

The Pattern Architects: Decoding Place Value & Multiplication

Lesson Overview

Target Audience: 3rd Grade (Small Group or Whole Class Intervention)

Duration: 30 Minutes

Objective: Students will identify and describe numerical patterns in a choral counting routine, explain the role of zero as a placeholder, and demonstrate how skip counting relates to multiplication notation and place value shifts.

Materials Needed

- Large chart paper or a digital whiteboard
- Markers (at least two different colors)
- Individual whiteboards and markers for students
- Place value mats (Hundreds, Tens, Ones)
- Base-ten blocks (optional for scaffolding)

1. Introduction: The Pattern Detective Hook (3 Minutes)

Hook: "Architects use blueprints to build skyscrapers, but did you know mathematicians have a secret blueprint for numbers? Today, you aren't just students—you are Pattern Architects. We are going to find the hidden structures that make numbers grow. By the end of this 30 minutes, you'll see how a simple '0' is actually a powerful tool that shifts the whole world of a number."

Student-Friendly Objective: "Today, we will discover patterns in numbers, see how skip counting is actually multiplication in disguise, and learn why the number zero is the most important 'space-saver' in the universe."

2. Routine 1: Counting Around the Circle (7 Minutes)

Inspired by Jessica Shumway's "Number Sense Routines."

The Setup: Stand in a circle. We will count by 10s, but to make it rigorous, we won't start at zero. We will start at 7.

I Do: "I'll start. 7. If I add a ten, the next person says 17."

We Do: Go around the circle: 7, 17, 27, 37... Stop at 107.

The "Think-Pair-Share" Interruption:

- "Look at the numbers we just said. What stayed the same? What changed?" (The 7 in the ones)

place stays; the tens place increases by 1).

- "Predict: If we keep going, what will the 15th person say? Don't count aloud yet—look for the pattern!"

3. Routine 2: Choral Counting & Recording (10 Minutes)

The Activity: We will chorally count by 20s, starting at 0. As we count, I will record the numbers in a vertical grid (6 numbers per row).

Recording (Teacher Modeling):

Row 1: 0, 20, 40, 60, 80, 100

Row 2: 120, 140, 160, 180, 200, 220

Deep Inquiry (The "You Do" Analysis):

- **Horizontal Patterns:** "Look at the first row. How much are we adding each time? (+20). How does this look in multiplication notation? (1×20 , 2×20 ...)"
- **Vertical Patterns:** "Look at the columns. What is the jump from 20 to 140? (+120). Why is it exactly 120? (Because there are 6 numbers in a row, and $6 \text{ groups of } 20 = 120$)."
- **The Zero Placeholder:** "In the number 200, what happens if I take away the zeros? It becomes 2. Why does the '0' matter even if it represents 'nothing' in that column?" (It pushes the 2 into the Hundreds place, making it 100 times larger).

4. Application: Multiplication & Place Value Shift (5 Minutes)

The Challenge: Give students a problem: 4×10 vs. 4×100 .

Instruction: "When we skip count by 10, four times, we get 40. When we do it by 100, we get 400. Look at the digit 4. In 40, it lives in the Tens house. In 400, it lives in the Hundreds house. The zero acts like a 'placeholder'—a bodyguard that keeps the 4 in the right seat so we know exactly how much it's worth."

Activity: On your whiteboards, write the number 5. Now, show me what happens to the 5 when you multiply it by 10. (Students write 50). Explain to your neighbor: Did the 5 move? (Yes, it shifted one spot to the left!)

5. Conclusion & Assessment (5 Minutes)

Recap: "Pattern Architects, what did we find today?"

- Counting by a number repeatedly is just multiplication.
- The '0' is a placeholder that shifts digits to higher place value 'houses.'
- Patterns can be found going sideways (rows) and up/down (columns).

Summative Assessment (Exit Ticket): "If I am counting by 50s and I just said the number 300, what is the next number? Write it down and circle the digit in the Tens place. Then, write the multiplication sentence that matches that number (e.g., $7 \times 50 = 350$)."

Success Criteria: Students can explain that the next number is 350 because one more group of 5 tens

was added to the 30 tens they already had.

Differentiation Strategies

- **For Struggling Learners (Scaffolding):** Use a place value mat and physical base-ten blocks to "see" the shift. When adding a zero, physically move the 'tens' rod to the 'hundreds' square.
- **For Advanced Learners (Extension):** Ask them to predict the pattern if we counted by 25s starting at 12. Have them identify where the "hundreds" place changes and why (the "bridge" numbers).
- **Multi-Sensory:** Use a "clap-snap" rhythm for counting (Clap for the tens, snap for the ones) to reinforce the place value components of each number.