

## Title: Back to School with Patterns

### **Brief Overview:**

Students will explore patterns using their bodies and items found in the classroom (school supplies). They will identify, extend, and create patterns using the vocabulary terms, term, core, and symbol.

### **NCTM Content Standard/National Science Education Standard:**

Algebra:

Understanding Patterns:

- Recognize, describe, and extend patterns and translate from one representation to another.
- Analyze how repeating patterns are generated.
- Describe, extend, and make generalizations about patterns.
- Represent and analyze patterns using words.

### **Grade/Level:**

Grades 2/3

### **Duration/Length:**

Three 50-minute lessons

### **Student Outcomes:**

Students will be able:

- Identify, copy, label, and extend repeating patterns using a variety of attributes.
- Represent manipulative patterns in symbolic form.
- Construct repeating patterns using no more than four different objects.

### **Materials and Resources:**

#### **Lesson 1**

- \*Laminated Pattern Cards (1 set for every 2 students) (Teacher Resource Sheet 1# a-o)
- Teacher Answer Key for Pattern Cards (Teacher Resource Sheet 1 #p)
- Find the Patterns worksheet (1 per student) (Student Resource Sheet 1)
- 6 copies of A,B,C,D cards (Teacher Resource Sheet 2)
- Pattern Scavenger Hunt (Student Resource Sheet 2)

#### **Lesson 2**

- \*Laminated Pattern Cards (1 set for every 4 students) (Teacher Resource Sheet 1 # a-o)
- \*Laminated Individual Object Cards (2 copies of each object per student) (Teacher Resource Sheet 3)
- Pocket Chart
- Pattern Labels (Teacher Resource Sheet 4)
- Pattern Game Directions (Teacher Resource Sheet 5)
- 6 X 18 strip of paper per student
- \*Finish the Pattern (Student Resource Sheet 3)
- Object Pictures (1 sheet per student) (Student Resource Sheet 4)

### **Lesson 3**

- \*Laminated Individual Object Cards (Teacher Resource Sheet 3)
- Pocket Chart
- Copy of Group Activity Directions per group (Student Resource Sheet 5)
- 6 X 24 strip of poster board per group
- Tape
- Students' scissors, glue, pencils, and crayons
- \*Object Pictures (1 sheet per student) (Student Resource Sheet 4)
- 6 X 18 strip of paper per student
- Create A Pattern Directions (Student Resource Sheet 6 # a - f)
- Pattern blocks for 6 groups
- Guess the Pattern Card Game Directions (Teacher Resource Sheet 7)
- Summative Assessment Pattern BCR (Student Resource Sheet 7)

#### **\*Preparation in Advance:**

Prepare these materials in advance by making the appropriate copies that will be needed for each lesson and laminate them for durability.

#### **Development/Procedures:**

### **Lesson 1 – Identifying Patterns**

#### **Preassessment –**

- Begin by asking the students to look at their clothing to determine if they are wearing a pattern on their clothing.
- Ask the students who have a pattern on their clothing to stand on one side of the classroom.
- Ask the rest of the students who do not have a pattern to stand on the other side of the classroom.
- Then call on the students who have a pattern to individually explain their pattern. (e.g. black and white stripes)

- After all students on the pattern side have explained their patterns, ask the other group of students if they can now recognize a pattern on their clothing.
- If there are any students, allow those students to explain their patterns.
- Then have all but three boys and three girls sit down.

### Launch –

- Use the 6 students (3 boys and 3 girls) who are still standing to create an AB pattern. (boy/girl)
- Once the students are in place ask the class “Is there a pattern?”
- The students will respond and explain their answers. “Yes, there is a pattern.”
- Ask, “What is the pattern?”
- The students will respond and explain their answers. “The pattern is boy-girl-boy-girl-boy-girl.”

### Teacher Facilitation –

- Ask the students to describe the pattern.
- Students’ responses: “boy/girl pattern.”
- Ask “What kind of pattern is this?”
- Students’ responses: “AB pattern.”
- If the students repeat “boy/girl” and have difficulty identifying the pattern symbolically, suggest that the students should use the letters A and B to name the pattern.
- Use the A B cards (Teacher Resource Sheet 1) to represent the pattern symbolically. Each student will receive the corresponding letter for his or her position in the pattern.
- Ask the question “How many people are in our pattern?”
- The students will answer “six”.
- Next introduce the vocabulary word, ‘**term**’.
- Explain to the students that 1 object (or person in our pattern) is called a **term**.
- Pose the question, “How many **terms** are in the pattern?”
- After the students have an understanding of the word **term**, introduce the vocabulary word, ‘**core**’.
- Ask the students, “How many times does the pattern repeat itself?”
- Students will answer, “Three times.”
- Explain to the students, “One section of the pattern (in this case the first AB section) is called the **core**.”
- “The **core** is the section of **terms** that repeats over and over again.”
- After this example, repeat the process with 9 students to create an ABC, ABB, ABCD, AABB, AAB pattern.
- For these examples, have the students stand in various positions. (Example: both arms up, hands on head, hands on hips – repeat to create an ABC pattern)

- Use the A, B, C, D cards (Teacher Resource Sheet 1) to label the patterns.
- Then discuss them with the students and ask the previous questions for the students to answer and discuss.

### **Student Application –**

- Divide the students into groups of 2 students.
- Distribute the laminated pattern cards (Teacher Resource Sheet 2 # a-o) – some with patterns and some with not. The cards will already be made and laminated for the activity.
- Each group of students will get one set of the cards.
- Students will work with their pattern cards to decide which cards have a pattern and which cards do not have a pattern.
- The students will sort their cards into two groups.
- Once all students are finished working, the students will share which cards are patterns and why as well as which cards do not have a pattern and why.

### **Embedded Assessment –**

- Observe the students working during this activity and monitor their understanding of identifying a pattern.
- Another assessment piece for this lesson is the worksheet Find the Patterns (Student Resource Sheet 1). The students will circle the pattern on the paper and label each pattern.

### **Reteaching/Extension –**

- **Reteaching** – Work with those students who are still having difficulty understanding the concept of identifying a pattern and the vocabulary term: term and core in a small group to help them better understand the lessons' concept.
- **Extension** – An extension for this lesson is a Scavenger Hunt throughout the school. Take the class on a walk through the school building to look for patterns. Use the Patterns Scavenger Hunt worksheet (Student Resource Sheet 2). Once back in the classroom, discuss the different types of patterns and where the patterns were located. (This can be adjusted to fit your specific school building.)

## **Lesson 2 – Extending Patterns**

### **Preassessment –**

- Use the laminated pattern cards (Teacher Resource Sheet 2 # a-o) from the previous day's lesson.
- Distribute one card to each student.
- Have the pocket chart labeled ABAB, AABB, ABB, AAB, ABC, ABCD, and No Pattern (Teacher Resource Sheet 3) at the top.

- The students will then look at the pattern on their card, decide if it has a pattern and if so what type of pattern.
- They will then share their pattern with class explaining the pattern and then place it in the correct column on the pocket chart.
- Each student will have a turn to share his or her card.

### **Launch –**

- Call on 6 students to come to the front of the classroom (3 boys and 3 girls)
- Arrange the students in an AB pattern (boy/girl/boy/girl/boy/girl)
- Ask the students to look at the pattern and identify it.
- Review the vocabulary words from the previous day (term and core). The teacher will ask, “How many terms are in the core?”
- Students will answer, “There are 2 terms in the core.”
- Then ask the students, “How many times does the core repeat?”
- Students will answer, “The core repeats 3 times.”
- Then ask the students, “What would come next in our pattern? A boy or a girl?”
- The students will look at the pattern and decide that a ‘boy’ will come next in the pattern.
- Explain to the students that this is called **extending** a pattern. When we extend a pattern, we are continuing the pattern and continuing to repeat the core.

### **Teacher Facilitation –**

- Place 9 students in an ABC pattern using various standing positions (Example: hands on head, right arm above head, and standing backwards – repeat 3 times with the students)
- Ask the students “How many terms are in the core of this pattern?”
- The students will answer, “There are 3 terms in the core.”
- The teacher will then ask, “How many times does the core repeat?”
- The students will answer, “The core repeats three times.”
- Then ask the students to extend the pattern, “What would come next in this pattern?”
- The students will answer, “hands on head.”
- After this example, then repeat the process with students to extend ABB, ABCD, AABB, AAB patterns.
- For these examples, have the students stand in various positions. (Example: both arms up, hands on head, both arms up – repeat to create an ABB pattern)
- Have the class share what would come next to extend each of the patterns.

### **Student Application –**

- The students will play the Pattern Card Game.

- Explain to the students the direction of the game using Teacher Resource Sheet 4.
- For this activity use the laminated pattern cards (Teacher Resource Sheet 2 # a-1 ONLY) (For this activity do not use cards #25 – 30) from the previous lesson and the laminated individual cards (Teacher Resource Sheet 5) for extending the patterns.
- Divide the class into groups of 4 students in each group.
- Then distribute 1 set of the laminated pattern cards (Teacher Resource Sheet 2 # a-1) per group.
- Each student selects 1 pattern card.
- Next, distribute 8 of each of the 4 laminated object cards to each group and place them face down in the middle of the group.
- The students will take turns picking up a card, looking at their pattern, and deciding if they can use the pictured object to extend their pattern.
- This will continue until the first student has extended their pattern 3 terms.
- If there is time after the first game, the students can pick a different pattern card from the set and play again by following the same rules.

#### **Embedded Assessment –**

- For the assessment activity, give each student a 6 X18 strip of paper with a pattern started on it. The teacher will have the paper with a pattern started and ready for each student. (Student Resource Sheet 3).
- Distribute the object pictures (Student Resource Sheet 4) for the students to use to extend the pattern that is on their strip of paper.
- The students will cut out and glue the pictures onto the paper that are necessary to extend the pattern.
- The students will extend their pattern 3 terms.
- When all the students are finished, they will then explain their pattern to the rest of the class.
- While the students are working on their patterns and describing/explaining them to the rest of the class, the teacher will be observing their level of knowledge on extending patterns.

#### **Reteaching/Extension –**

- **Reteaching** – Those students who are still having difficulty understanding the concept of identifying a pattern and the vocabulary words, term and core, work with the teacher in a small group to help them better understand the lessons concept.
- **Extension** - At the end of the lesson show the students a pattern using one of the pattern cards, and ask the students to predict what the tenth term would be in the pattern. Use several of the cards and ask the students what the 13, 15, and 17 terms would be.
- Another extension for those students who have an understanding of the concept of extending patterns, can visit the math website [Patterns in Mathematics](#)

## **Lesson 3 – Creating Patterns**

### **Preassessment –**

- Use the laminated individual cards (Teacher Resource Sheet 5) from the previous lesson.
- Use the cards to create a pattern and place the cards/patterns on a pocket chart in the front of the classroom.
- Then distribute one laminated individual card (Teacher Resource Sheet 5) to each student.
- Move around the classroom and ask each student to place his or her card on the pocket chart where it belongs to extend the proper pattern.
- Once all students have placed their cards on the pocket chart, as a class the teacher and students can check the patterns and discuss them.

### **Launch –**

- The students will be working in groups to create and perform a pattern to the rest of the class.
- Divide the students into group of 6 students (about 3 groups of 6-8 students)
- Distribute the directions for the activity using Student Resource Sheet 5.
- Explain the directions of the activity to the students: They should have up to 3 terms in the core and the core should repeat at least 2 times.
- The group can dance, sing, or do movements to create their pattern.
- Give the students time to think of their pattern and practice together.
- Once all the groups are ready, they will take turns performing their pattern to the rest of the class. Each group will have a turn to perform.
- The other students will be trying to guess the pattern.

### **Teacher Facilitation –**

- Divide the students into groups of four.
- Provide each group with a piece of 6 X 24 poster board.
- The students will use their own school supplies (scissors, glue, pencils, and crayons) to create a pattern as an entire group.
- Tell each group the kind of pattern to create (Group #1-AB pattern, Group #2 –ABC pattern, Group #3 –AAB pattern, Group #4 – ABCD pattern, Group #5 – ABB pattern)
- Once they have their pattern laid out on the poster board, they will use tape to tape the objects down.
- When all the groups are finished, they will then share the patterns that they created with the rest of the class.
- The teacher will ask the rest of the class questions such as: “What kind of pattern did the group create?” “What is the core of the pattern?” “How

many terms are in the core?” “How many times does the core repeat?”  
“What would come next to extend the pattern?”

- Students will share their answers and discuss them as a class.

### **Student Application –**

- Students will use clip art picture (Student Resource Sheet 4) to create their own pattern on a strip of paper.
- Give a strip of 6 X 18 piece of paper to each student.
- The students will also receive a worksheet with pictures (Student Resource Sheet 4) of school supplies.
- The students will color and cut out the pictures and then use them to create a pattern on their paper.
- The students should create a pattern with up to 4 terms and should repeat at least 3 times.
- Have the students glue the pictures onto their paper.
- After all the students are finished working on their pattern, have them share their patterns with the class.
- The students will orally ask the class a question about their pattern, and the class will answer their question. (Example questions – “What would come next in my pattern?” “How many terms are in the core?” “How many times does the core repeat?”)

### **Embedded Assessment –**

- Observe students as they are answering questions and evaluate them on whether or not they were able to create a pattern.

### **Reteaching/Extension –**

- **Reteaching** – Work with those students who are still having difficulty understanding the concept of creating a pattern in a small group to help them better understand the lessons concept.
- **Extension** – As an extension for the concept creating a pattern, the class will be divided into 6 groups. Each group will receive 1 set of 4 cards (Student Resource Sheet 6 # a - f) with directions on each card for creating a pattern. The students will read and follow the directions on the cards and use the pattern blocks to create the pattern.
- Another extension for the lesson on creating patterns is to have the students work with a partner to play Guess the Pattern Game. The teacher can use the provided Guess the Pattern Game Directions (Teacher Resource Sheet 6).

### **Summative Assessment:**

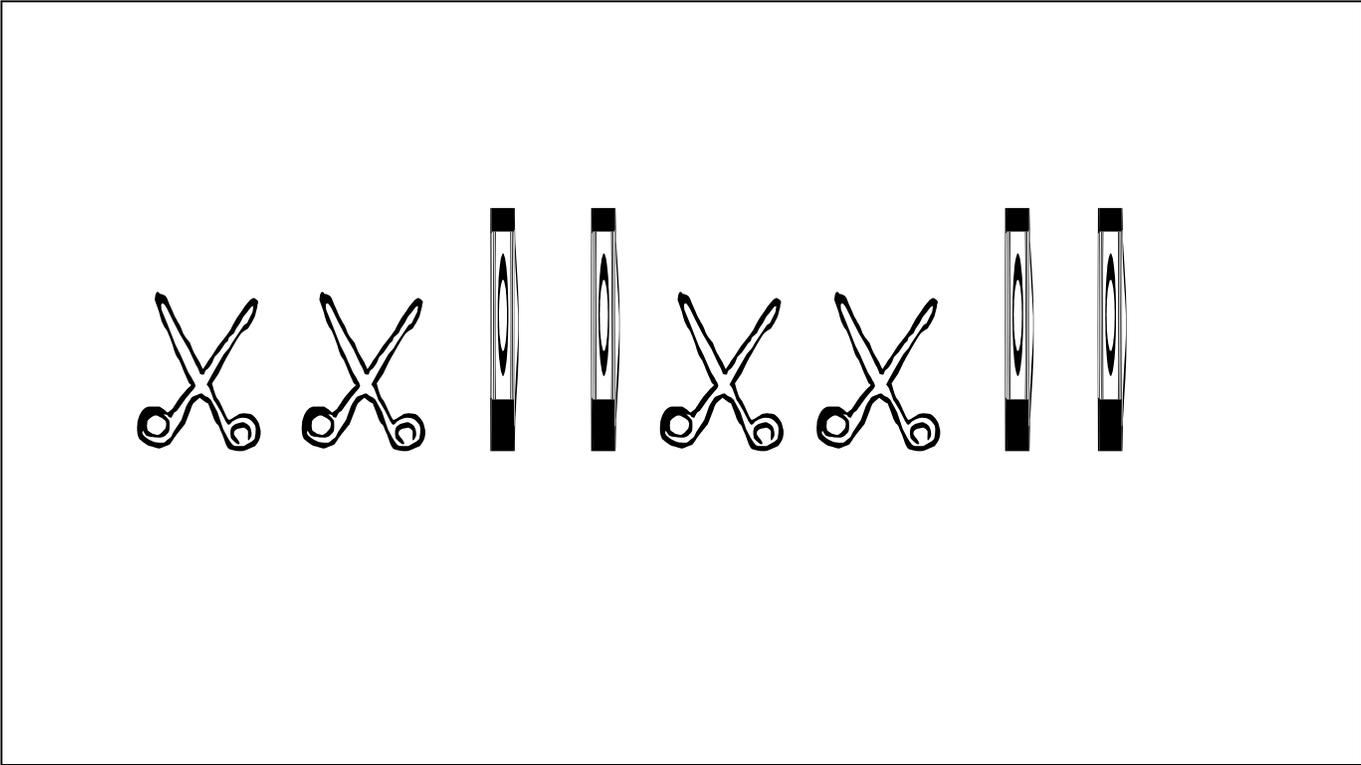
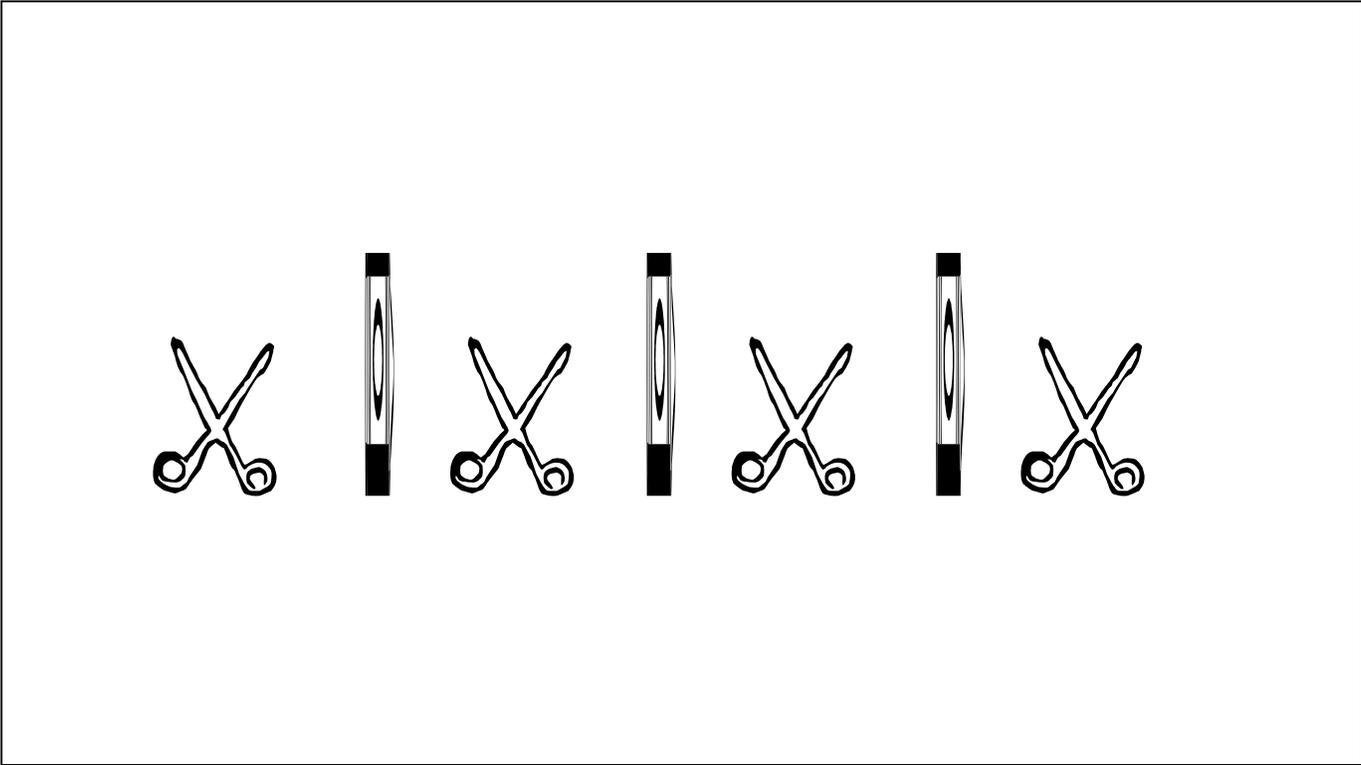
- Students will complete a Summative Assessment Pattern BCR (Student Resource Sheet 7). Answer Key is on Teacher Resource Sheets 7 & 8.
- Students will correctly extend the pattern.
- Students will use symbolic representation of the pattern to identify and extend the pattern in written form.

**Authors:**

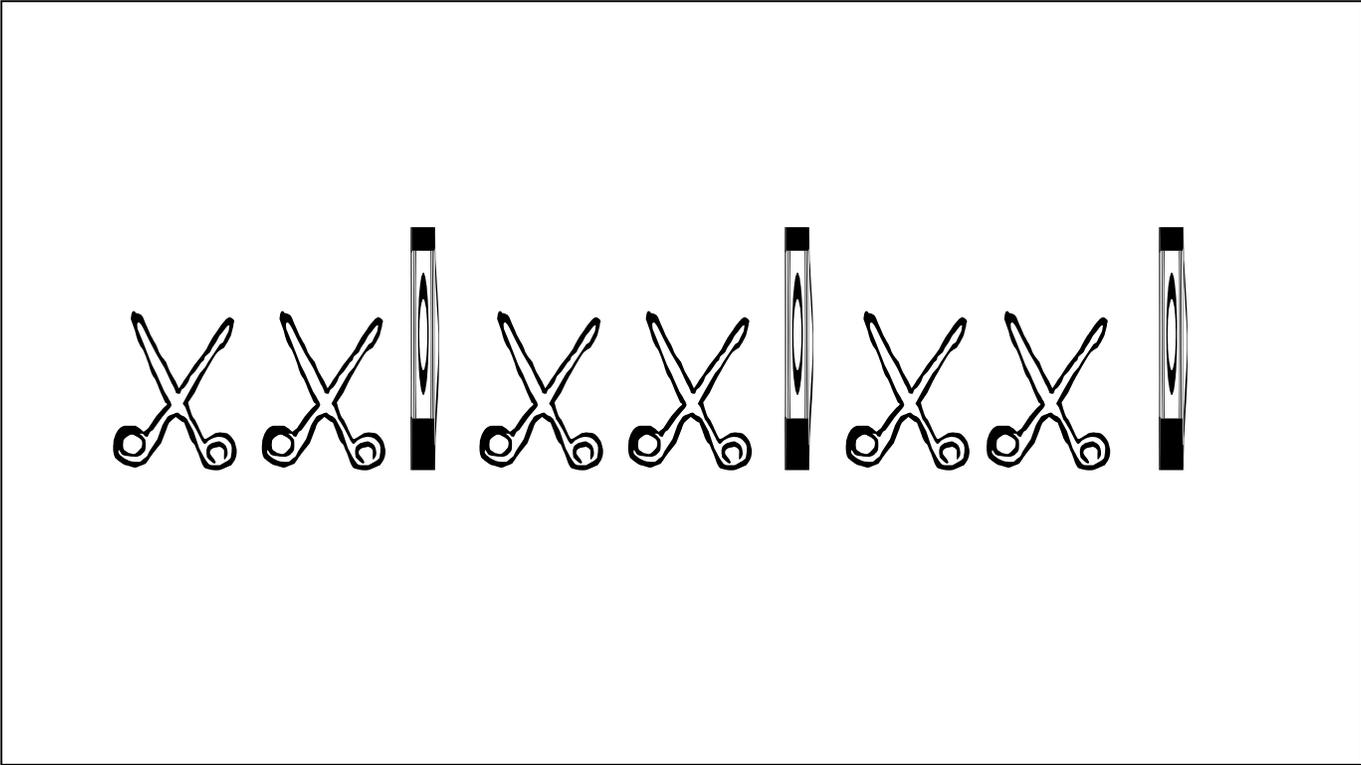
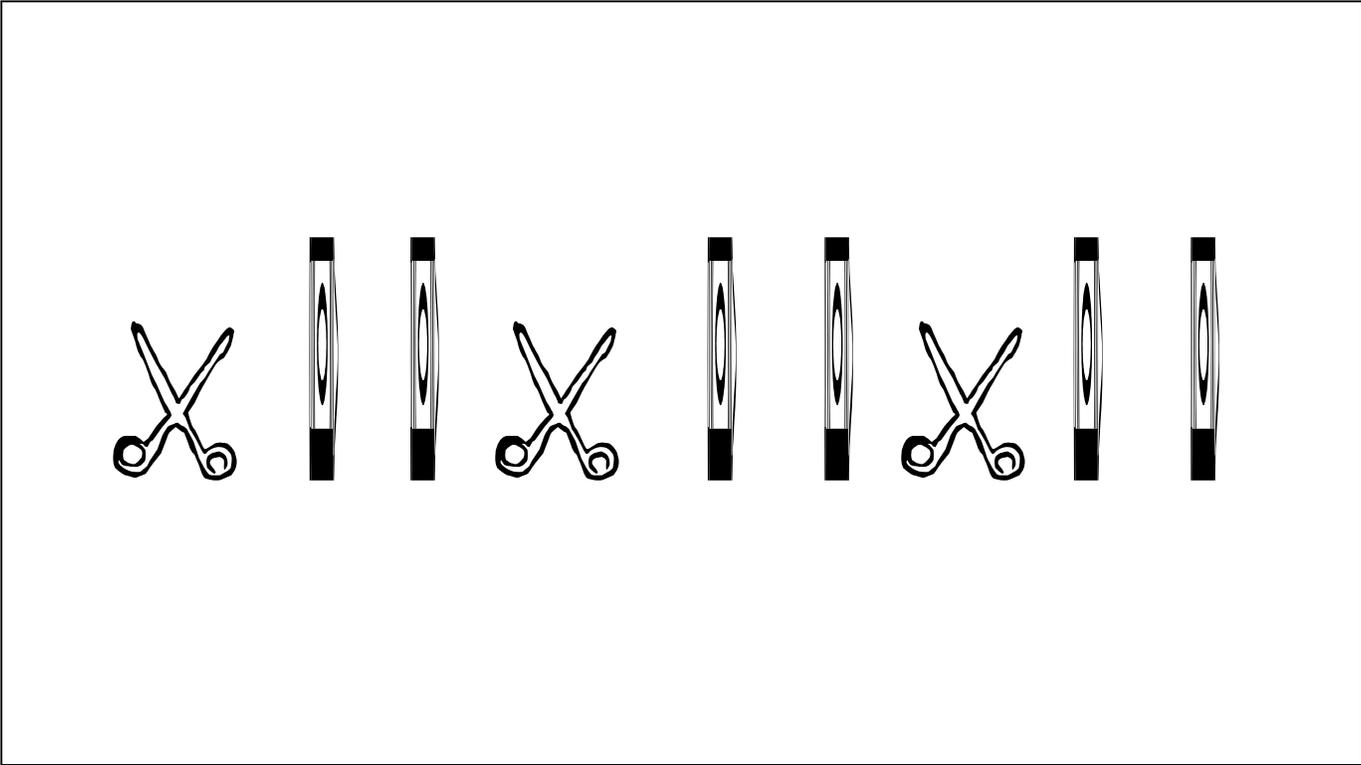
Jill Robey  
Potomac Elementary  
King George, VA

Michelle Venable  
Centerville Elementary  
Frederick, MD

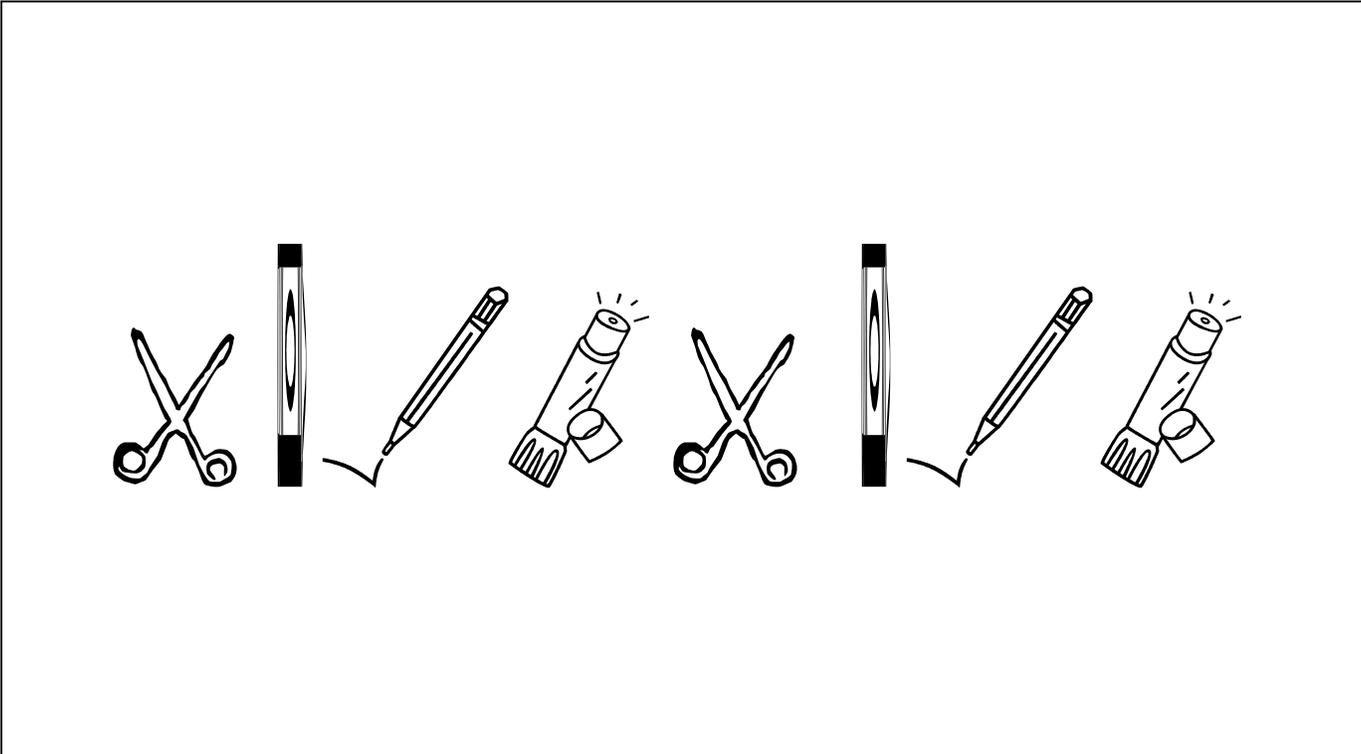
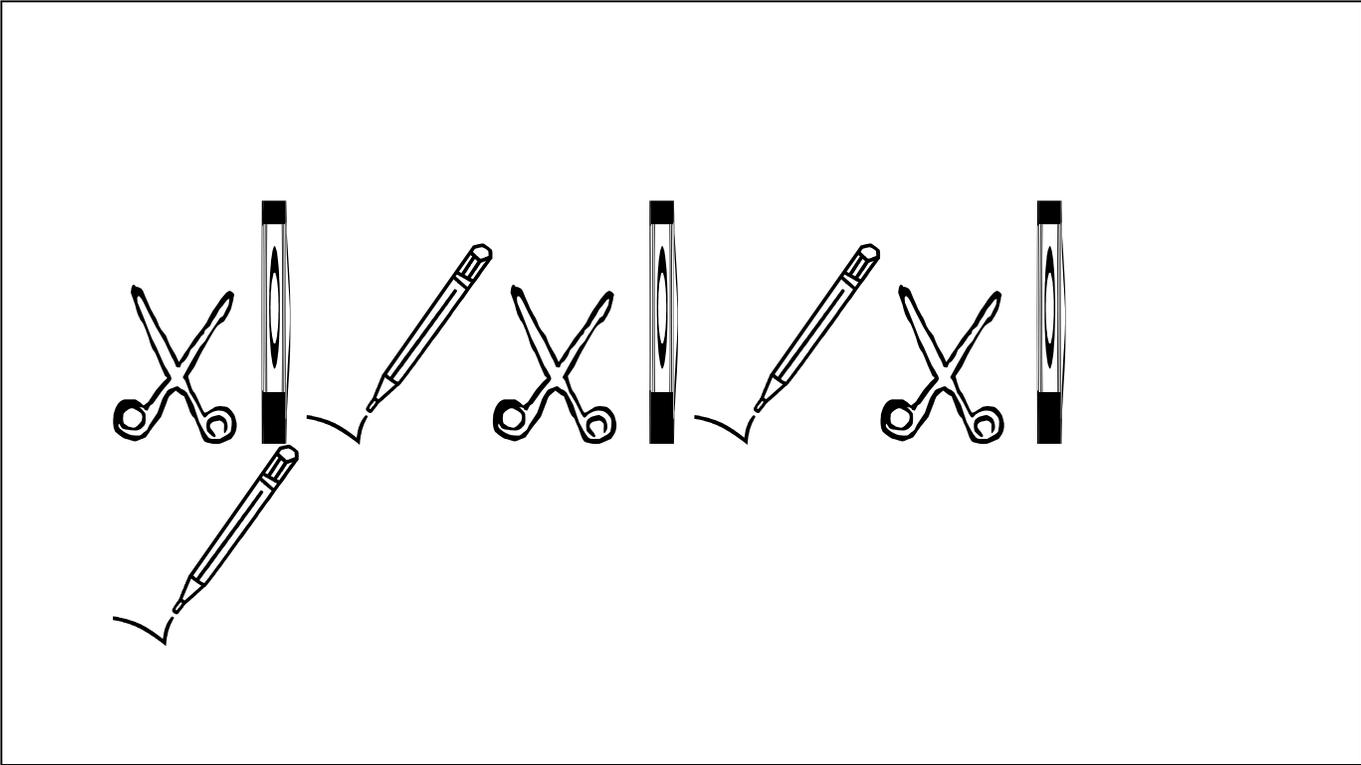
Pattern Cards



Pattern Cards

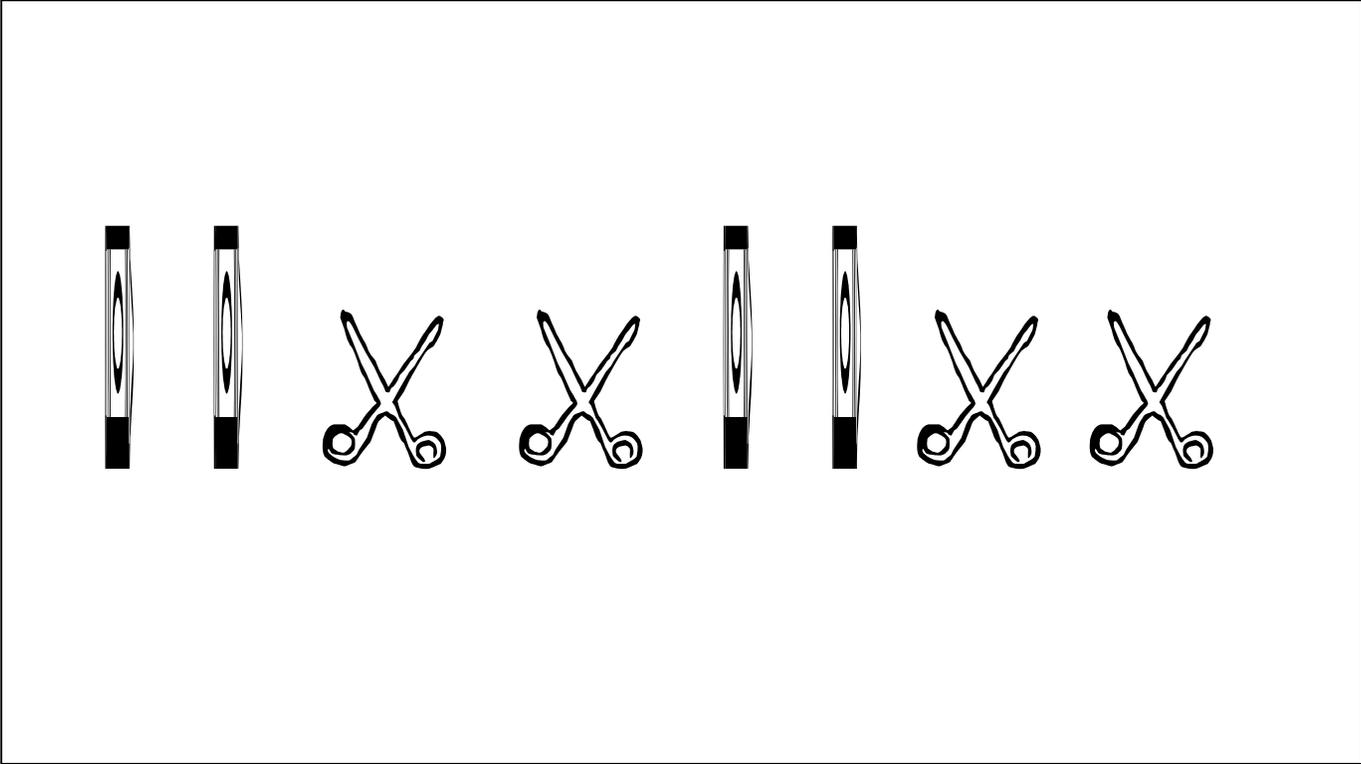
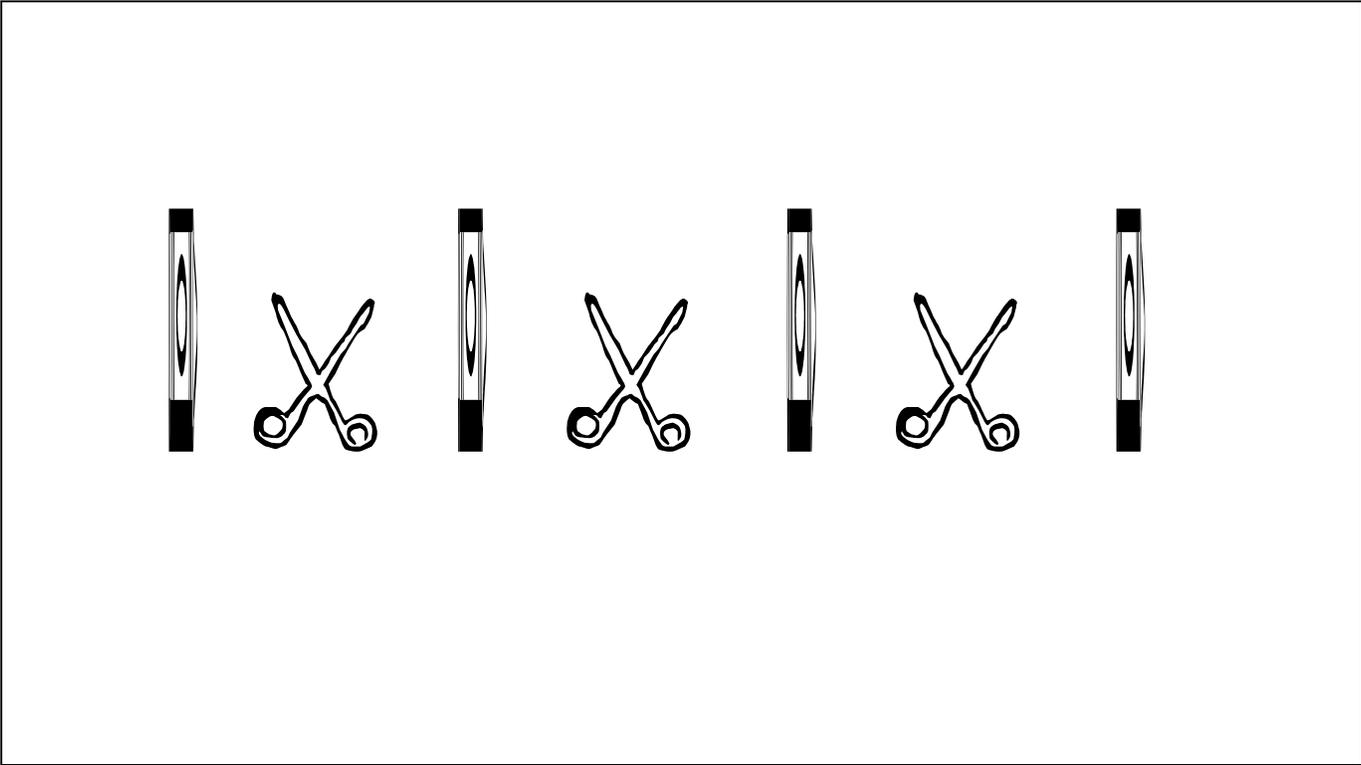


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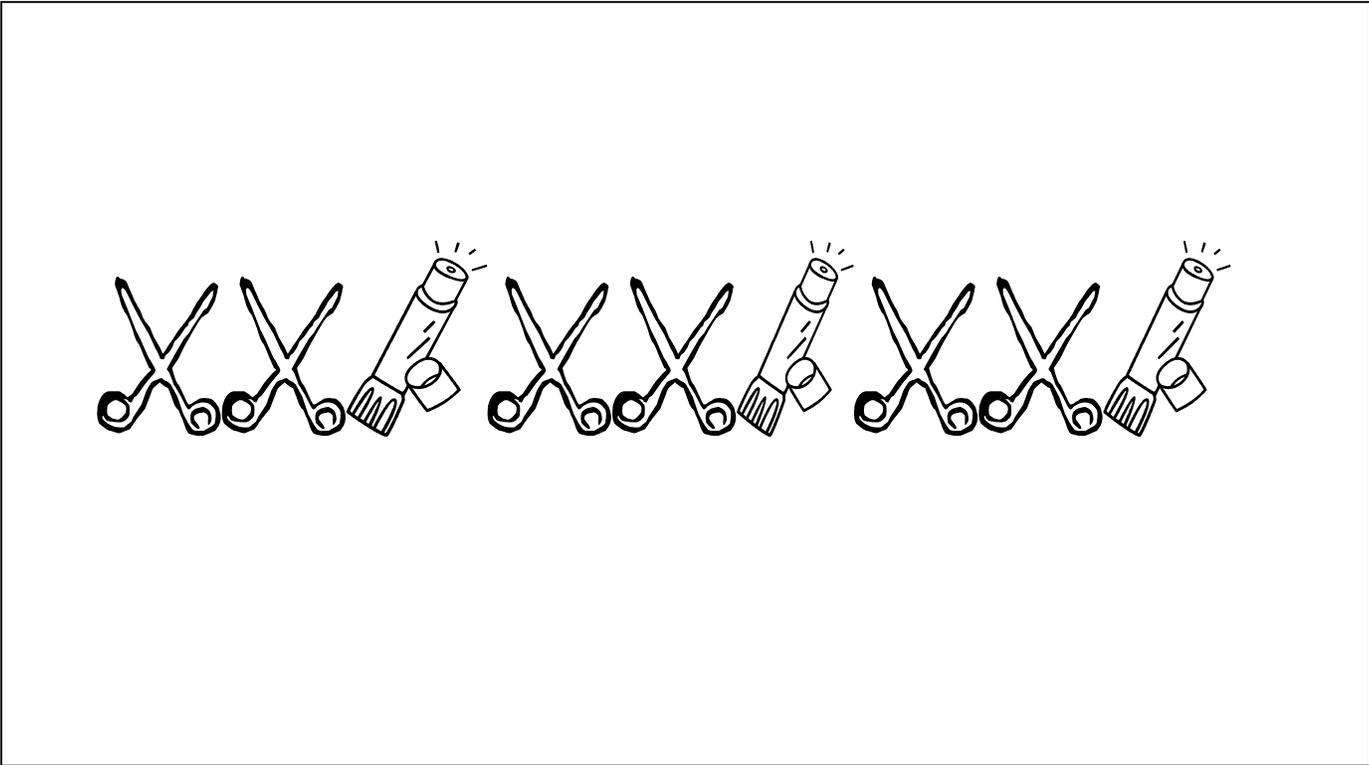
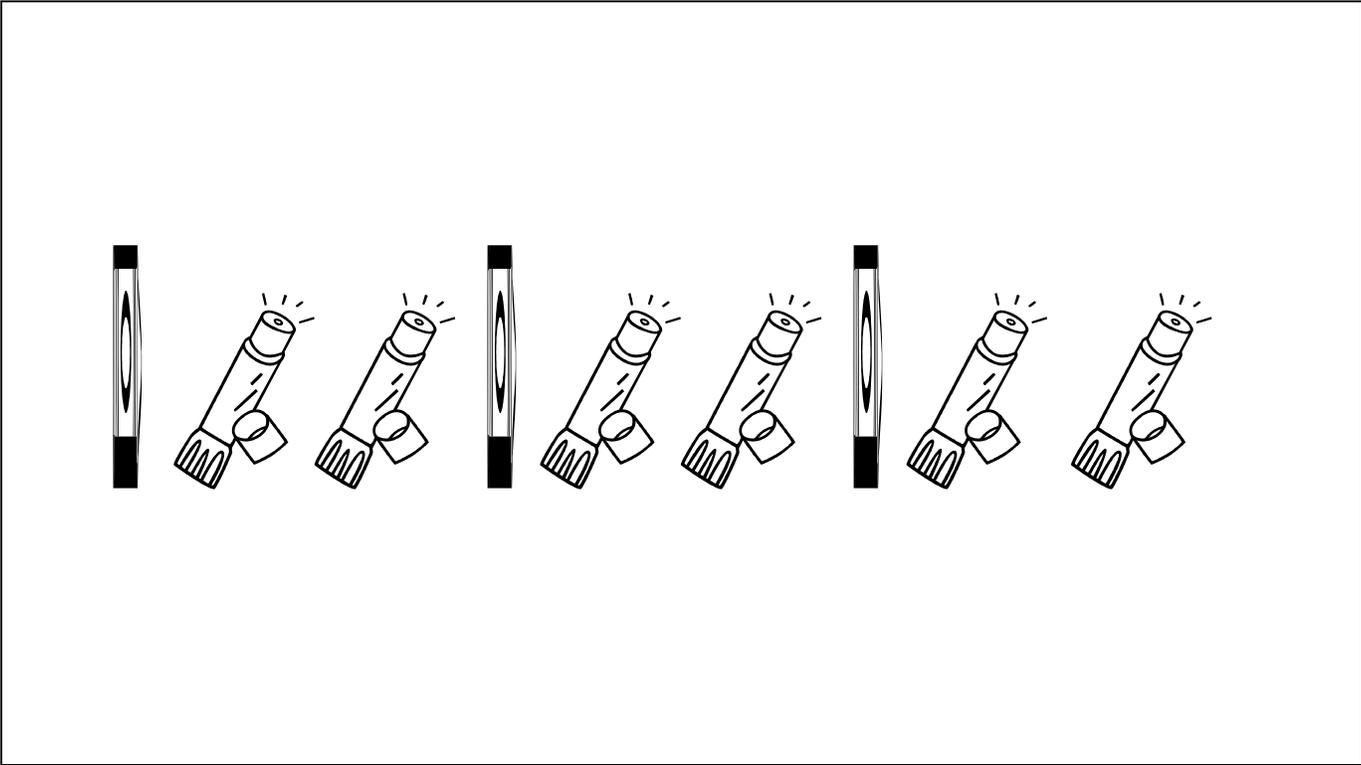




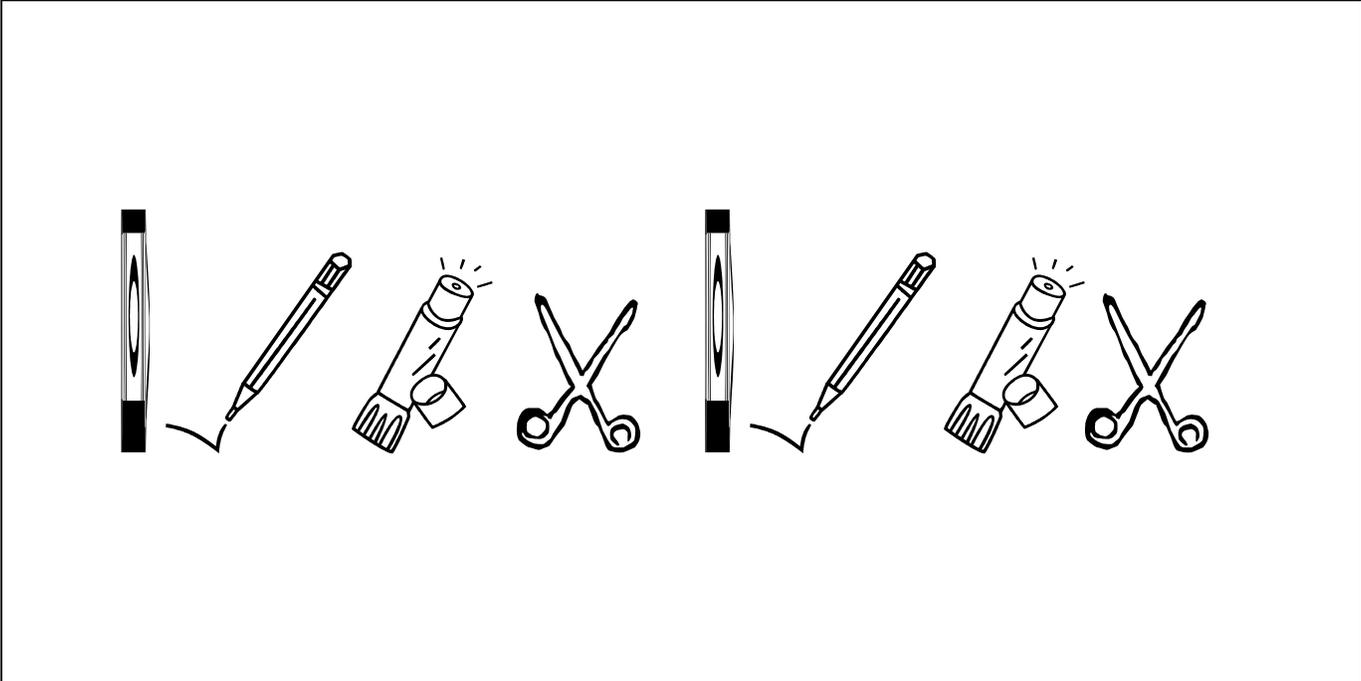
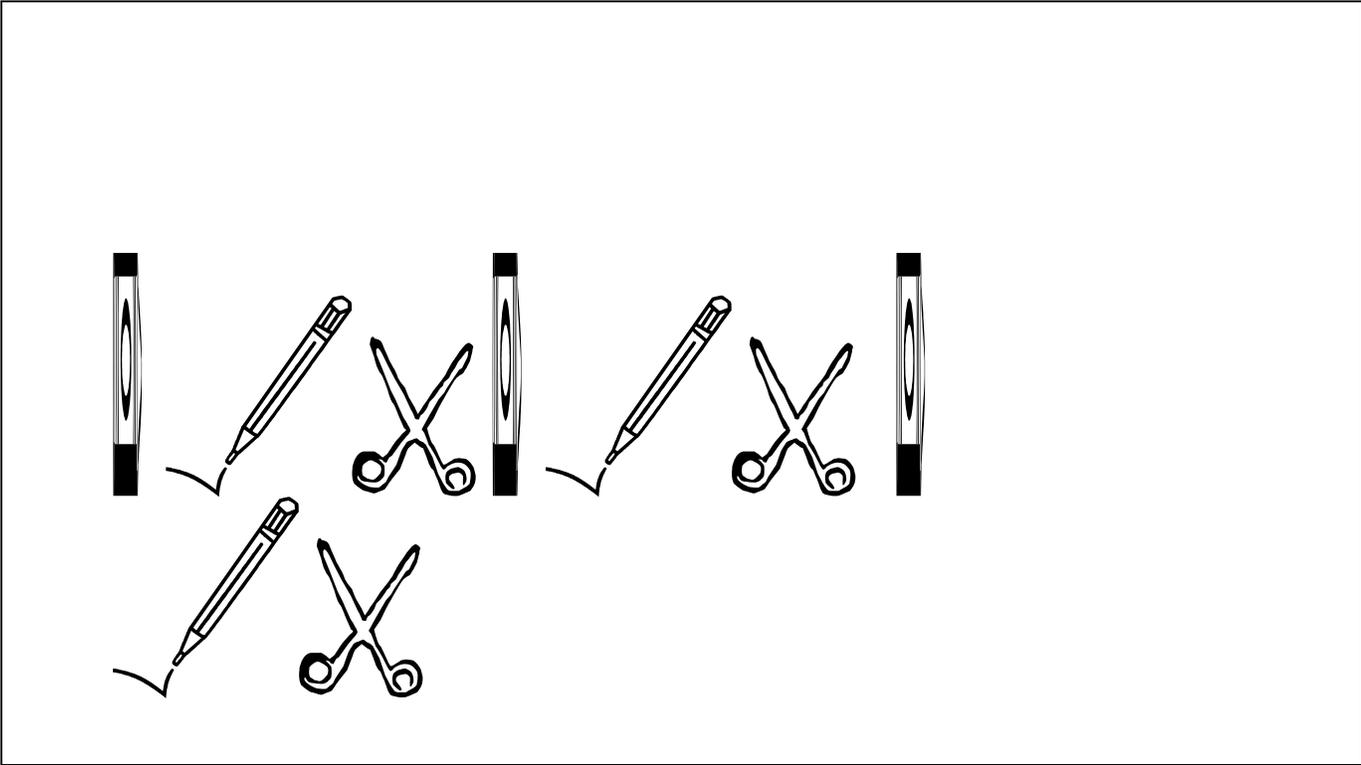
Pattern Cards



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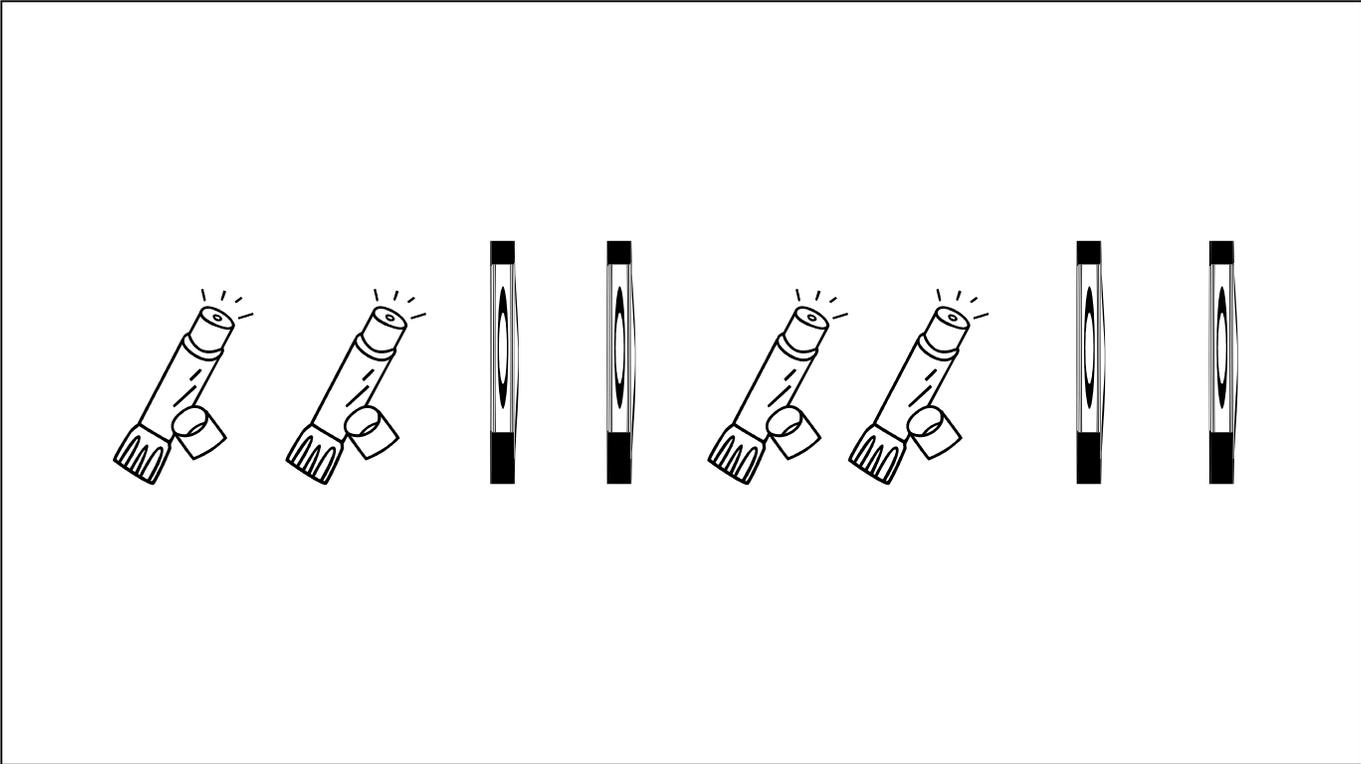
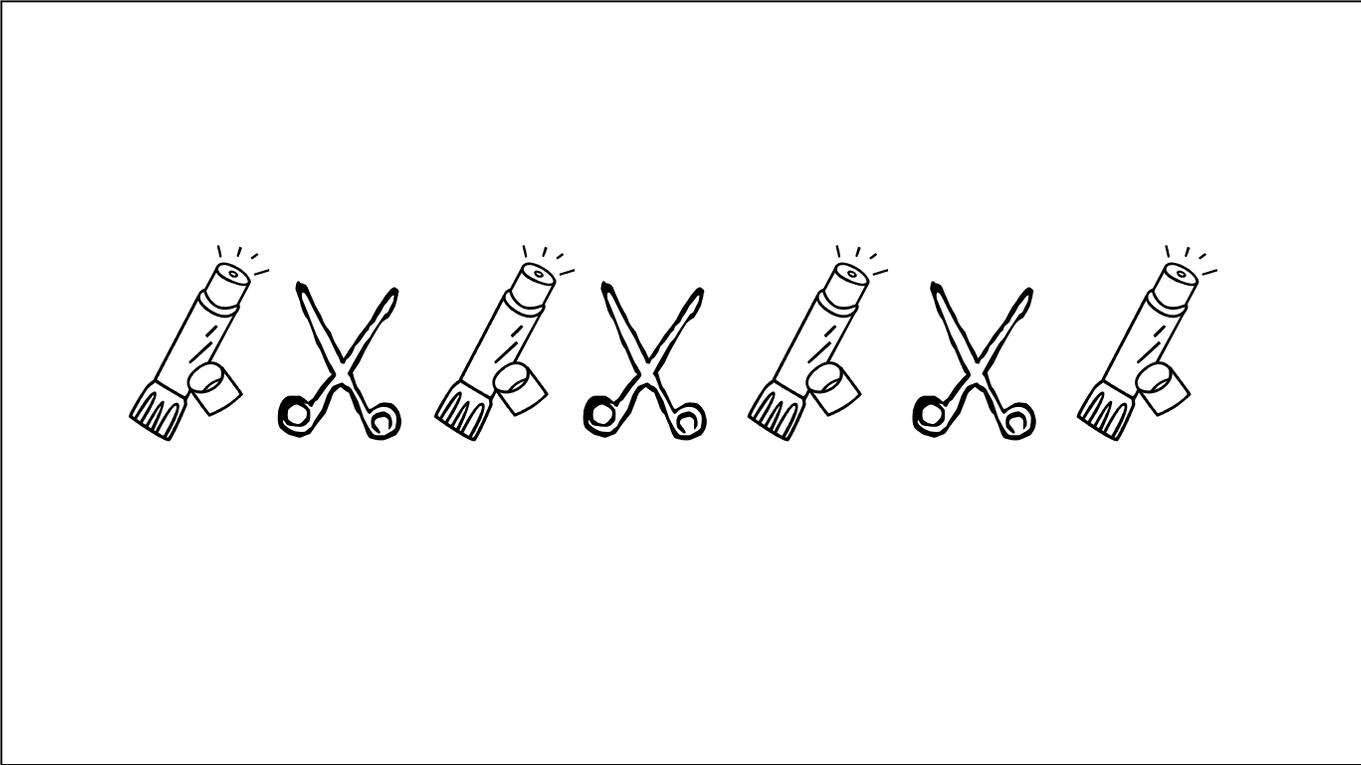


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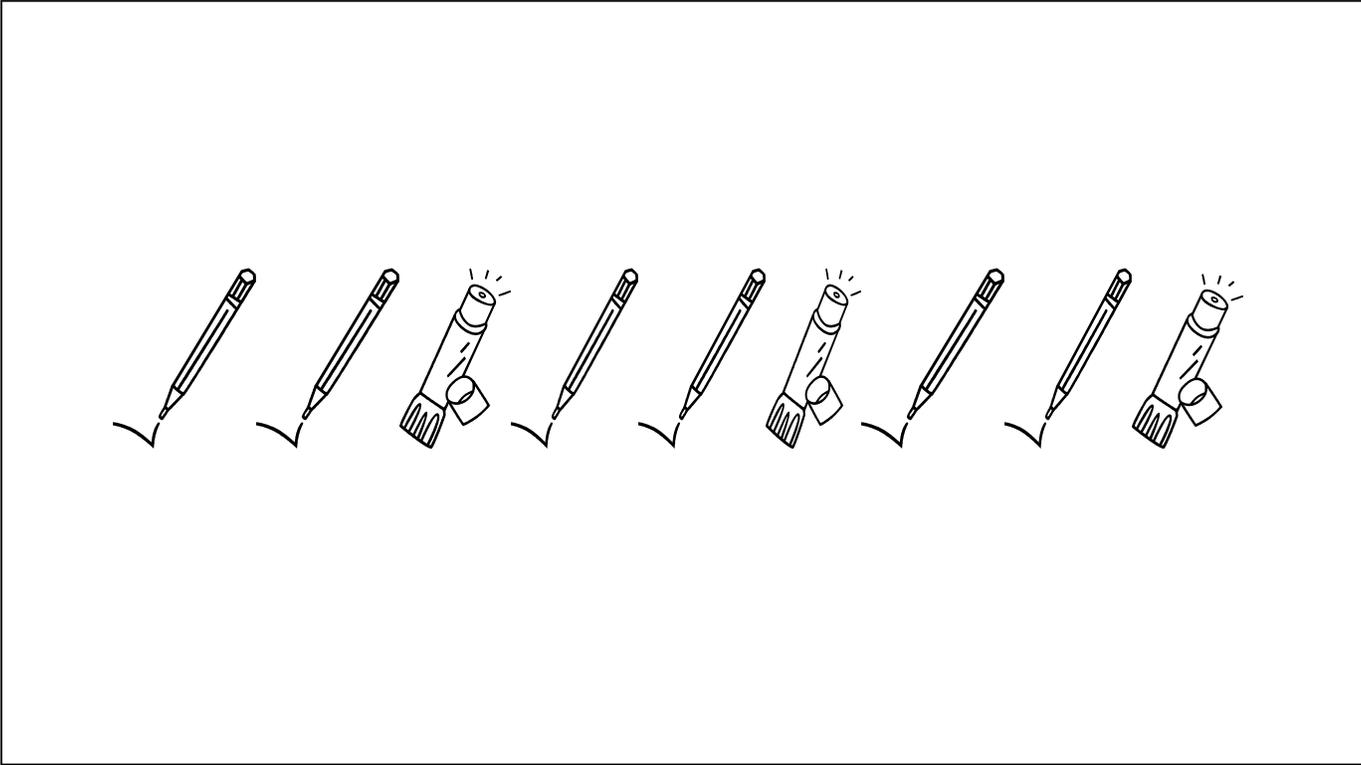
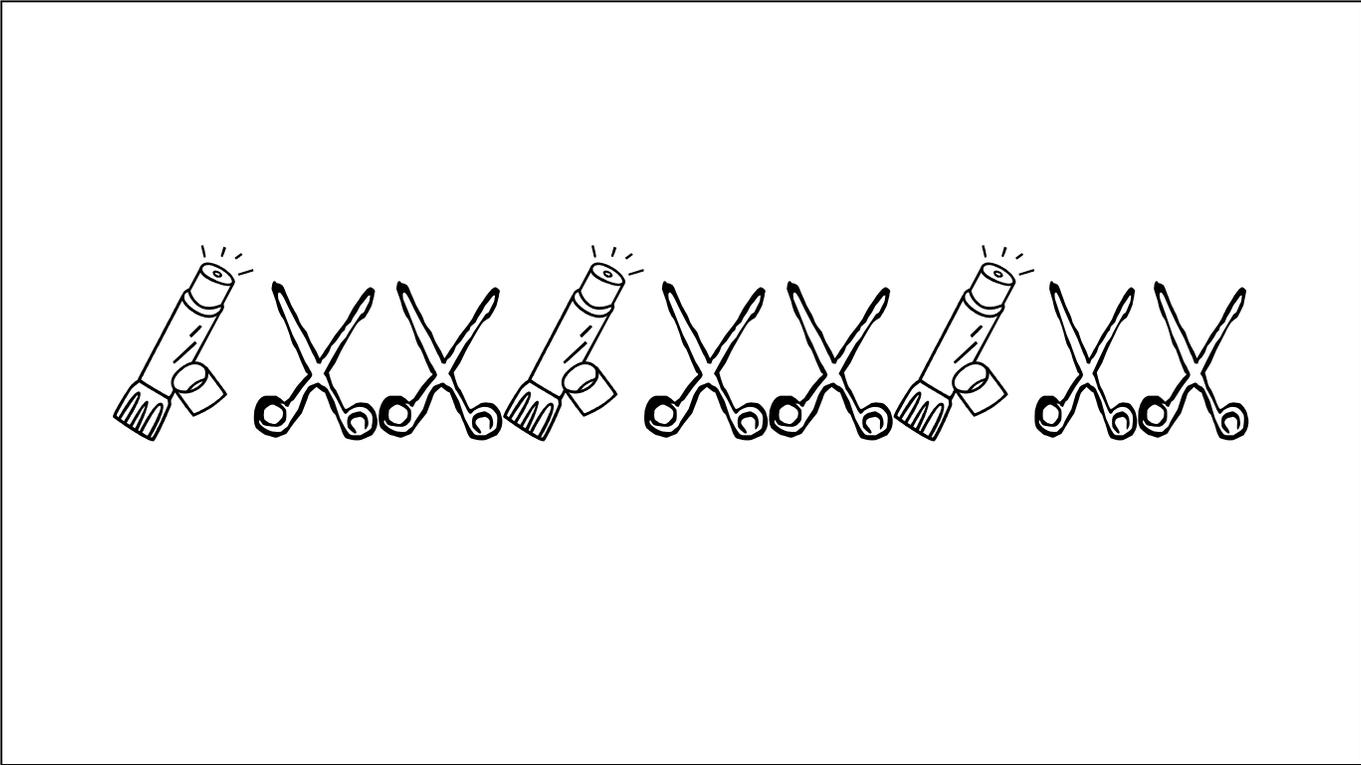




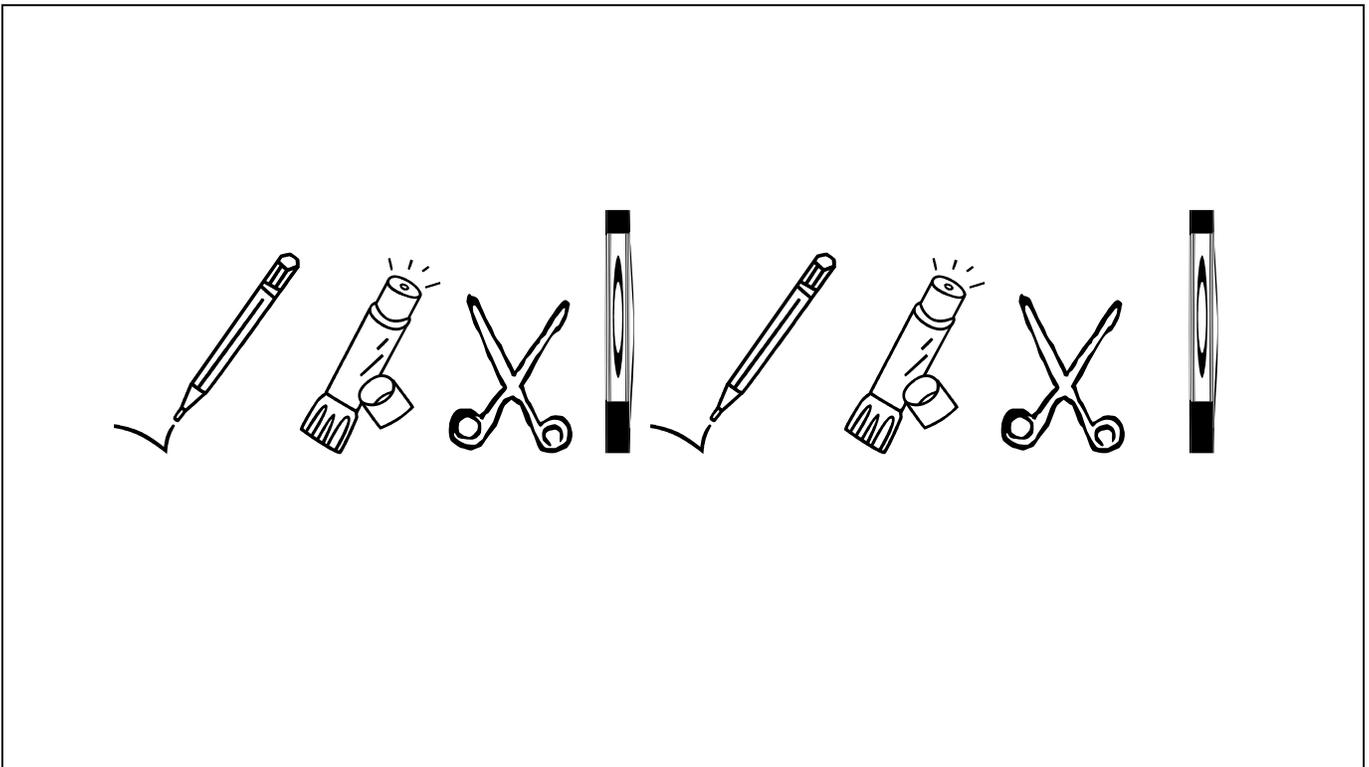
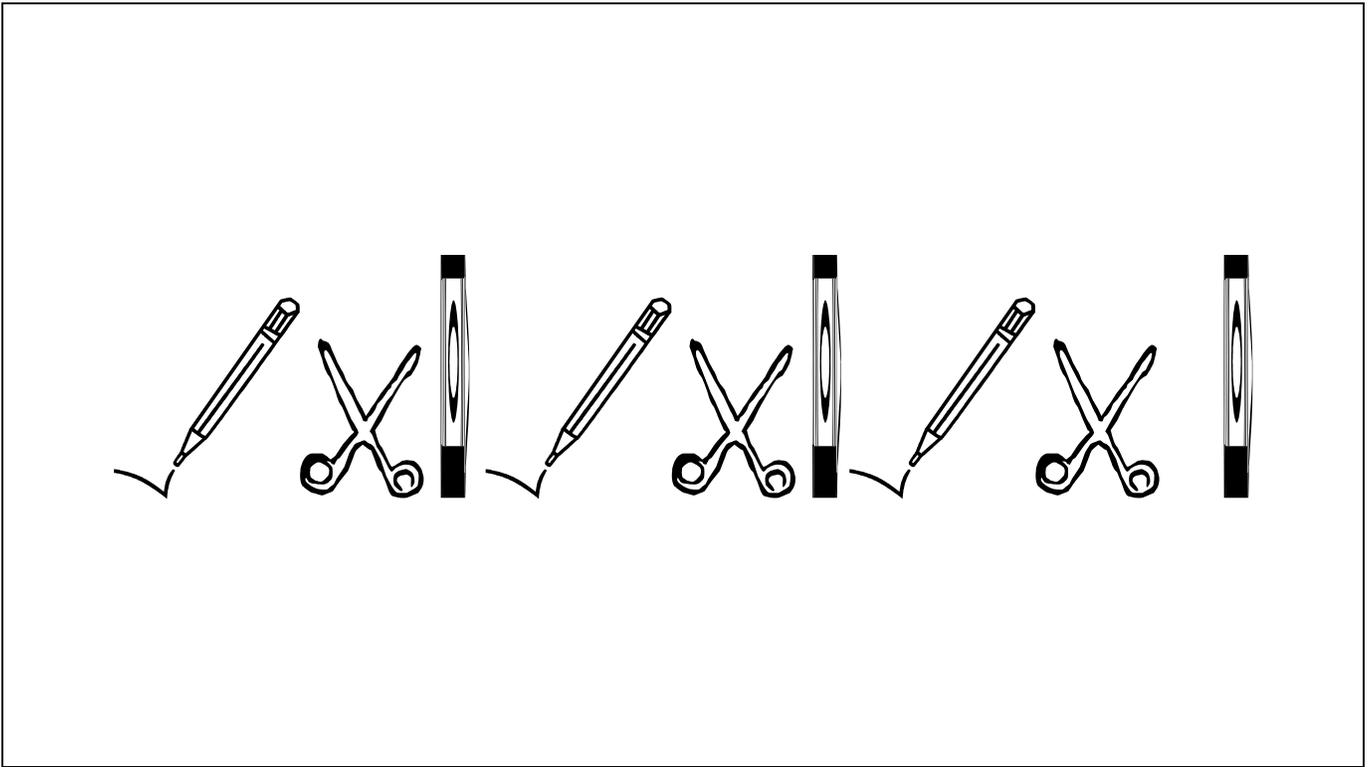
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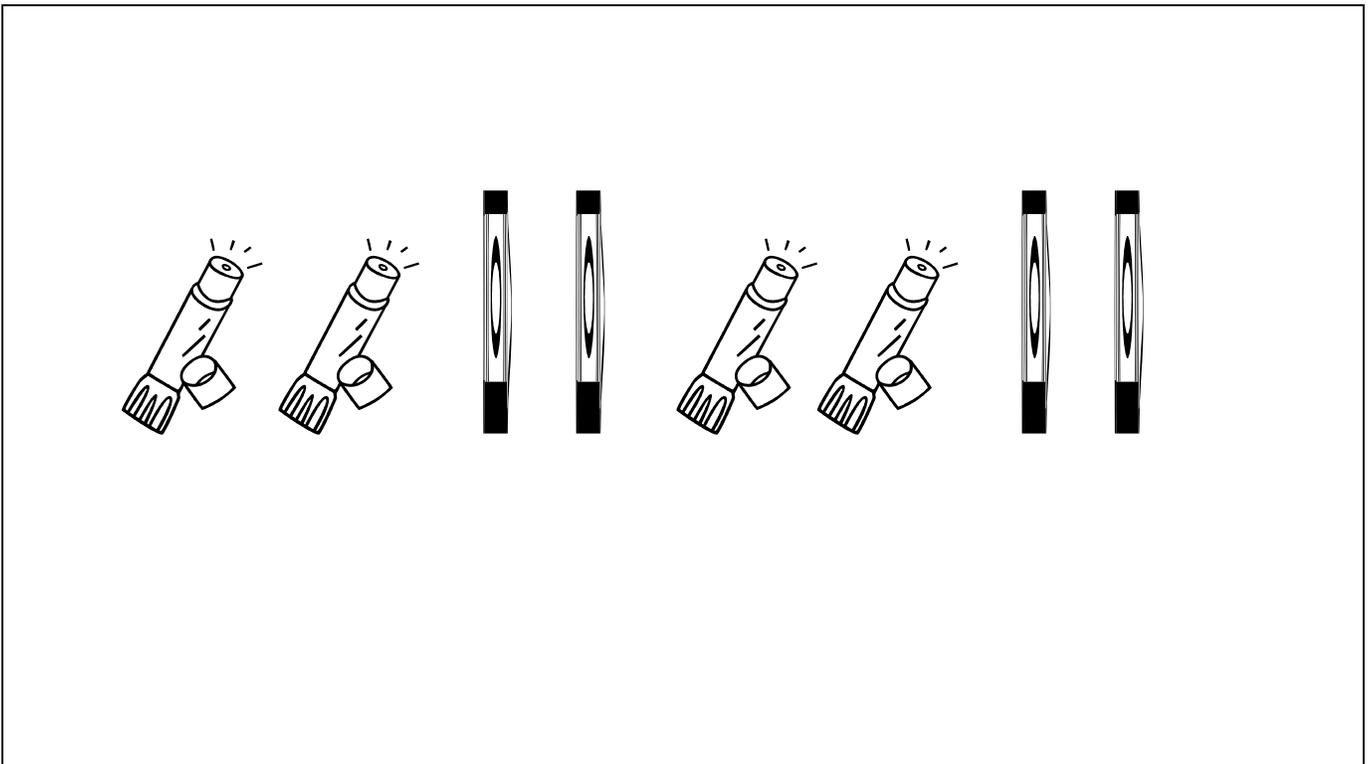
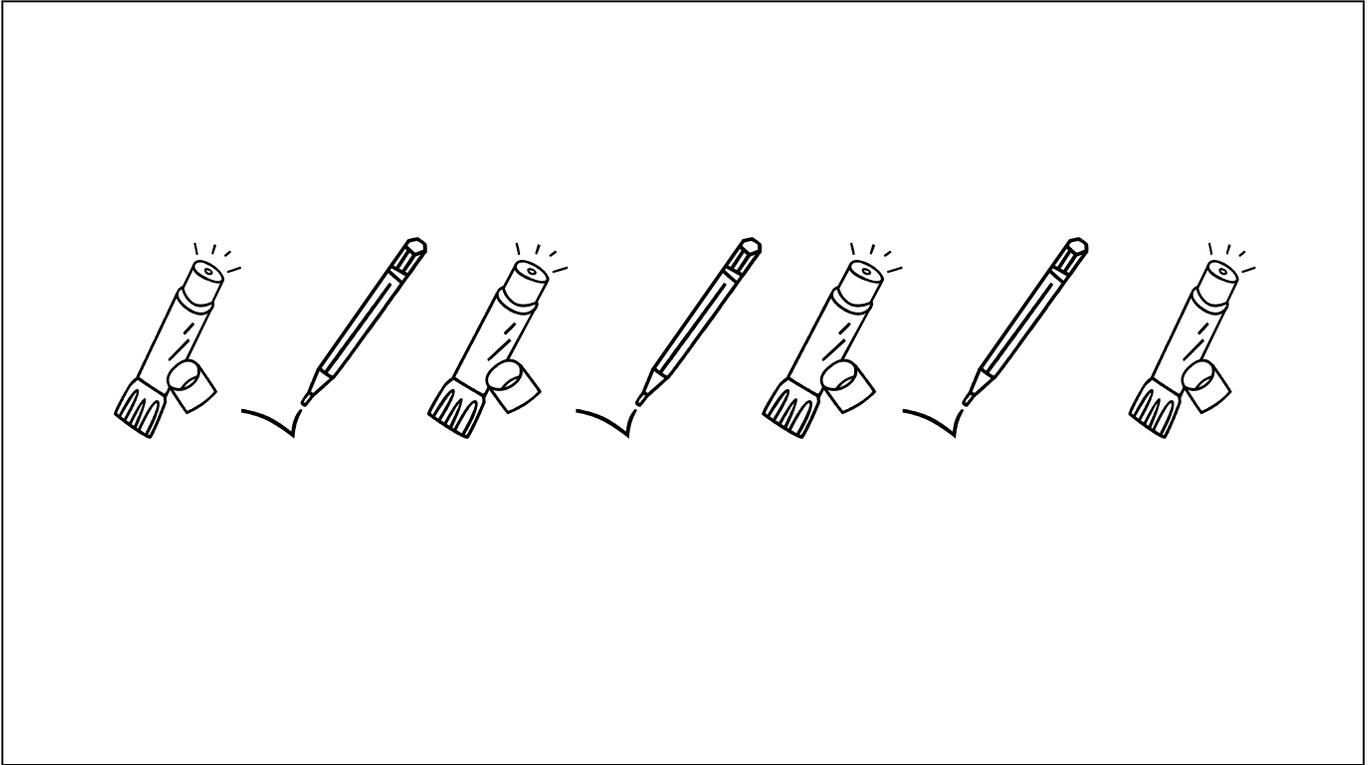
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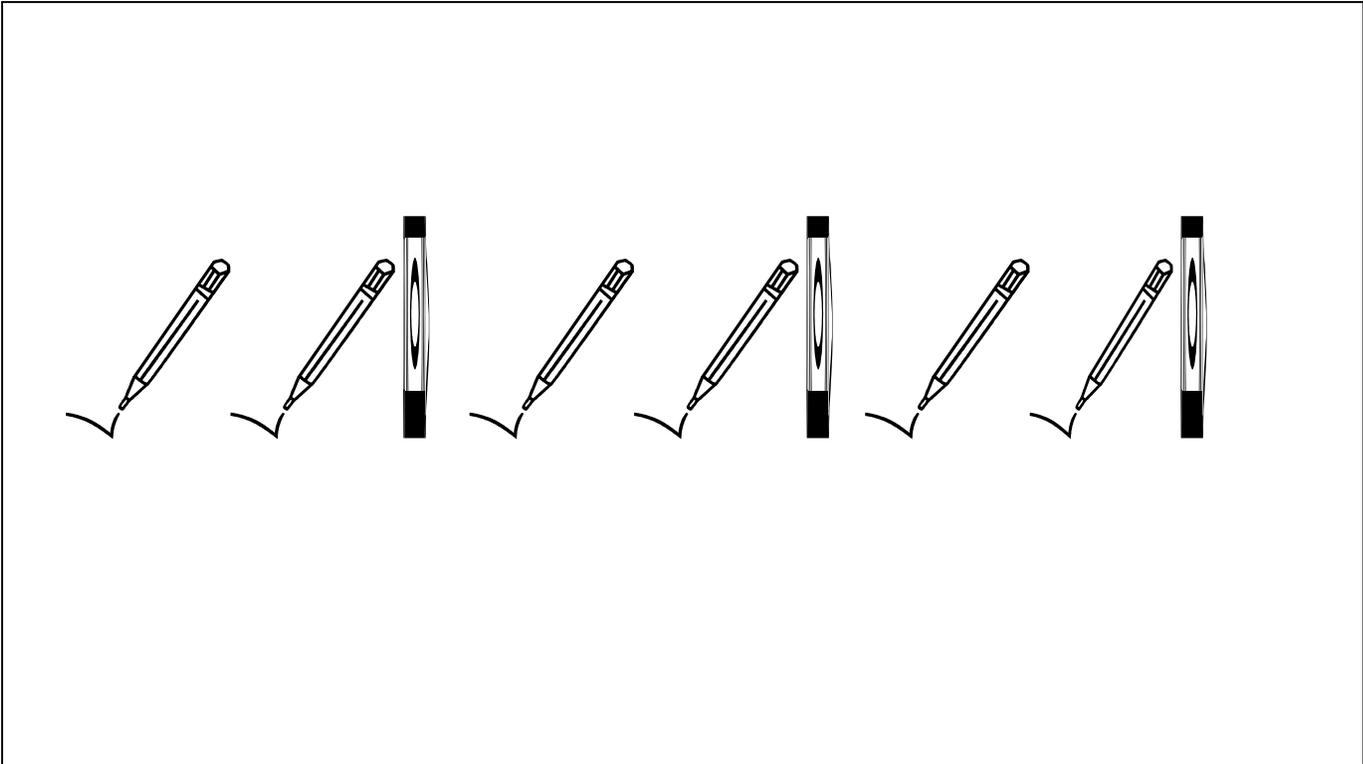
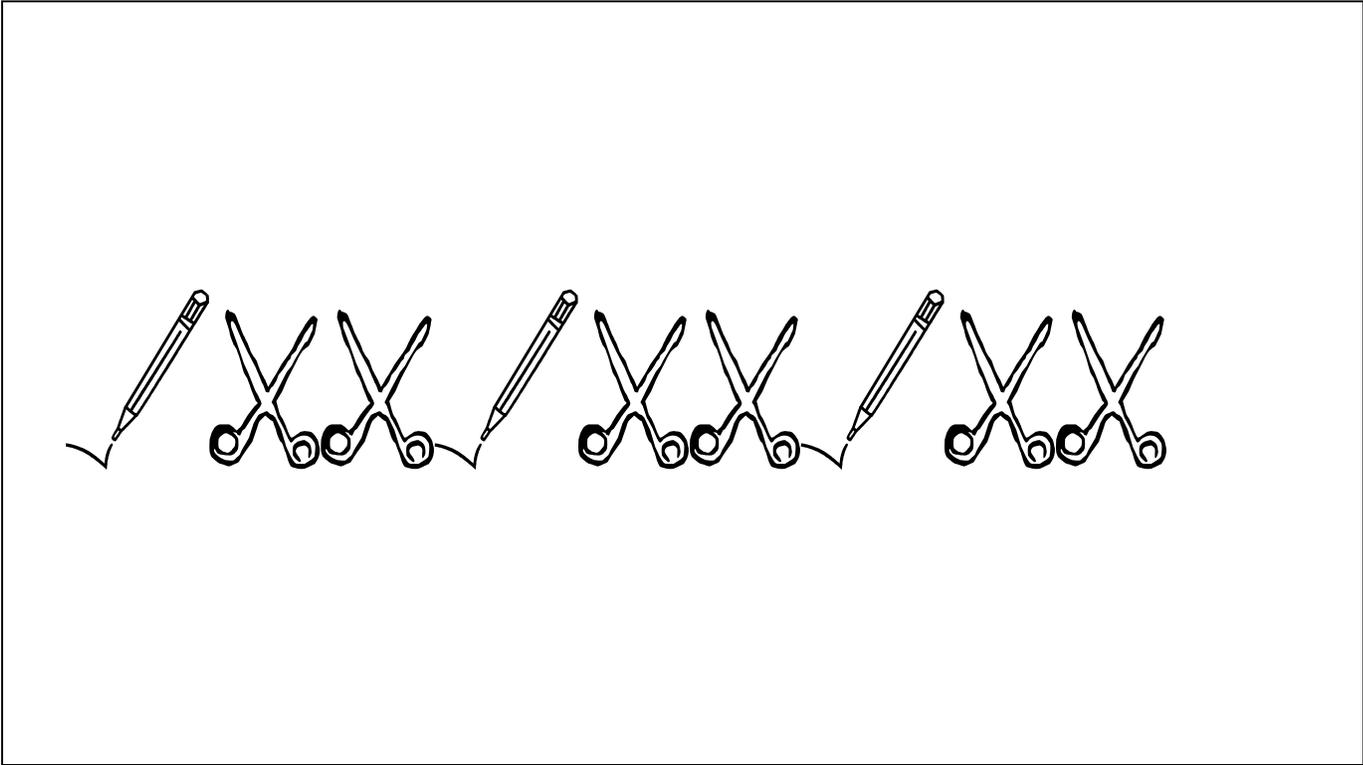
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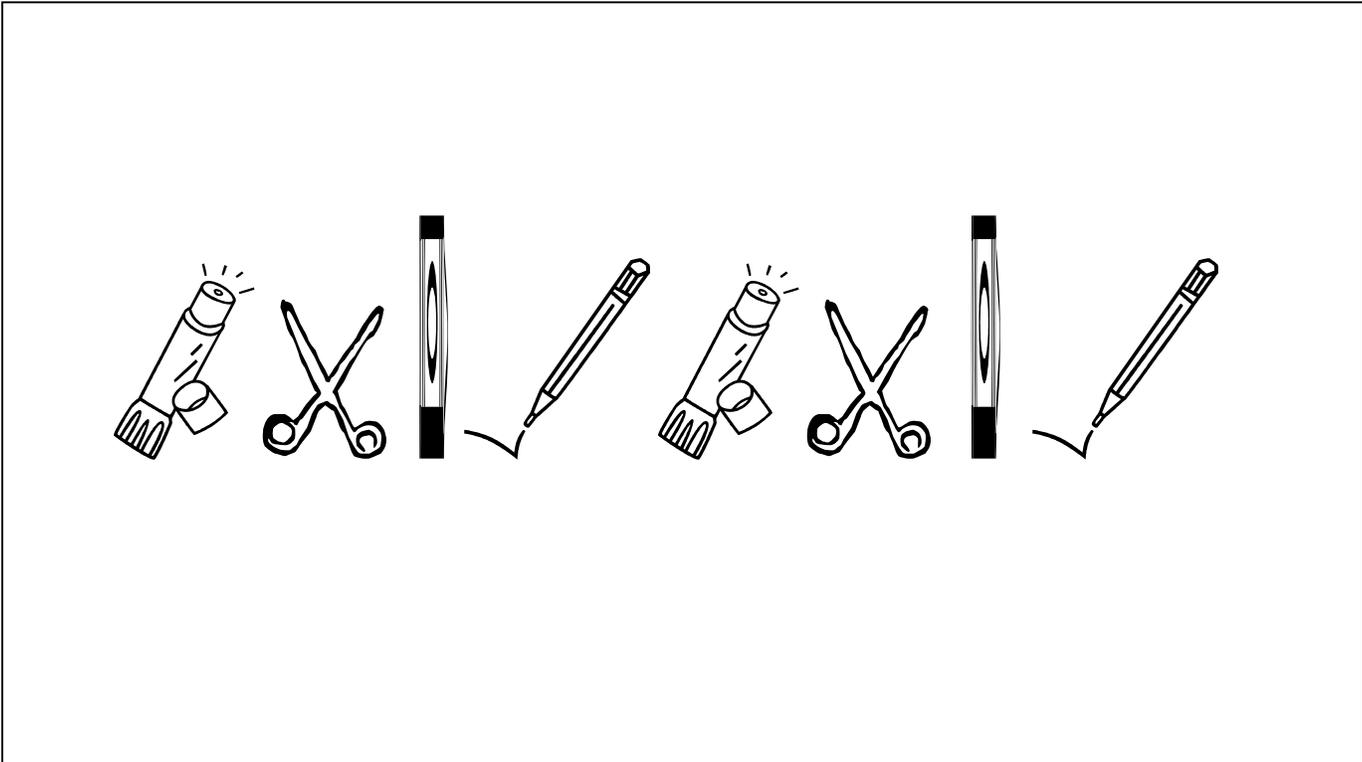
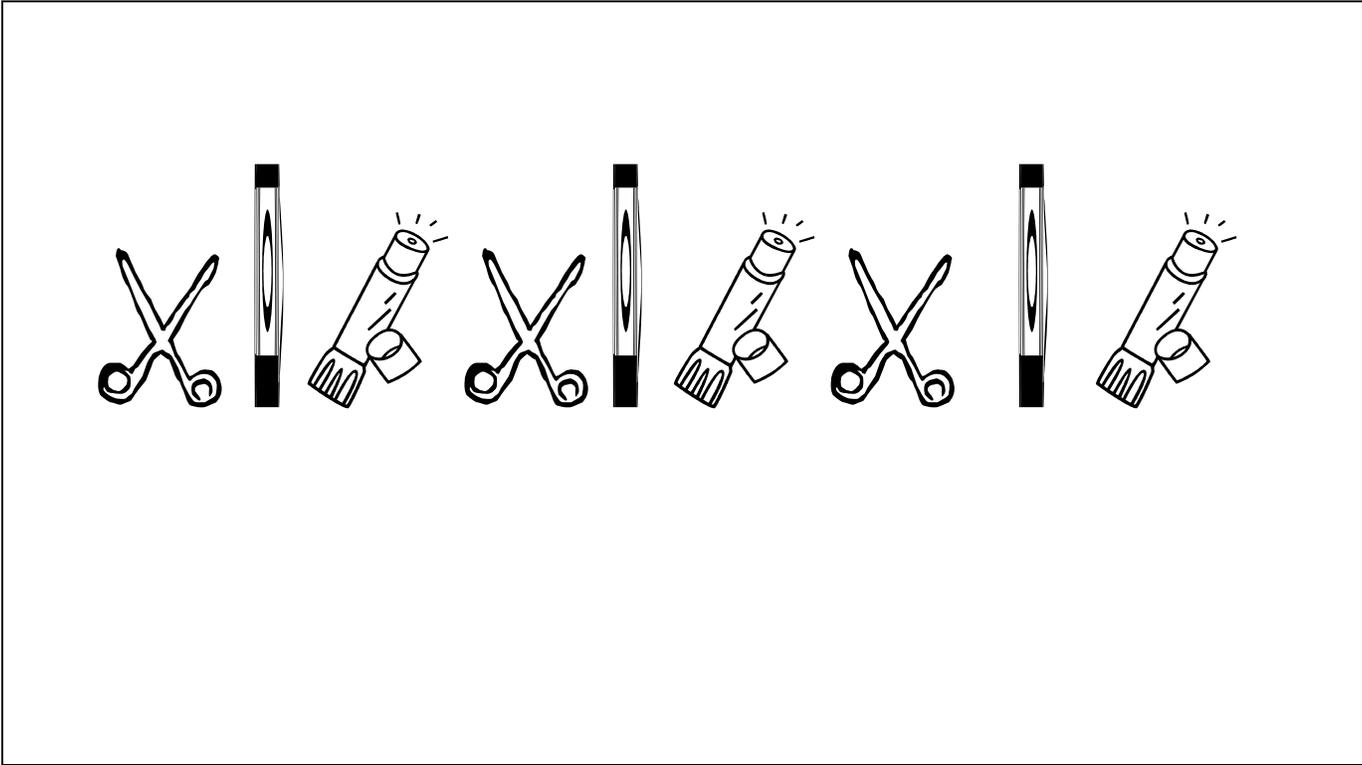
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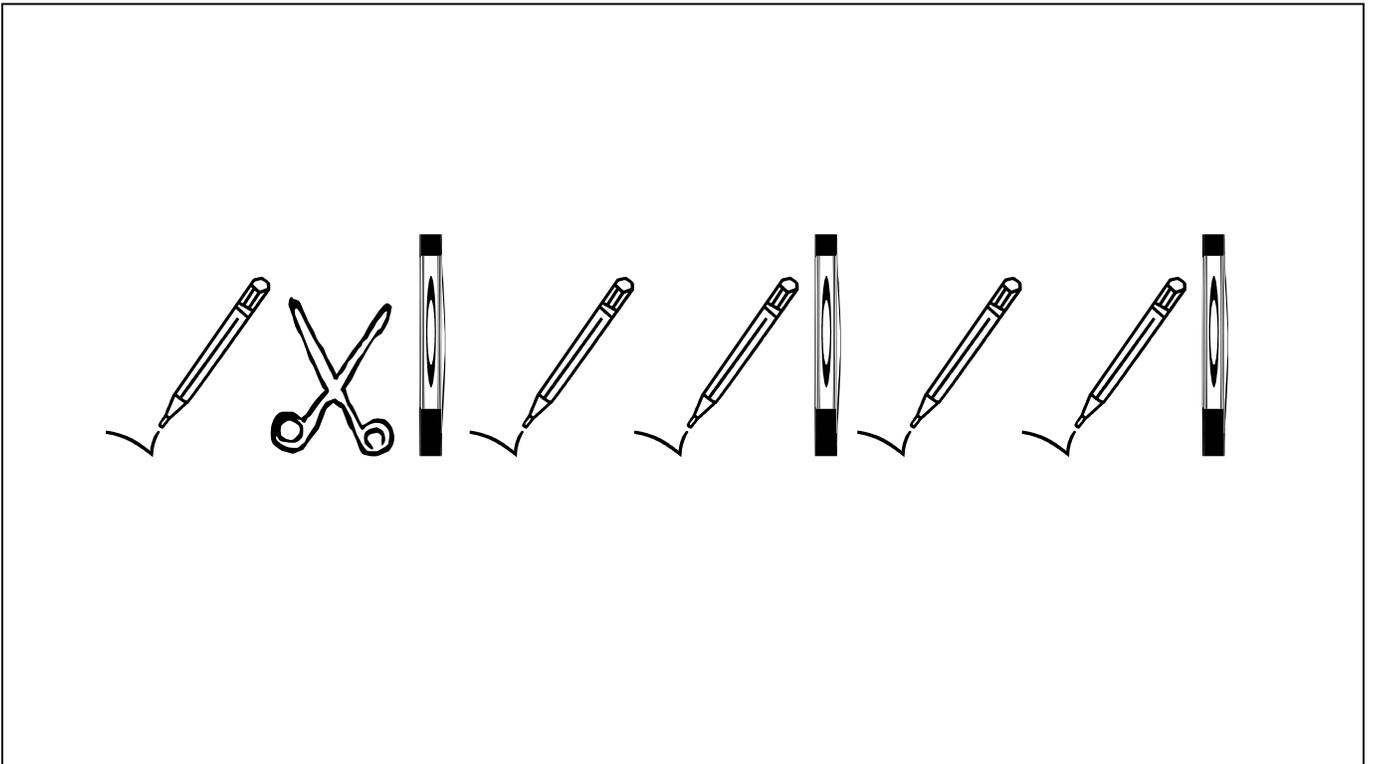
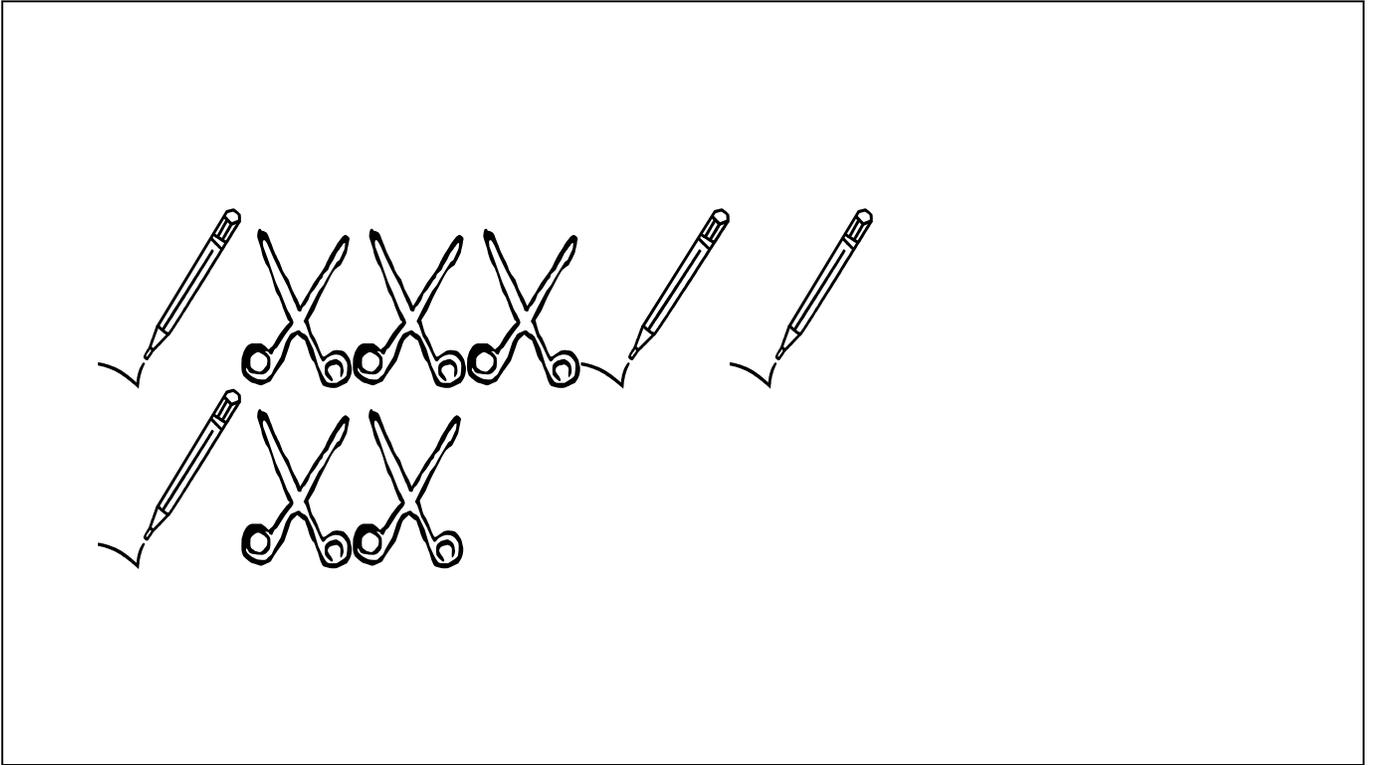
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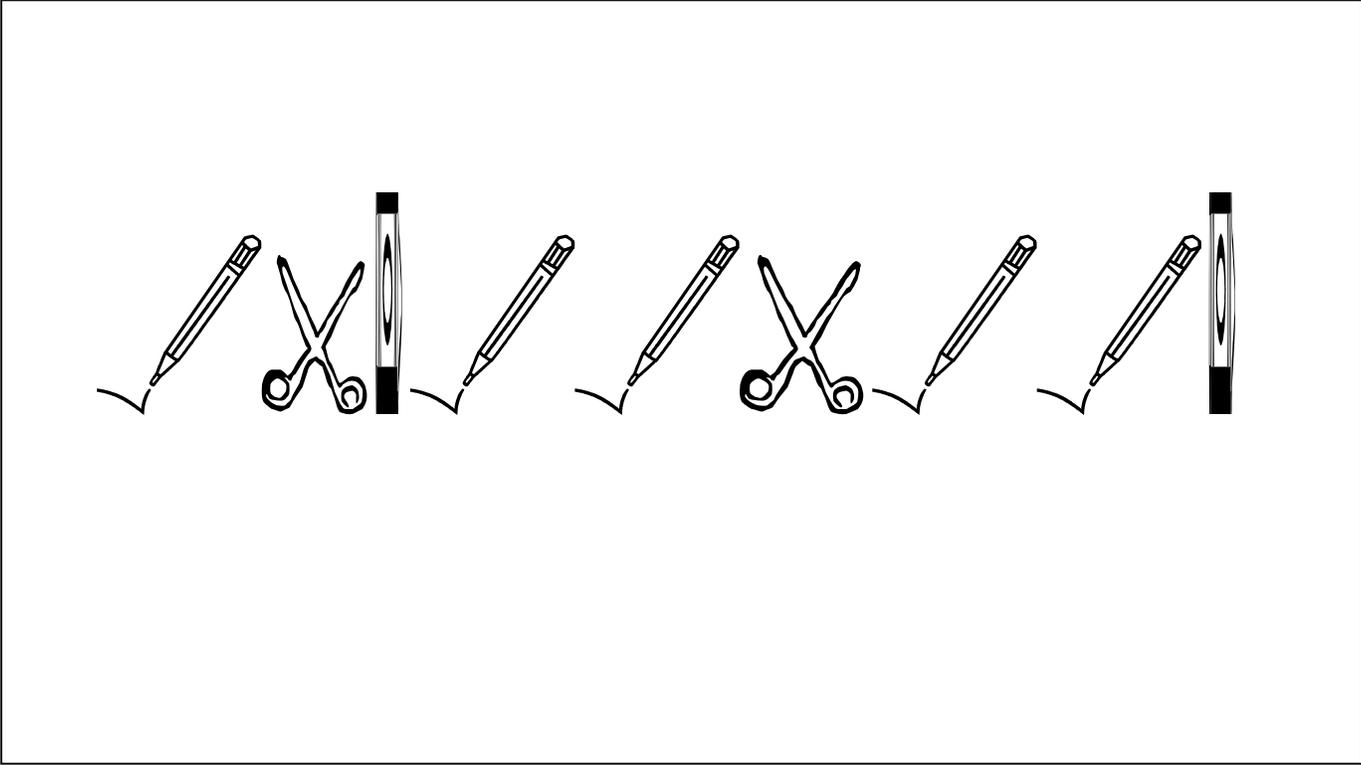
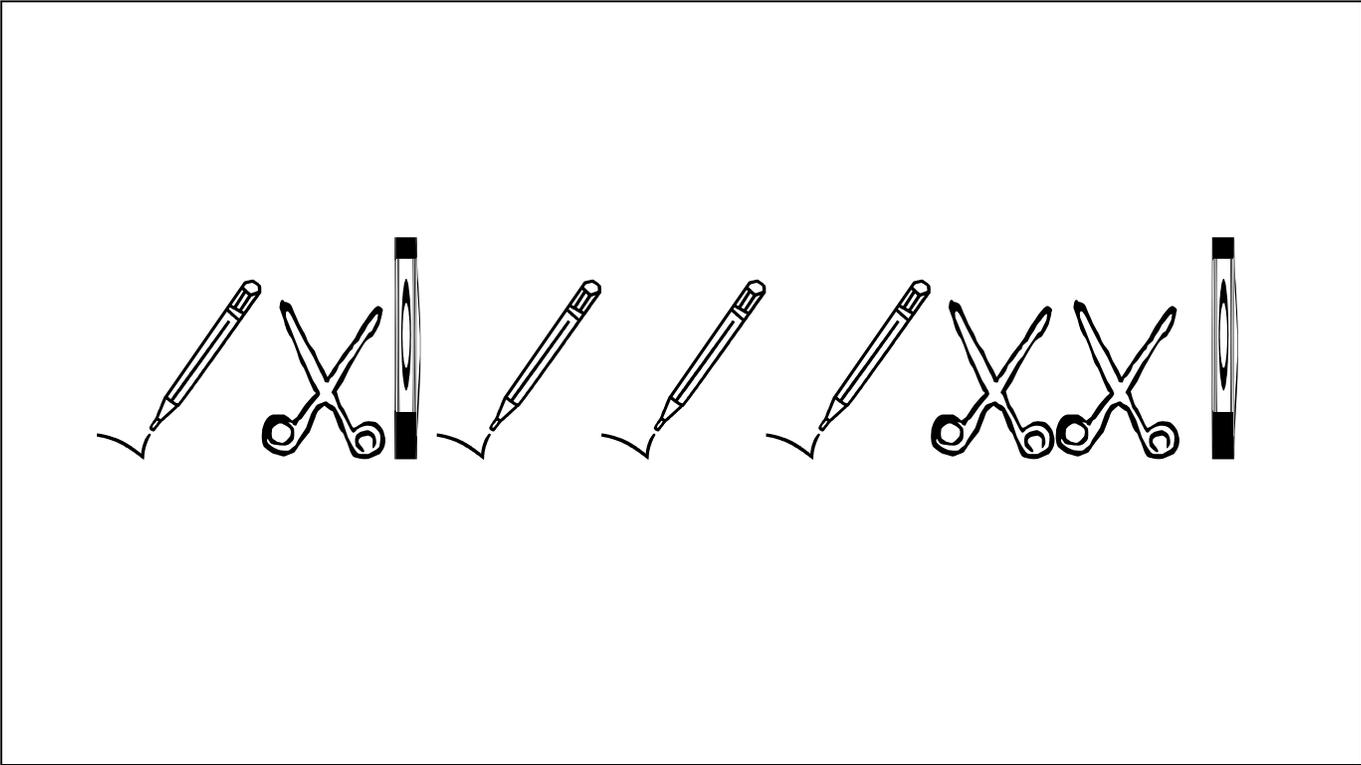


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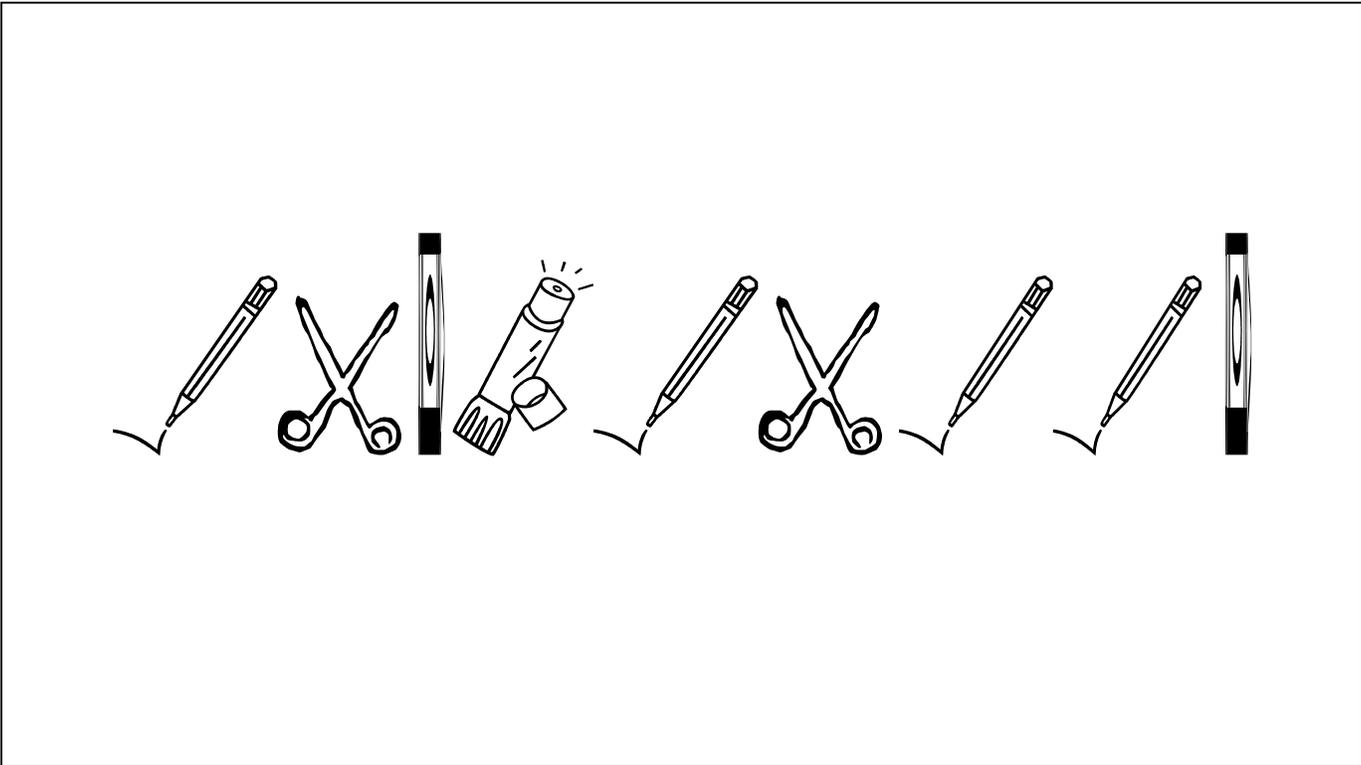
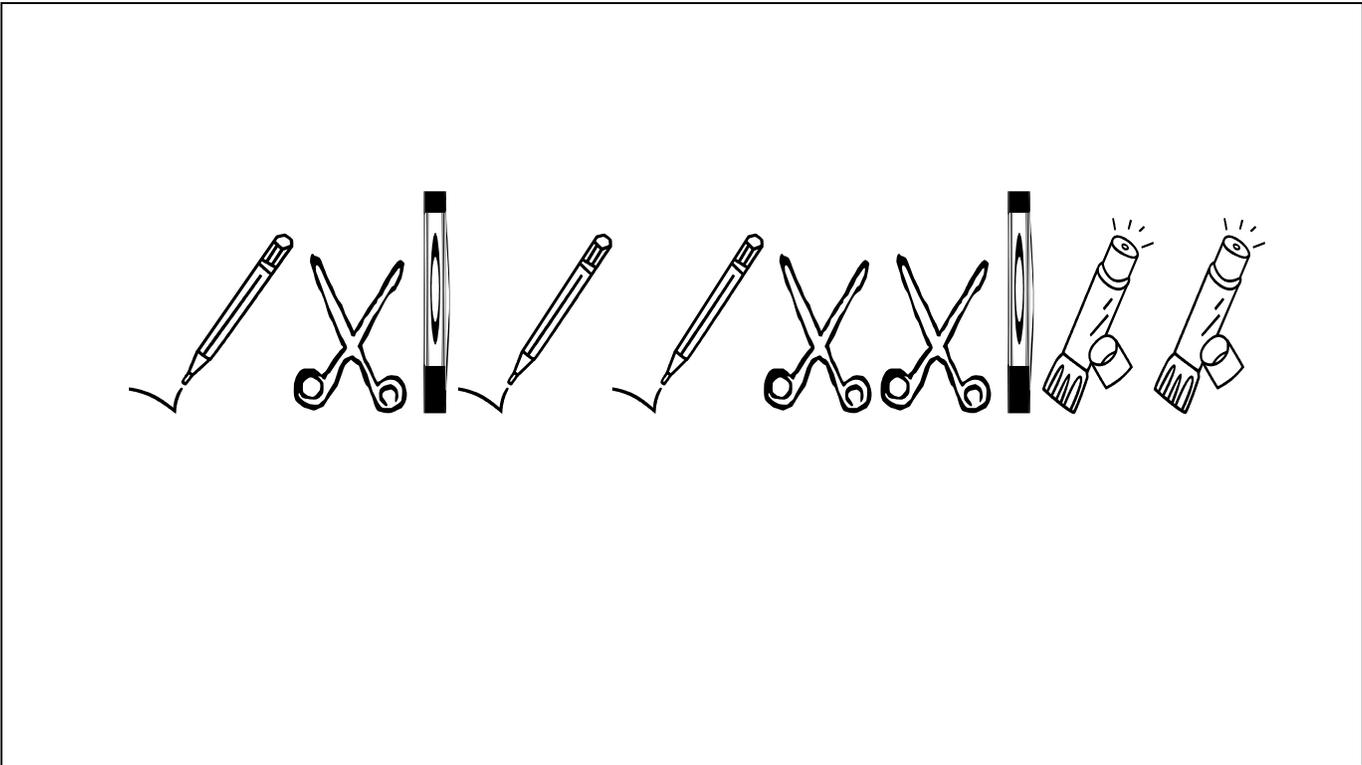




Pattern Cards



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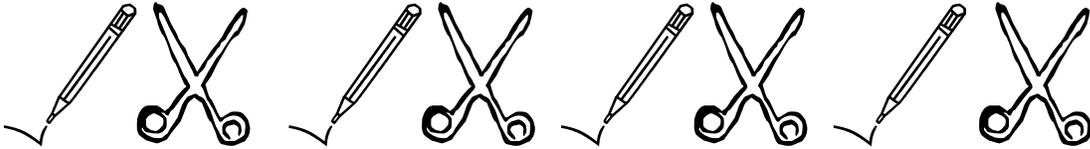
## Pattern Cards Answer Sheet

1. ABAB
2. AABB
3. ABB
4. AAB
5. ABC
6. ABCD
7. ABAB
8. AABB
9. ABB
10. AAB
11. ABC
12. ABCD
13. ABAB
14. AABB
15. ABB
16. AAB
17. ABC
18. ABCD
19. ABAB
20. AABB
21. ABB
22. AAB
23. ABC
24. ABCD
25. No pattern
26. No pattern
27. No pattern
28. No pattern
29. No pattern
30. No pattern

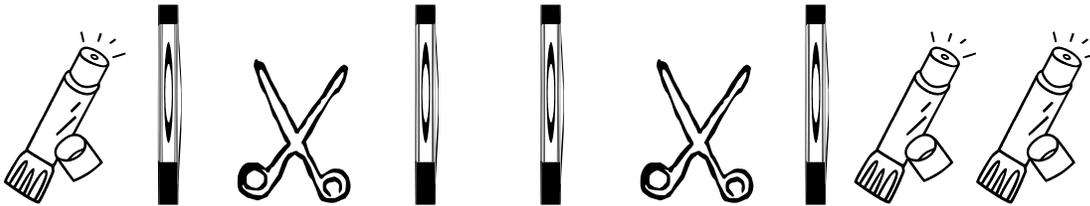
# Find the Patterns

Name \_\_\_\_\_

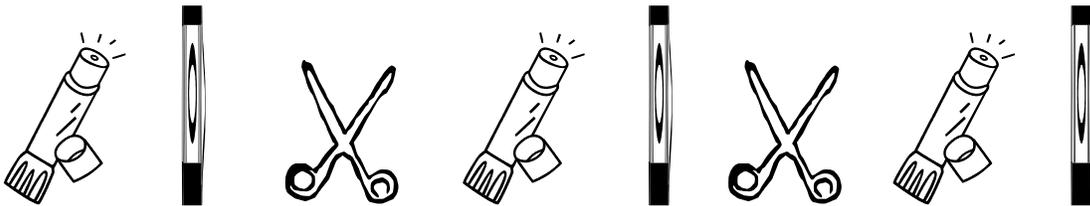
Circle each row that shows a pattern. Use **A, B, C, D** to label the terms in each pattern. Tell how many terms are in each core.



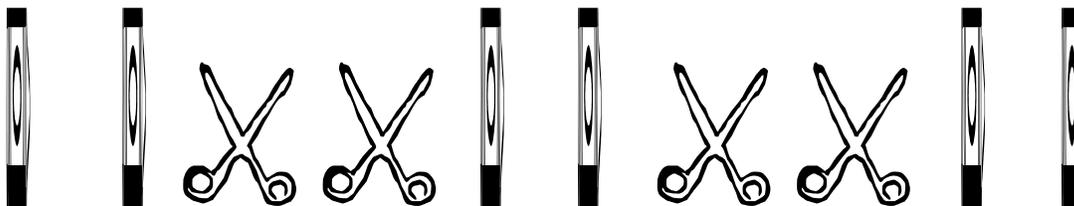
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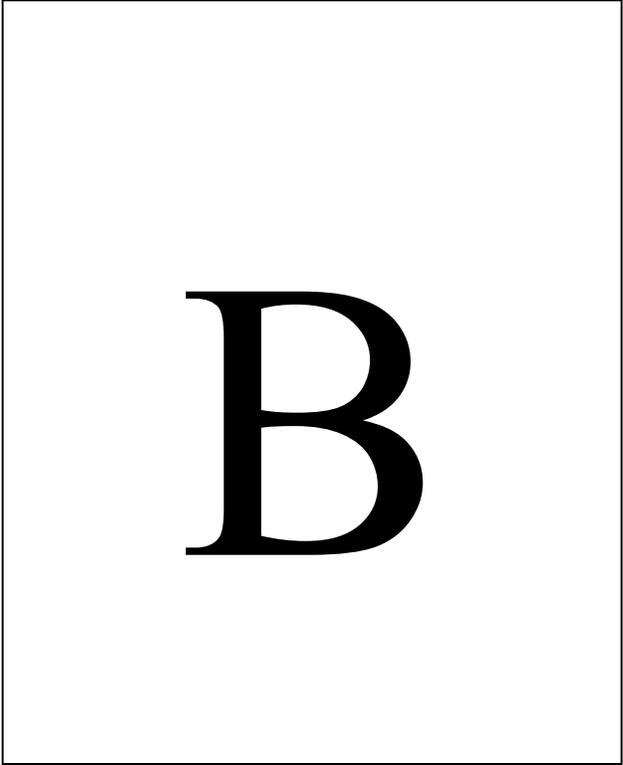


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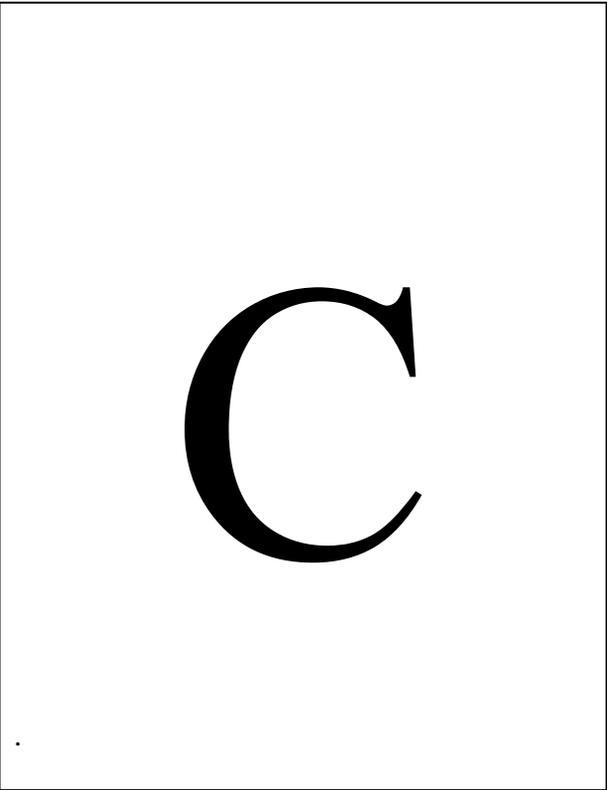
**A, B, C, D Cards**



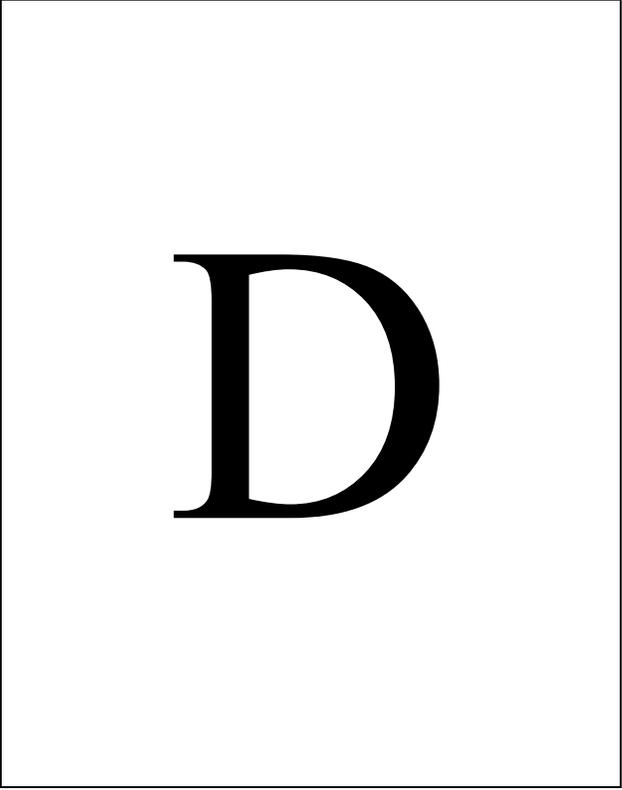
A



B



C



D

## Patterns Scavenger Hunt

Name \_\_\_\_\_

Take a walk around your school and find a pattern that shows each **core**. Write where you found each pattern.

1. **ABAB** \_\_\_\_\_

2. **ABBA** \_\_\_\_\_

3. **AABB** \_\_\_\_\_

4. **ABB** \_\_\_\_\_

5. **AAB** \_\_\_\_\_

6. **ABC** \_\_\_\_\_

7. **ABCD** \_\_\_\_\_

Did you find a pattern that is not listed above? \_\_\_\_\_

What was the **core** of the pattern? \_\_\_\_\_

How many **terms** were in the **core**? \_\_\_\_\_

Where did you find the pattern? \_\_\_\_\_

\_\_\_\_\_

Pattern Labels

ABAB

AABB

ABB

AAB

ABC

ABCD

No Pattern

## Pattern Game Directions

### Materials:

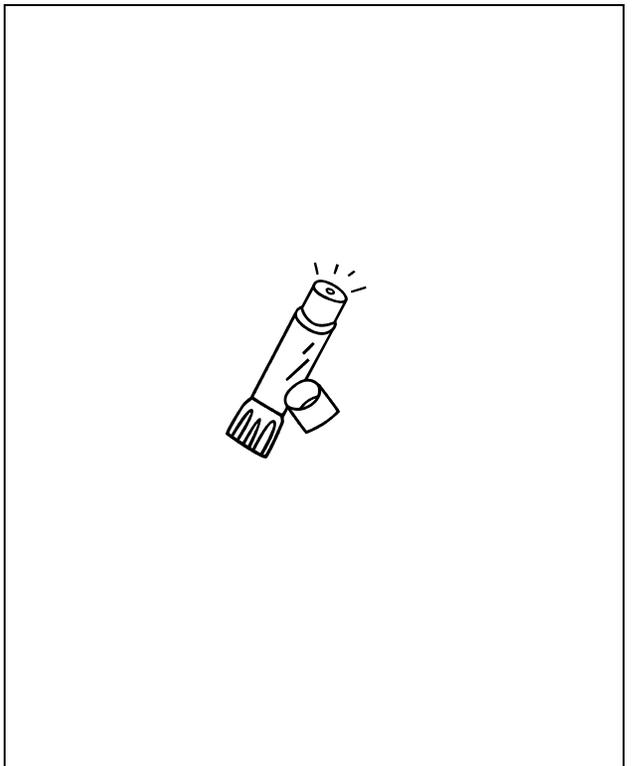
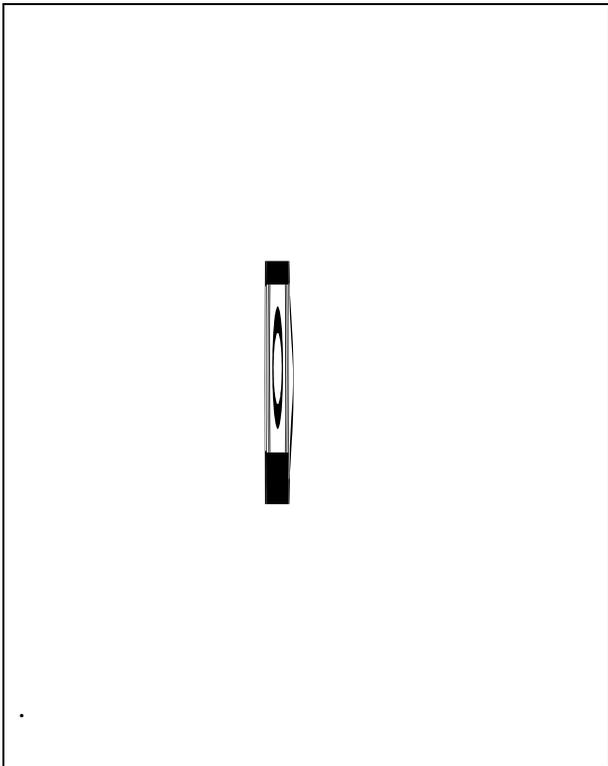
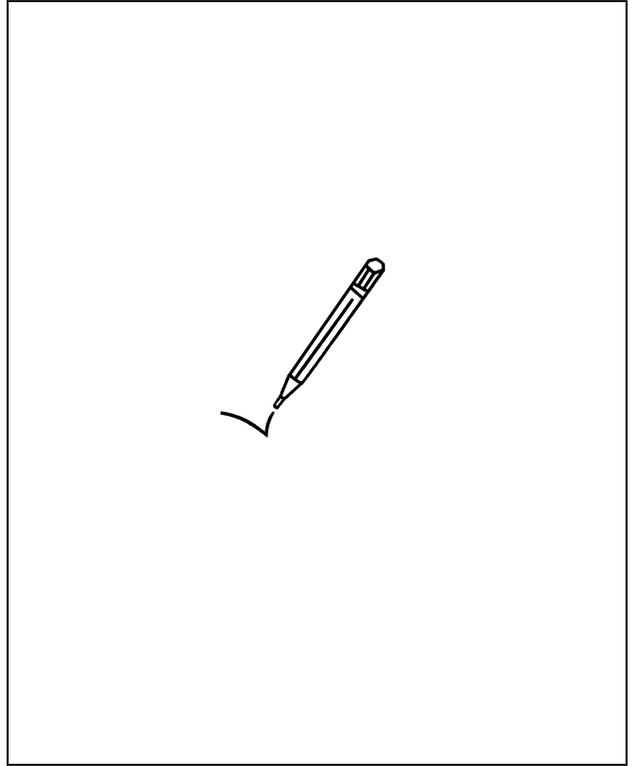
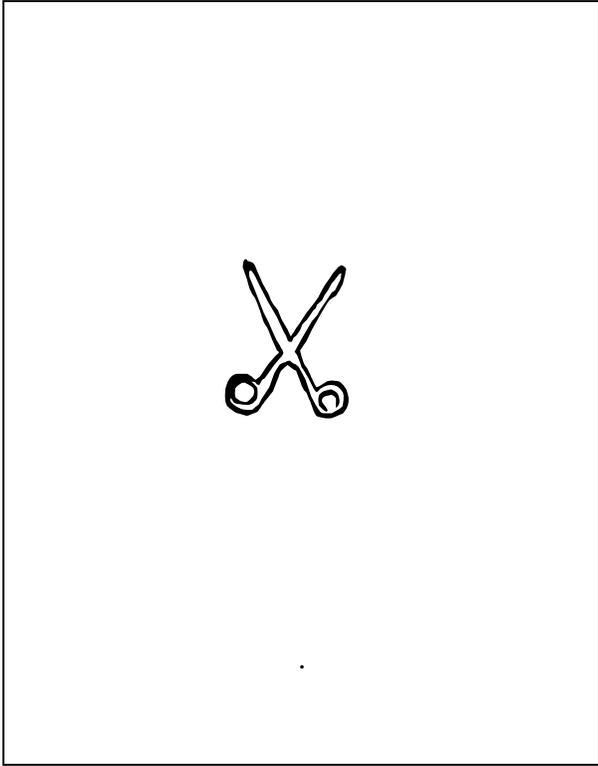
\*Laminated Pattern Cards - 1 set for every 4 students  
(Teacher Resource Sheet #2 a-l cards #1 - 24 ONLY - Do Not use cards #25 - 30)

\*Laminated Object Cards (Teacher Resource Sheet 5) - 2 copies of each object per student

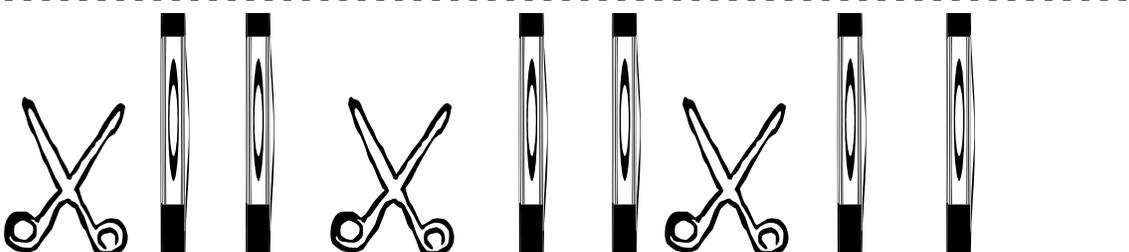
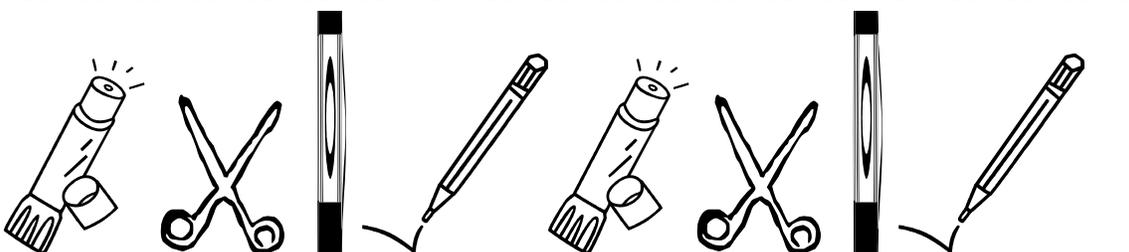
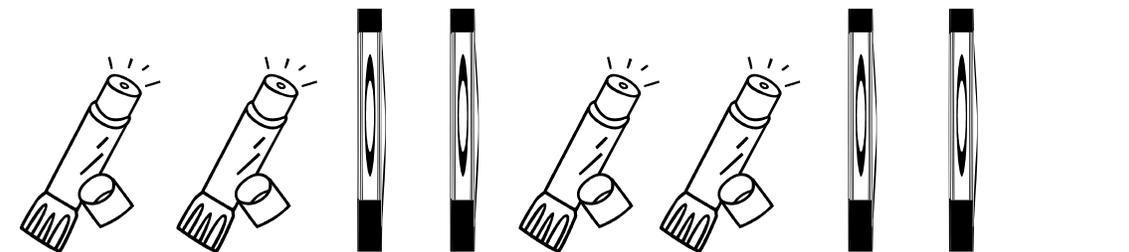
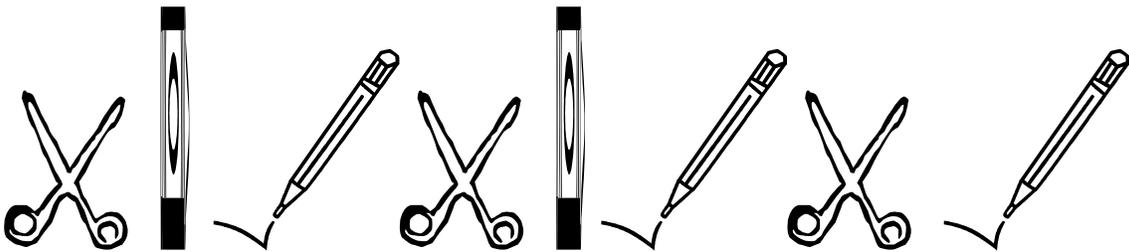
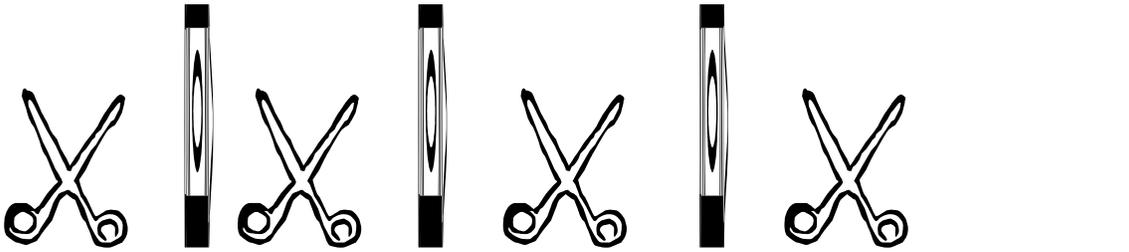
### Directions:

1. Divide the class into groups of 4 students.
2. Distribute 1 set (cards #1-24) of laminated pattern cards to each group.
3. Each student should select 1 pattern card.
4. Distribute 8 of each of the 4 laminated object cards to each group and place the cards face down in the middle of the group.
5. Each student will take a turn to pick up a card from the pile.
6. Look at the card and decide if the object can be used to extend the pattern.
7. If the card can be used, the student can keep the card, if the card cannot be used, the card should be placed at the bottom of the pile.
8. The game will continue until the first student has extended their pattern 3 terms.
9. After the game is over, the students can pick a different pattern card from the set, and play again following the same rules.

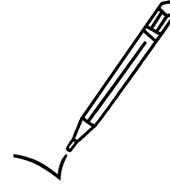
# Object Cards



Finish the Pattern



# Object Pictures



## **Create-A-Pattern Group Activity**

Your group should create a pattern using your bodies. You can use appearance, poses, body movements or sounds to create your pattern. You will demonstrate your pattern to the rest of the class and they will try to guess the core of your pattern and the number of terms in the core. When creating your patterns, remember these guidelines:

1. You can use up to three terms in your core.
2. Your core must have at least two repetitions.
3. Everyone in your group must be included in your pattern.

## Create A Pattern Directions

Begin your pattern with a red pattern block.

Repeat the pattern 3 times.

Do not have a green and blue shape next to each other.

Use more blue than green or red.

## Create A Pattern Directions

Begin your pattern with a shape that has 3 sides.

Repeat the pattern 3 times.

Do not have an orange and green shape next to each other.

Use more squares than any other shape.

### Create A Pattern Directions

Have a green and red shape next to each other.

Repeat the pattern 3 times.

Do not use any squares in the pattern.

Use more yellow shapes than red shapes.

### Create A Pattern Directions

Do not put a shape with 3 sides next to a shape with 4 sides.

Repeat the pattern 3 times.

Have 3 terms in the core of your pattern.

Use more red shapes than blue shapes.

## Create A Pattern Directions

Use more triangles than squares in your pattern.

Repeat the pattern 3 times.

Have 4 terms in the core of your pattern.

Do not have a red shape next to a blue shape.

## Create A Pattern Directions

Begin with a red pattern block.

Repeat the pattern 3 times.

Have 2 terms in the core of your pattern.

Use more yellow shapes than any other shape.

## Guess the Pattern Game

**Materials:**

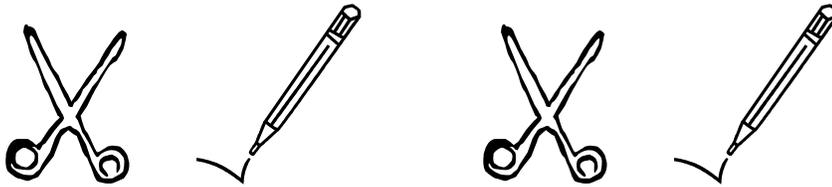
a set of four of each Object Card per student

**Directions:**

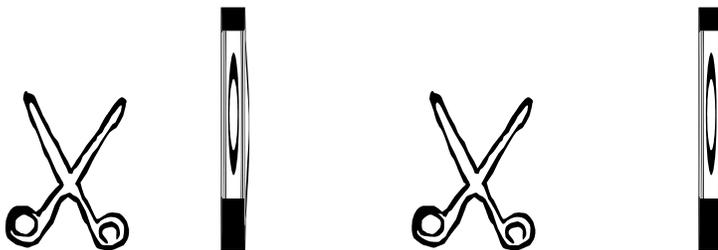
1. Divide the students into pairs sitting at their desk opposite each other.
2. Give each student four of each of the four Object Cards.
3. **Student A** will use up to eight Object Cards to create a pattern with no more than four terms in the core. The must repeat their pattern twice. They should turn their cards face down on the desk so that **Player B** cannot see what the pattern is.
4. **Player B** then lays down the same number of cards face up on the desk to create his guess for what **Player B's** pattern is.
5. **Player A** then turns face up any Object Cards that **Player B** guessed correctly.

For example:

If **Player A** made the pattern:



And **Player B** guessed the pattern:



Then **Player A** would turn his first and third cards face up.

6. **Player B** then leaves the correct cards in the pattern and changes the incorrect cards to make another guess at the pattern.
7. **Player A** then reveals any correct cards.
8. This continues until **Player B** guesses the pattern. Then **Player B** creates a pattern and **Player A** tries to guess it.

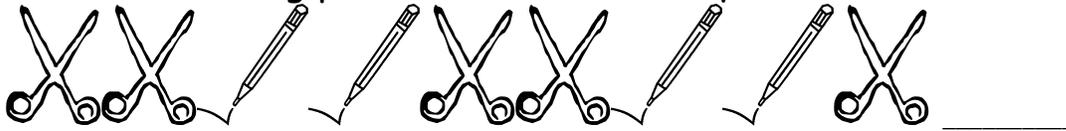


**MSA Brief Constructed Response “Kid Speak”  
Mathematics Rubric  
Grades 1 through 8**

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

## Brief Constructed Response

Use the following pattern to answer the questions below.

**Part A**

What would the next object be in the pattern?

scissors

**Part B**

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

(Score of 2) The core of this pattern is AABB. I know this because it goes scissors, scissors, pencil, pencil, scissors, scissors, pencil, pencil and then back to scissors. There are four terms in the core. The core is repeated 2 times. The third core was started with scissors, so I knew that to continue the pattern scissors would be the next object.

(Score of 1) The pattern went scissors, scissors, pencil, pencil, scissors, scissors, pencil, so I knew that a pencil would come next.

(Score of 0) Incorrect answer or no evidence that the student understands the core of the problem.