## Counting Around the Class

In this lesson, students will find patterns when counting by related numbers and explain the relationship of multiplication and division.

**NC Mathematics Standard(s):**

Multiply and divide within 100.

**NC.3.OA.7** Demonstrate fluency with multiplication and division with factors, quotients and divisors up to and including 10.

* Know from memory all products with factors up to and including 10.
* Illustrate and explain using the relationship between multiplication and division.
* Determine the unknown whole number in a multiplication or division equation relating three whole numbers.

**Understand properties of multiplication and the relationship between multiplication and division**

**NC.3.OA.6** Solve an unknown-factor problem, by using division strategies and/or changing it to a multiplication problem.

Additional/Supporting Standard(s):

**NC.3.OA.1** For products of whole numbers with two factors up to and including 10:

* Interpret the factors as representing the number of equal groups and the number of objects in each group.
* Illustrate and explain strategies including arrays, repeated addition, decomposing a factor, and applying the commutative and associative properties.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Attend to precision
6. Look for and make use of structure
7. Look for and express regularity in repeated reasoning

Student Outcomes:

* + - * I can count by 3s to get to 30. (Number may differ for different students.)
      * I can explain the relationship of multiplication and division.
      * I can find patterns when counting by 3s and then counting by 6s. (Patterns may differ for different students).

Materials:

* + - * None for basic activity of counting around the class.
      * Chart paper or document Camera (optional)

Teacher may decide when to record multiples to make them visible to students or to extend the activity to allow students to investigate the patterns created by multiple of a number.

Advance Preparation:

* + - * Teacher makes decisions about what number or numbers students will count by.
      * Teacher makes decisions about where and how to record counting sequences.
      * Teacher plans questions to probe student thinking.
      * Teacher plans questions she may ask during this activity.

Directions:

* + - * Choose a number to count by. Students count around the class by a single digit numbers to provide practice with multiplication and related division facts.
      * Predict the target number:
      * Before the count starts, students try to estimate the ending number of the count (number the last person in the class will say). Refer to this number as the target number.
      * Count around the class by the selected number. If students count by 3s, the first student says “3”, the next student says “6”, etc.
      * Pause during the count:

After students are familiar with this activity, begin pausing during the count and asking, “How many people have counted so far? How do you know?” Example: When counting around by 3s, after a student says 24, the teacher asks, “How many people have counted so far?” Students will have to think about the factor x 3 that will equal 24. Students begin to think about the relationship between a factor and it’s multiple.

Extension:

* + - * Teacher records the multiples on chart paper as they are stated aloud: 5, 10, 15, etc.
      * Students look for patterns.
      * Count around the circle or the class as many times as needed to reach 100 or greater.
      * Next do the same for counting by 10. This time students say multiples of 10.
      * Teacher again records the multiples of 10 as they are stated aloud.
      * Students compare and discuss patterns of the multiples of 5 and multiples of 10.
      * Teacher records multiples of 3 when students are counting around the class. Teacher also records multiples of 6 when students are counting around the class.
      * Ask students to compare the multiples of 3 and 6. (Students should notice that every other multiple of 3 is also a multiple of 6.) What other numbers will have this same pattern?
      * Students can find patterns in 3s, 6s, 9s, and also can see pattern of doubling when comparing 2s and 4s; 3s and 6s, 4s, and 8s, etc.

Variations:

* + - * Students can count in a small group.
      * In small groups, students can take turns “pausing” during the count.
      * Possible questions asked by a student:

“How many multiples have we said so far?” “How do we know?”

Whispering Version of Counting Around the Class

This version may support students in seeing multiplication as equal “groups “.

1. Choose a number (factor) to count by: Example 5
2. In this version, students always count around the class or circle by ones.
3. Only multiples of the “selected number” are said aloud. Other numbers are whispered.
4. If students are counting by fives, students count 1, 2, 3, 4, **5**, 6, 7, 8, 9, **10**, etc. (only multiples of 5 are said aloud, other numbers are whispered)
5. The teacher may pause at a certain point, such as after 15 and ask, “How many students have counted so far? “ (15 students)
6. Ask the students who have said a number out loud to stand. Ask, “Why are only 3 students standing?” Elicit the connection of 3 groups of 5 students to 15.

Landmark numbers:

* + - * Counting around the class by landmark numbers support students in building understandings of our base ten system of numeration. Ask students to count by different landmark numbers, beginning with 10 and with multiples of 10 to reach 100; count by multiplies of 50 to reach 1000, etc.
      * When learning about money, students might count by values of coins such as quarters. The value of coins tend to be landmark numbers for many students. Example, count by 5, 10, 25, 50, 100. (Can also say 5 cents, 10 cents, to 1 dollar and 25 cents, etc.)
      * Start with a given number and count backwards. Select numbers with patterns such as 500 and count backwards by 25.

Questions to Pose:

Before:

Ask: After we count around the class by 3s, what will the last student will say? (Use this question for different numbers.)

During:

* + - * When counting multiplies, pause during the count. Ask “ How many students have counted so far?” How do you know?
      * After counting around the class by 3s, Ask: “If we count around the class by 6s, what number will the last student say? Explain your reasoning.
      * When counting by multiplies, pause during the count and ask “How many students have counted so far?” How do you know?
      * Ask students to explain how this question related to division? Ask this question many times.

After:

Assessment:

* + - * What multiples do individual students know?
      * Are students able to understand the relationship between skip counting and multiplication?
      * Are students able to identify patterns found in multiples of numbers?
      * Are students able to see relationships between factors and multiples?
      * Are students able to see relationships when comparing multiples of given numbers?

Possible Misconceptions/Suggestions:

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| **Possible Misconceptions** | **Suggestions** |
| Students may count but are not connecting to groups. | Use the “Whispering Count” and ask students to get in groups.  Provide opportunities for students to use models to make equal groups**.** |

**Solutions:** NA

Adapted from TERC Investigations Curriculum