



Play Games, Learn Math!

Playing with Patterns

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In mathematics, patterns are more than beautiful designs—patterns follow a recognizable rule or sequence that allows us to predict what comes next. A preschool morning follows a predictable sequence that repeats each day: breakfast, free play, circle, small group, outdoor play, lunch, and so on. Recognizing patterns helps children make sense of the world around them and feel confident because they can predict what comes next.

As you engage children in everyday activities, help them notice patterns and describe them in words. Include patterns that you can see, hear, and touch. You can look for patterns in books, music, art, buildings, and even on your clothes. The most common types of patterns found in preschool classrooms are *repeating* and *growing* patterns.

Repeating patterns

In classrooms, we tend to notice and talk about repeating patterns the most. The stripes in the American flag are a

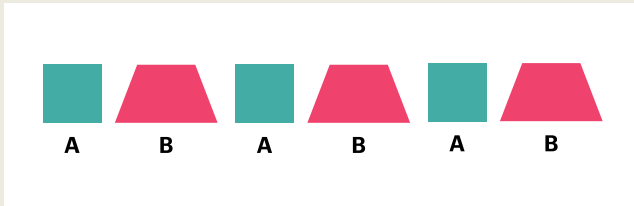
repeating pattern: red, white, red, white, red, white. The repeating part, or *unit*, for the stripes is *red, white*. We can label this an *AB* pattern, where red is A and white is B. The stripe pattern is ABABAB.

“ I was worried about how I was going to teach the AB pattern lingo since it seemed too abstract for many preschoolers to grasp. But Aaron, he understood immediately what I was saying. Now everything is, ‘Look, an ABB pattern!’ I was truly amazed.”

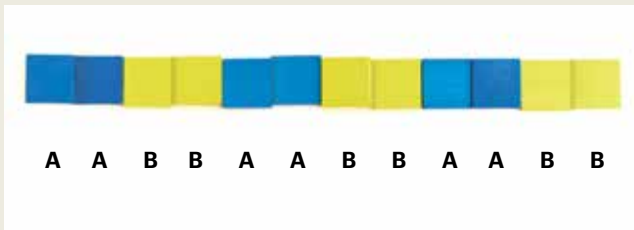
—Susan,
Western Massachusetts

Understanding that patterns are made up of repeating units, and using letters to name them, can be challenging for children, but it's important: research has shown it helps with later success in math.

The pattern that follows is also an AB pattern, because *square*, *trapezoid* is a repeating unit.



AB patterns are the simplest. But you can also have ABB patterns, ABC patterns, AABB patterns, and many more.



Here are some more examples using repeating patterns.



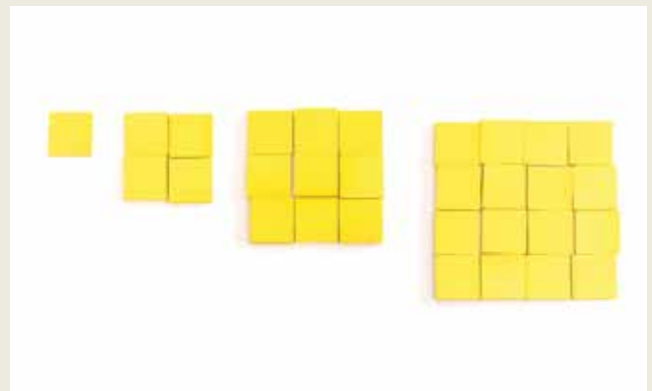
Growing patterns

Growing patterns keep increasing or decreasing by the same amount. In the example, the red block towers increase in height by one block each time. It is a *plus-one* growing

pattern. Our number system is a plus-one growing pattern, too: 1, 2, 3, 4, 5. Each unit grows bigger by one. Preschoolers love noticing that a growing pattern looks like stairs!



Below is another example of a growing pattern:



Children develop in their understanding of patterns. They begin by recognizing patterns in songs, poems, dances, art, and clothing. With practice, children will be able to copy patterns that they see, find what's missing from a pattern, extend a pattern, and create their own patterns (see the progression chart on page 22).

When children identify a pattern and notice the rule it follows, they are developing an important mathematical habit of mind—looking for and making use of structure. This skill will help them understand number patterns and relationships and, later on, algebra.

As you and the children play with patterns, ask them:

- *What comes next in the pattern?*
- *Can you draw the pattern on a piece of paper?*
- *Can you draw the pattern from memory (without looking)?*
- *What is different about these two patterns? What is similar?*



Pattern Games: Materials and Teacher Tips

Materials to collect

Pattern blocks, Unifix Cubes, colored beads—anything you have enough of to make a repeating or growing pattern. You can also download pattern templates here: <http://ym.edc.org/pattern-games>.

Tips for playing

- These games are presented in the order in which children typically develop their understanding of patterns. But you can adjust the instruction to their needs.
- Most games suggest children play for 5–10 minutes, but some children may be deeply engaged in these activities for 20 minutes or more.

“ I noticed after playing these games that Marianna was making patterns with various manipulatives in the classroom and showing her friends. She even noticed patterns in the books that we read. At the art table, she was cutting pieces of paper and gluing them on a large piece of paper. She said, ‘Look, big, little, big, little, big, little.’ ”

—Anna, Preschool Teacher,
New Hampshire

Repeating and Growing Patterns

Game 1: Copy My Pattern

Focus on recognizing and copying patterns.

Ages 3+ | 5–10 minutes

1. Show children a pattern that you made (e.g., ABAB repeating). Ask the children to talk about what they notice about the pattern.
2. For repeating patterns: Chant the pattern with the children so they can hear the repeating unit. For example, “Triangle, square, circle, triangle, square, circle . . .” Be sure to create different types of patterns, such as AB, ABB, ABC, AABB.
3. For growing patterns: Show children how the pattern grows: “The tower gets one block taller each time.”
4. Invite children to make the same pattern using the same materials.

Things to notice as children play

The goal is to help children see that patterns have a sequence that repeats. Watch to see if they are able to copy the pattern correctly or if they lose track of the pattern after a few units have repeated.

Game 2: Make Your Own Pattern

Focus on creating patterns.

Ages 3+ | 5–10 minutes

1. Invite children to make their own patterns.
2. For repeating patterns: Ask children what repeats in their pattern and then challenge them to label it using letters (AB, ABB, ABC, etc.).
3. For growing patterns: Ask children to explain what is growing (or shrinking) in their pattern, and by how much each time.

Things to notice as children play

Children learn a lot by making their own patterns. They may make mistakes, and that’s OK, because mistakes are part of the learning process. For repeating patterns, try chanting the pattern aloud. This often helps children identify the repeating unit and find a mistake.

Game 3: Find the Mistake, or What's Missing?

Focus on fixing patterns.

Ages 4+ | 5–10 minutes

1. For repeating patterns: Create a repeating pattern. Cover (or remove) one of the objects, then show the pattern to the children. Ask the children to fill in the blank space.
2. For growing patterns: Create a growing pattern with a mistake, then show the pattern (with the mistake) to the children. Ask the children if they can figure out where the mistake is and then fix it.

Things to notice as children play

Children love finding mistakes that teachers make. It's usually easier for children to find a mistake when it occurs further along in a pattern—in other words, when there are two or three repeating units of the pattern already.

Game 4: Extend the Pattern

Focus on keeping the pattern going.

Ages 4+ | 5–10 minutes

1. Make a pattern with at least two repeating units.
2. Ask the children to continue the pattern following the same rule.

Things to notice as children play

Watch to see if children are able to extend the pattern correctly, maintaining the same rule as it gets longer and longer. Children love to make really, really long patterns. Be sure to leave enough space!

Game 5: Same Rule, Different Stuff

Focus on pattern transfer.

Ages 4/5+ | 5–10 minutes

1. Show children a pattern that you made (using materials such as pattern blocks).
2. Ask children to make a pattern that follows the same rule but uses different materials (such as Unifix Cubes).
3. For repeating patterns: Ask the children, “What’s my pattern rule?”
4. Challenge them to name the pattern using letters (AB, ABB, ABC, etc.).
5. For growing patterns: Ask children what is growing (or shrinking) in the pattern and by how much each time.

Things to notice as children play

When children are proficient at making a pattern that follows the same rule as another pattern, and when they are able to use letters to label the pattern (such as an AB pattern), they have a strong understanding of patterns. This skill can be quite challenging because they have to pay attention to the pattern rule rather than the materials that make the pattern.

Experiencing Repeating Patterns Bodily

You can dance, sing, or clap in a repeating pattern. At circle time, start a pattern like clap, clap, stomp; clap, clap, stomp (clap, clap, stomp is an AAB pattern). Invite children to join in. Then unexpectedly stop demonstrating, and see if they can continue the pattern without you. Next, a child could take the lead and make an AAB pattern using different moves.

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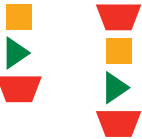



This information has been adapted from *Games for Young Mathematicians*, a program of research in early mathematics at the Education Development Center (EDC), supported by funding from the National Science Foundation and the Heising-Simons Foundation. For more math information and games, visit <http://ym.edc.org>.

Progression of Pattern Concepts for Young Children

This chart offers different and challenging pattern activities you can do with children. The chart may also be used to increase the level of difficulty of the pattern activities you offer in order to enhance young children's learning. The lines between columns are intentionally fuzzy because the ages are approximate. Children's understanding of patterns depends on their past experience and practice with patterns. The stages represent general expectations for children, but each child will reach these indicators at their own pace.

Note: Encourage children to make their own patterns, as well. These will increase in complexity and accuracy with their opportunities to practice.

~ @3 years old	~ @4 years old	~ @5 years old	~ @6 years old (end of kindergarten)
<p>Recognize (Identify existing patterns)</p> <p>Teacher: Let's find patterns in the classroom.</p> <p>Child: The stripes on my shirt go black, red, white, black, red, white.</p> <p>or</p> <p>Child: The stars on the wall go big, little, big, little.</p>	<p>Copy (Make the same pattern with the same materials)</p> <p>Teacher: I made a pattern with these blocks. Now you make the same pattern.</p>  <p>Child makes the same pattern:</p> 	<p>Transfer (Make the same pattern with different materials)</p> <p>Teacher: I made a pattern with these blocks. Now you make a pattern with different blocks that follows the rule about what repeats.</p>  <p>Child makes the same pattern with different blocks:</p> 	<p>Make it from memory (Remember and replicate a pattern)</p> <p>Teacher: I'm going to show you a pattern for just a short time, then I'm going to hide it. You try to make the pattern from memory.</p>  <p>Child makes the same pattern from memory:</p> 
	<p>Fix (Find the missing piece)</p> <p>Teacher: Please fix this pattern.</p>  <p>Child fixes the pattern:</p> 	<p>Name the repeating unit</p> <p>Teacher: I made a pattern tower. Now you make a tower that just shows the repeating unit.</p>  <p>Child makes:</p> 	
	<p>Extend</p> <p>Teacher: What comes next in my pattern?</p>  <p>Child extends pattern:</p> 