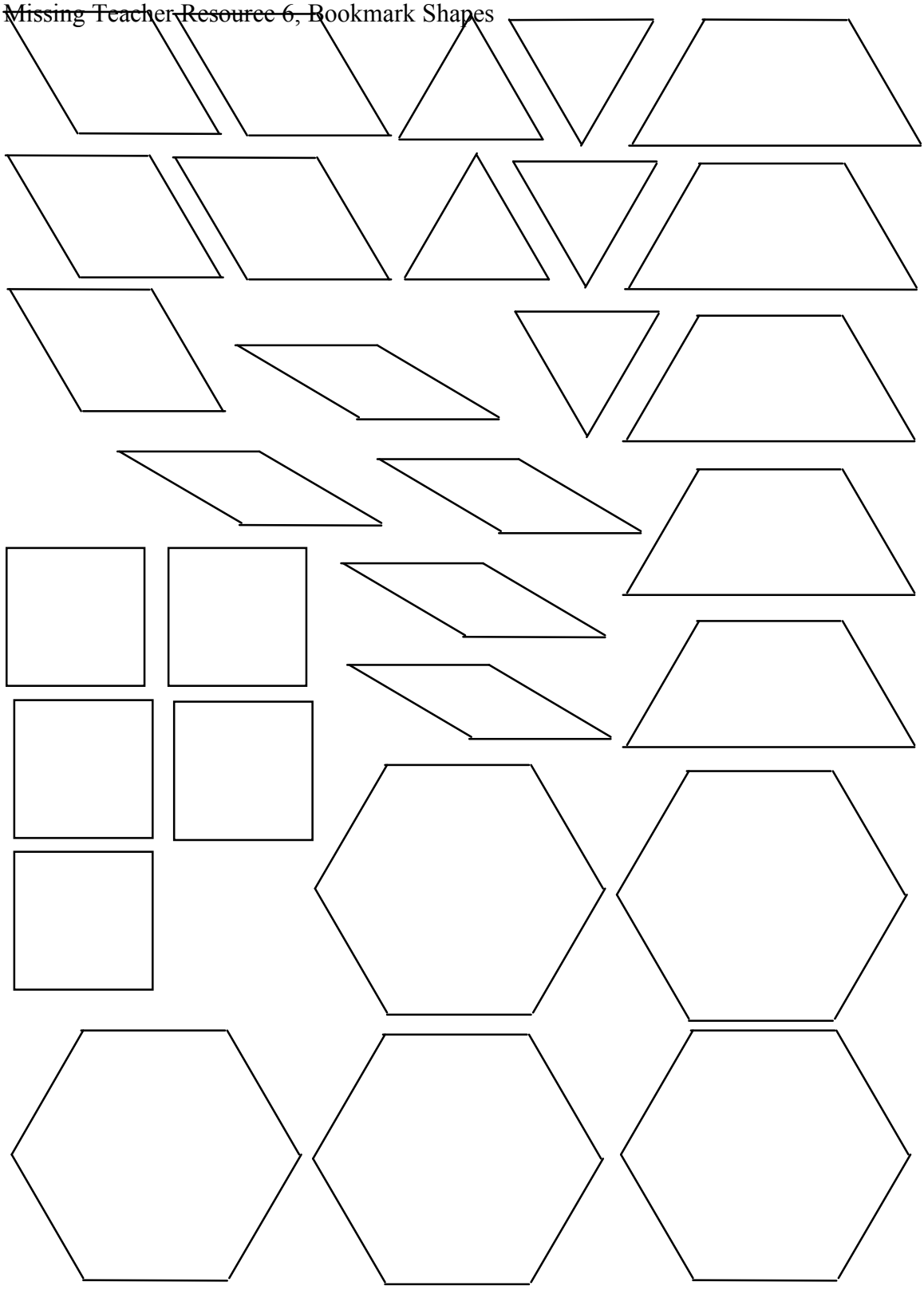
Teacher Resource 5

ABBC Pattern Sheet Scoring Rubric

Student Name	Created an ABBC pattern	Repeated the pattern 3 times	Labeled the core	Labeled the repeating terms	Labeled terms with a number value	Colored 17th term correctly	Labeled 17th term with a letter	Labeled 17th term with a number value

Bookmark Shapes

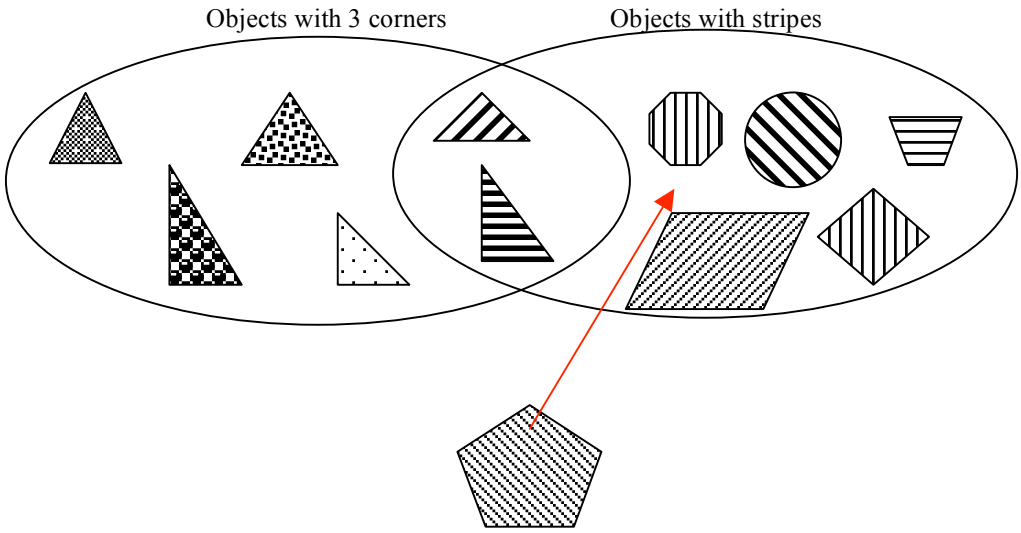
~~Missing Teacher Resource 6,~~ Bookmark Shapes

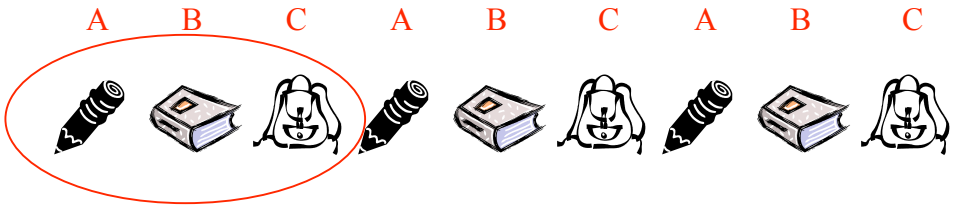


Name _____ Date _____

Attributes and Patterns Quiz- Answer Key

1. Draw a line to show where the shape should be placed on the Venn Diagram.





2. In the above pattern, draw a circle around the terms in the pattern core.

3. Label all of the terms in the above pattern using the letters ABC.

4. Circle the object that would come next in the pattern.

5. Circle the object that would come 12th in the above pattern.

A B B C A B B C A B B C

5, 4, 4, 7, 5, 4, 4, 7, 5, 4, 4, 7

6. In the above pattern, draw a circle around the terms in the pattern core.

7. Label all of the terms in the pattern using the letters ABC.

8. Circle the number that would come next in the pattern.

7 8 5 4 1

9. Circle the number that would come 15th in the pattern.

7 8 5 4 1

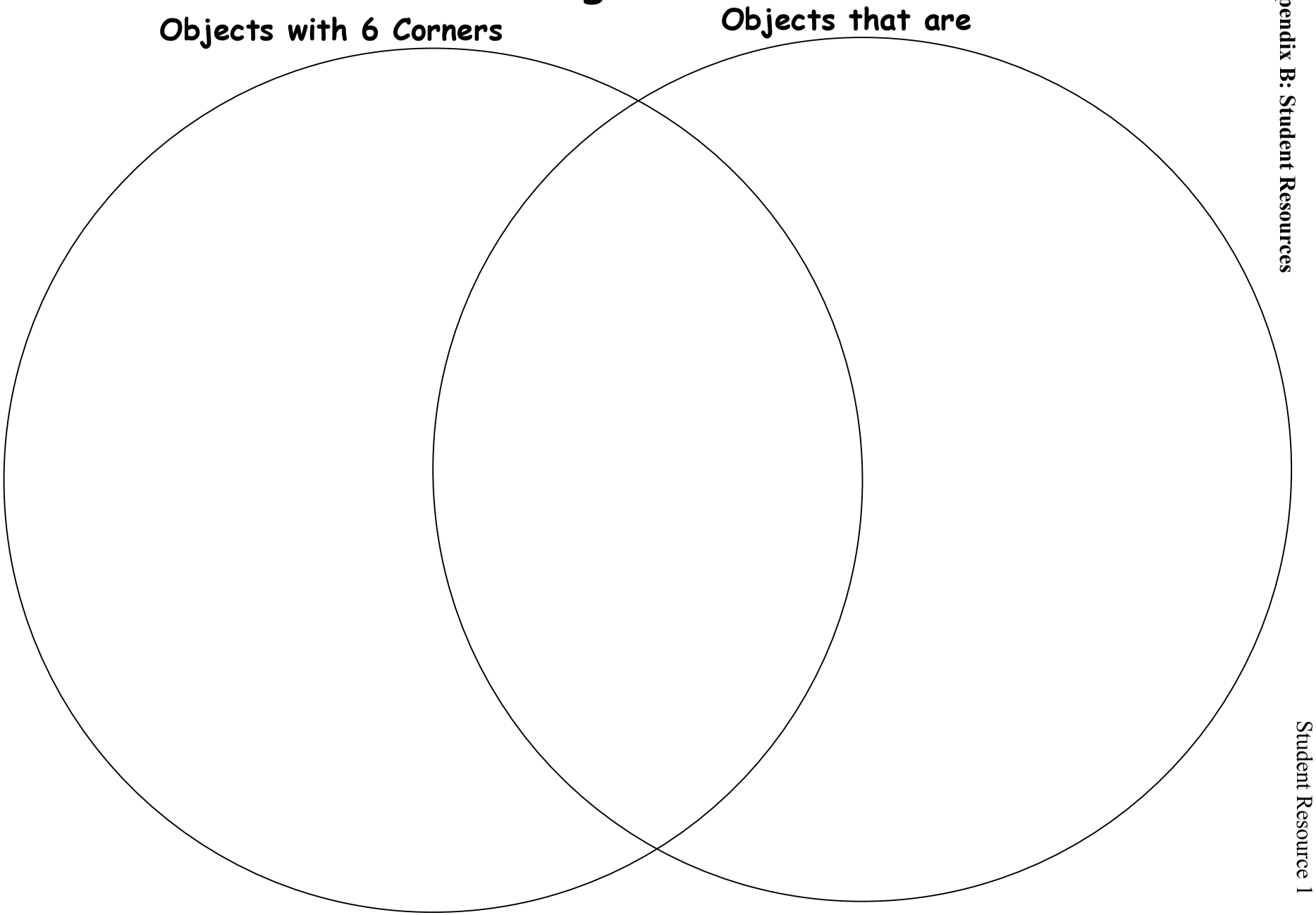
Teacher Resource 8

Bookmark Shapes Scoring Rubric

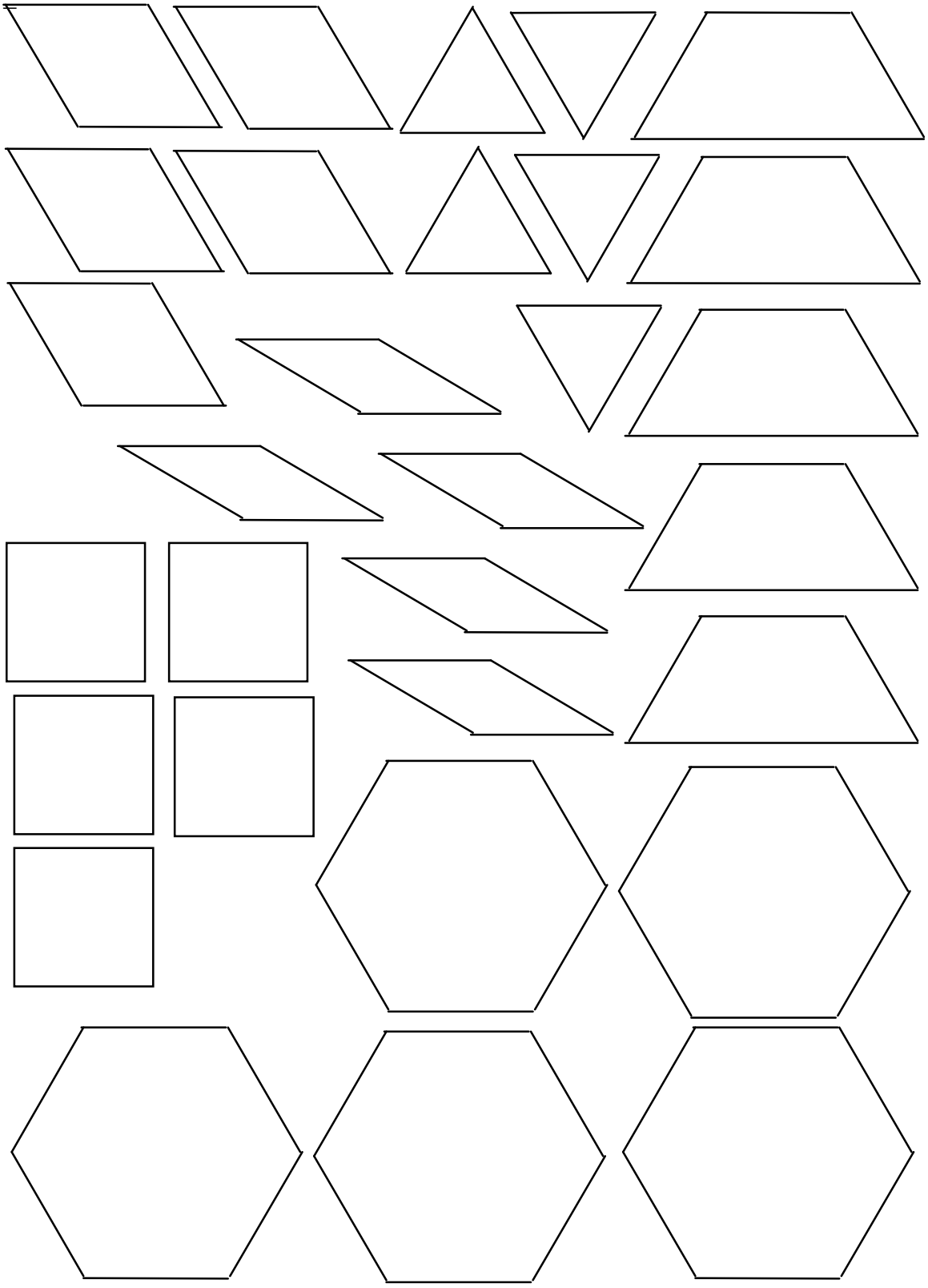
Student Name	Created a pattern with 3 or 4 terms in the core	Repeated the pattern at least 3 times

Name _____ Date _____

Venn Diagram Sort

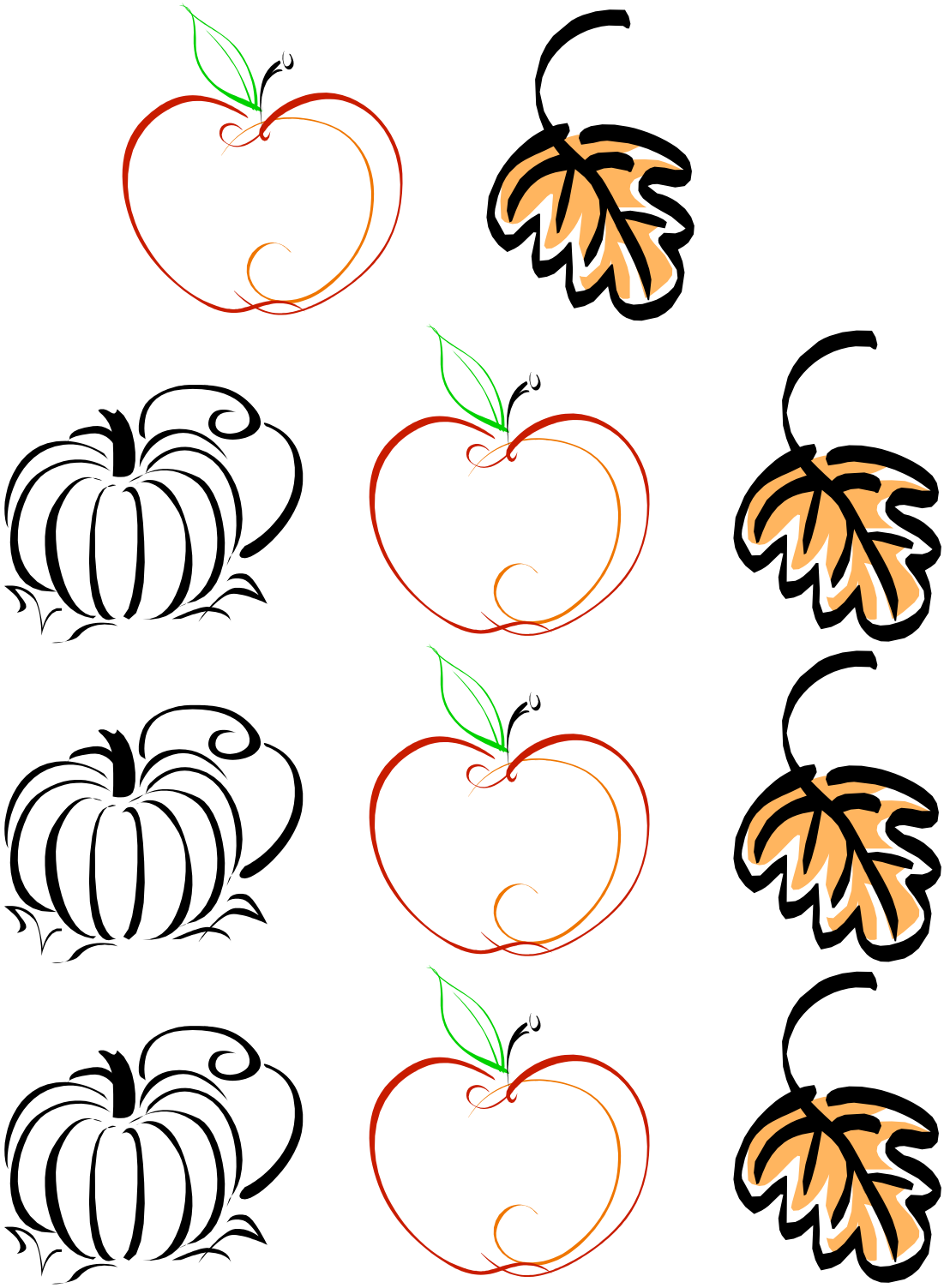


Pictures for Venn Diagram Sort



Student Resource 3

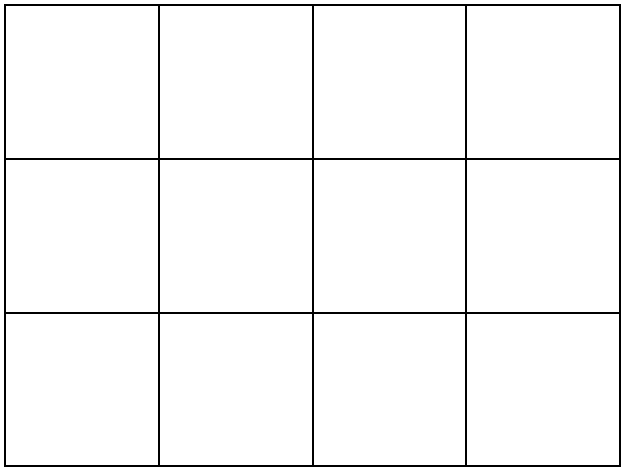
Small Pumpkin, Apple, and Leaf Pictures

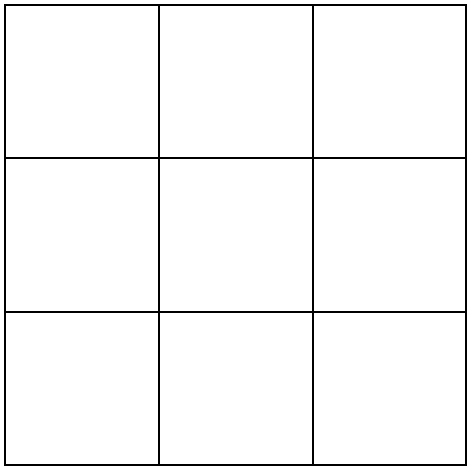


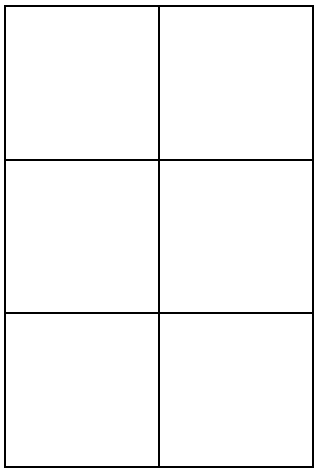
Name_____ Date_____

Grid Paper Patterns

Directions: Use each grid below to create a different repeating pattern. Your pattern should go across the rows, and continue throughout the rest of the rows in the grid. Your core should have at least 2 terms but no more than 4 terms. For example, you can make a color pattern (red, blue, red, blue), or a pattern that follows a theme (example: 4th of July: star, firecracker, flag, star, firecracker, flag).







Student Resource 5

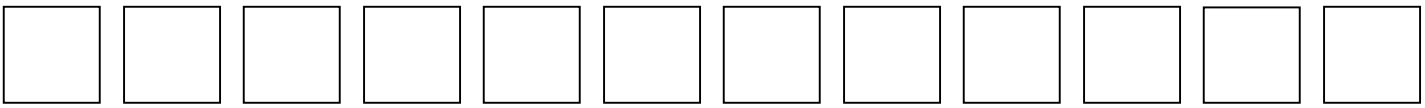
ABBC Pattern Sheet

Name_____ Date_____

Directions:
Part A:

Look at the ABBC pattern on your desk. Please complete the following:

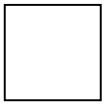
- Copy your pattern by coloring in the boxes below to match your pattern.
- Label the terms in your pattern with either an A, B, or C above each one.
- Use the Snap Cube Values Chart to record each number value below each term in your pattern.
- Label the core in your pattern.



Directions:
Part B:

Look at your ABBC pattern completed above. You should notice that there are 12 terms in the pattern. On the square below, predict what the 17^{th} term would be if this pattern continued.

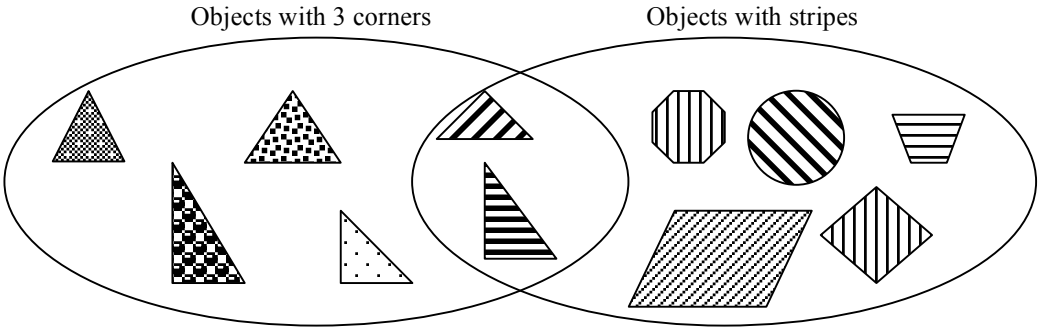
- Color the term.
- Label the term with either an A, B, or C above it.
- Use the Snap Cube Values Chart to record the number value below the term.

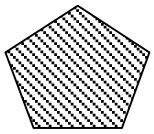


Name _____ Date _____

Attributes and Patterns Quiz

1. Draw a line to show where the above shape should be placed on the Venn Diagram.





2. In the above pattern, draw a circle around the terms in the pattern core.

3. Label all of the terms in the pattern using the letters ABC.

4. Circle the object that would come next in the above pattern.

5. Circle the object that would come 12th in the above pattern.

5, 4, 4, 7, 5, 4, 4, 7, 5, 4, 4, 7

6. In the above pattern, draw a circle around the terms in the pattern core.

7. Label all of the terms in the pattern using the letters ABC.

8. Circle the number that would come next in the above pattern.

7 8 5 4 1

9. Circle the number that would come 15th in the above pattern.

7 8 5 4 1

Name _____ Date _____

Make a Bookmark

Directions: Make a pattern using the Bookmark Shapes! Things to remember:

- You must have either 3 or 4 terms in your core
- Your pattern must repeat at least 3 times
- Glue your pattern onto the blank bookmark below
- Be as creative as you would like!