**Exploring Counting Patterns**

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| In this lesson, students explore counting patterns to develop place value understanding. |

**NC Mathematics Standards:**

**Extend and recognize patterns in the counting sequence.**

**1.NBT.1** Count to 150, starting at any number less than 150.

**1.NBT.7** Read and write numerals, and represent a number of objects with a written numeral, to 100.

**Additional/Supporting Standards:**

**Understand place value.**

**1.NBT.2** Understand that the two digits of a two-digit number represent amounts of tens and ones.

**Use place value understanding and properties of operations.**

**1.NBT.5** Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

**Student Outcomes:**

* I can count to 150 starting at any number (within 80 first semester).
* I can read and write numbers to 100 (within 80 first semester).
* I can explain patterns in the digits of numbers on a number chart.
* I can use number patterns to help me mentally find 10 more or less than a two-digit number.

**Math Language:**

Pattern

Row

Column

Digits

Tens Place

Ones Place

**Materials:**

* A large class number chart, such as a number line or a hundred chart, is a useful classroom resource to support students with the Counting Around routine
* Word problem on chart paper to use with the whole group
* A class set of printed copies of the problem for students to glue in their math journals
* A basket of tools including snap cubes, tens frame cards, and number lines
* Number charts for each student. This lesson suggests a 100 chart, but this may vary for differentiation and time of year (50 chart, 100 chart, 150 chart, and/or 101-200 chart)
* 10-20 transparent chips per person
* Chart paper for anchor chart
* A 101-200 number chart for pairs only filled in to 120 (for first semester, may use a 100 chart only filled in to the number 60 and focus on filling in the next two blank rows)

**Advance Preparation**:

* Gather materials listed above
* Write word problem on chart paper
* Copy and cut student copies of the word problem to glue in math journals
* Select and prepare appropriate number charts for each student
* Select and prepare appropriate number cards for partners to arrange in order

**Directions:**

1. Counting Around Routine (5 minutes)

Counting Around may be used with the group seated in a circle. The teacher gives a starting number and each child says the next number in the counting sequence until the teacher gives the stop signal. Once students learn the routine, they may be asked to count on by ones, tens, twos, and fives, starting at various numbers. Teachers may ask questions to encourage students to predict and test their ideas such as:

* *Let’s start with the number 20 and count by ones. Who do you think will say 30? How do you know?*
* *Let’s start with the number 45 and count by tens. Who do you think will say 95?*

*How do you know?*

Note: This routine may be used regularly throughout the school year and differentiated based on the students’ understanding of counting. It may be used for practice counting forward or backward in whole and small group instruction. The routine can be especially useful for extending rote counting by ones from 100-150 and counting by tens from any start number. This routine may be encouraged as a partner activity in stations or as students wait in line throughout the day.

1. Counting in a Problem Context (20 minutes)

Show students the following problem on chart paper, asking them to read aloud with you. Read again. (After midyear, a higher number, such as 84, could be used as a start number).

*** Tim was counting his race cars. He stopped counting at 64 so he could eat lunch. What will be the next numbers Tim says when he counts the rest of his 16 cars? How do you know?***

***64, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_, \_\_\_***

***Explain what you did using pictures, numbers, or words.***

Ask students to restate the problem in their own words to partners and ask the whole group:

* *What do you know about this problem?*

Students go to their work spaces to glue the problem into their journals.

Students solve the problem with partners using their tools and explain their work.

Teachers monitor student work and may ask questions such as:

* *How do you decide what numbers come next?*
* *Do you notice a pattern in the numbers as you count?*
* *What seems to be repeating? What seems to stay the same?*
* *What’s important to remember when you write larger numbers?*
* *What tool(s) did you use? How did that help?*
* *Could you use a different tool to prove your answers? Which way is quicker and easier? Why?*

\*Any students who finish early may create a similar problem involving counting by adjusting the character and objects.

Bring students back together to share counting strategies. Select at least one student who used the hundreds chart as a tool to share. Use their explanation to transition to the next activity.

1. Investigate Counting Patterns and Summarize Ideas on an Anchor Chart (15 minutes)

Give students 100 charts and transparent chips. Students touch each number on their 100 chart tool as the class counts together from 1-100. Ask:

* *Do you notice a pattern in the numbers as you count across any row on the chart?*
* *Talk with your partner about the patterns you notice as you count across a row.*
* *Does that happen in every row? Why?*
* *Try to use specific math language (students may reference an interactive word wall featuring words such as pattern, row, column, digits, tens place, and ones place).*

On the anchor chart, record the patterns that students notice.

Next, students use transparent chips to keep track of numbers that they say as they start at 10 and count by tens. Ask partners to discuss:

* *What do you notice about the numbers we covered with chips?*
* *What do you notice about their digits?*
* *What happens if you start at another number in the first row and count by tens? Try it!* ***(Test the idea a couple of times with different starting numbers 1-9)***
* *Does that happen in every column? Why?*

On the anchor chart, record the patterns that students notice.

1. Extend the Counting Sequence (15 minutes)

Review the patterns students noticed on the hundred chart.

Ask: *Would the same patterns appear on a 101-200 chart? Why?*

Distribute 101-200 number charts to pairs that are only filled in to 120. Starting at 101, point intentionally to the digits as you read the numbers from 101-120. Invite students to join in with reading the numbers when they notice the pattern.

Ask:

* *What do you notice?*
* *How did looking at the digits help you to read these numbers?*
* *Discuss with your partner how we could use these patterns to help us to continue counting to 150?*
* *What might we say after 120? What might that look like? Can you and your partner find the number card that shows that number? Can you keep counting?*

Allow partners to rote count from 121 to 150.

Ask partners to sequence the number cards to fill in the chart from 121-150.

Encourage them use counting to check their number placements.

**Evaluation of Student Understanding**

**Informal Evaluation:** Observation

Observation of students counting by ones and tens during Count Around, when writing numbers to count in their math journals, and when counting and arranging number cards 121-150. If available, partners could take pictures of their work using iPads.

**Formal Evaluation/Exit Ticket:**

If you start at the number 81 and count by ones, what numbers will you count next? Write the numbers in the blanks.

81, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_,

\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_,

\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_

What patterns do you notice in the tens place? Why?

**Meeting the Needs of the Range of Learners**

**Intervention:**

* Students who cannot recognize the number patterns may first need more practice reading and writing numbers in a smaller range (within 20, within 50) before working within 80 or beyond.
* Students who do not recognize the hundreds board pattern that ten more may be found by looking below a given number need more practice with counting ten more than a number. Try covering a number on the top half of the chart with a chip. Predict what would be ten more than that number. Count to check your thinking. Repeat until students are convinced and can explain why the number that is ten more is below the original number and the number that is ten less is above the original number.
* Students who cannot explain patterns in the digits may need to build from their understanding of teen numbers as being ten and some more ones. They may also need models such as tens frames and counters and/or snap cubes to help them visualize the tens and the ones within two-digit numbers.

**Extension:**

* Allow students to fill in all of the numbers on a 101-200 chart.
* Ask how counting patterns help us know *ten more* or *ten less* than a number without counting? Create an example and write an explanation to explain if it would work every time.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Student has difficulty with rote counting to larger numbers. | Have them rote count to smaller numbers to help them realize patterns in the sequence. |
| Students might reverse place value when writing numbers. | Have the student use cubes to compose and decompose numbers to help them see connections between models and numbers. |
| Students may make counting errors when crossing over decades. | Have students look at the tens place to identify the next ten. They may even highlight each digit in the tens place to note the pattern.  Have students use 100 boards, number lines, or other tools at the point of difficulty. |
| Students do not understand that counting by tens is ten more. | Teacher can have students relate one more, two more, and five more to skip counting to help them see the connection. |

**Special Notes:**

Numbers used for counting activities in this lesson may be modified to use a particular number range based on the time of year.

**Possible Solutions:**

Student solutions will be the same, but explanations and strategies should be varied. Help students see connections between explanations and strategies that are used.

*Adapted from* Hunovice, L., OConnell, S., & SanGiovanni, J. (2016). *Teaching first-grade math*. Portsmouth, NH: Heinemann.

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**\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_**

**Explain what you did using pictures, numbers, or words.**

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**Explain what you did using pictures, numbers, or words.**

**Exit Ticket**

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| **If you start at the number 81 and count by ones, what numbers will you count next? Write the numbers in the blanks.**  **81, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_,**  **\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_,**  **\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_**  **What patterns do you notice in the tens place? Why?** |





