**Exploring Equality**

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| In this lesson, students explore equality using the equal sign. They will first explore equality with sets or groups using the equal sign then move to exploring equality with equations. The lesson could be taught consecutively in one math block but may need to extend over multiple days depending on student understanding of the concept of equality, or having equal amounts. The lesson could also be modified or extended by repeating tasks and discussion with more emphasis on subtraction. |

**NC Mathematics Standards:**

**Analyze addition and subtraction equations within 20.**

**NC.1.OA.7** Apply understanding of the equal sign to determine if equations involving addition and subtraction are true.

**Additional/Supporting Standards:**

**Add and subtract within 20.**

**NC.1.OA.6** Add and subtract, within 20, using strategies such as:

* Counting on
* Making ten
* Decomposing a number leading to a ten
* Using the relationship between addition and subtraction
* Using a number line
* Creating equivalent but simpler or known sums

**Standards for Mathematical Practice:**

**3.** Construct viable arguments and critique the reasoning of others

**6.** Attend to precision

**7.** Look for and make use of structure

**Student Outcomes:**

* I can determine if equations involving sets and/or numbers are true using the equal sign.
* I can use the equal sign appropriately to show when groups or expressions are equal.
* I can explain why equations are true by using addition and subtraction.

**Math Language:**

**What words or phrases do I expect students to use as they talk during this lesson?**

 equal, equation, true, add, addend, subtract, more, fewer, more of, less of, same as

**Materials:**

* Manipulatives to use for making groups or counting, such as cubes or counters
* Math journals or student activity pages for students to show their thinking
* Exit tickets

**Advance Preparation**:

* Gather materials
* Copy exit tickets and perhaps also student activity page(s)

**Launch:**

1. Introduce the task (2-3 minutes)

Tell students you are buying balloons for a birthday party. You want to have an equal amount of blue and red balloons. Present the task with sets to students and tell that this shows the red and blue balloons that you have bought for the party. You need them to tell you if this is true, that you indeed do have an equal amount of red and blue balloons. (Avoid using the word “same” when introducing the task; hopefully students will use in their explanations.)



**Explore:**

1. Solving the Problem (5-7 minutes)

Have students work individually to determine if there is an equal amount of red and blue balloons. Encourage them to use their math journals or student activity pages to explain why it is true, that there are equal amounts, or if it is not true. They should use numbers and/or words to show their thinking.

Notice how students are determining if the sets are equal and also how they are explaining their thinking and reasoning. Consider a few different examples of student work (could be accurate or inaccurate) and in what order you would like students to share their thinking to spark discussion once you bring the students back together as a class.

**Discuss:**

1. Discussion (8-10 minutes)

Bring students back together as a large group and take a quick tally of who says **Yes**, it is true because the sets of balloons are equal and who says **No** it is not true because the sets are not equal. Respond based on how students respond. (If all say No, respond with something such as *Wait! I really don’t have an equal amount of red and blue balloons?! How do you know?*  Or if some say Yes and some say No, respond such as: *Uh-oh, it doesn’t sound like we agree and I definitely need an equal amount of red and blue balloons. Let’s work together to make sure I end up with equal amounts.*)

Ask a few students (whose work you identified while students were exploring) to share what they were thinking and how they determined if the sets were equal. Ask questions to encourage students to explain their thinking in more depth, such as:

* *What did you do first? Then what did you do?*
* *How can you prove the amounts are not equal?*
* *Did you show what you were thinking with numbers?*
* *What would need to happen for the amounts (or groups) to be equal?*

As students talk, make note of the words they are using; you may even want to jot them on a chart or on the board. You are specifically listening for *same, same as, same amount/number, more, less, fewer*, etc. As you or your students recap what is determined (that the sets are not equal), use and reiterate this vocabulary (e.g. *The amounts are not the same because there are more blue balloons than red balloons. To make the amounts equal, we need the same number of blue and red balloons.)*

**Launch:**

1. Introduce the task (2-3 minutes)

Tell students they have been so helpful that you would like their help again. Explain that your dad is making cupcakes for the party and he wants to make sure there is an equal amount of chocolate and vanilla cupcakes. As he is baking, he uses the following equation to show how many chocolate and vanilla cupcakes he has.

 c*hocolate vanilla*

 4 + 4 = 5 + 3

 *Is my dad’s equation true? Does he have an equal amount of chocolate and*

 *vanilla cupcakes?*

**Explore:**

1. Solving the Problem (8-10 minutes)

Have students work in partners or groups of three to determine if the expression is true and there is an equal amount of chocolate and vanilla cupcakes. Try not to prompt or guide, but allow students to use any method of their choosing to determine equality. Use questions such as the following as needed:

* *How did you determine they are/are not equal?*
* *How could you draw this situation?*
* *Can you explain your thinking to me?*

Consider a few different examples of student work (could be accurate or inaccurate) and in what order you would like students to share their thinking to spark discussion once you bring the students back together as a class.

**Discuss:**

1. Discussion (10-15 minutes)

Bring students back together as a large group and again take a quick tally of who says **Yes**, it is true and who says **No**, it is not true. Respond accordingly, then proceed with selected students sharing their thinking and their work. As students explain their process of determining if the equation is true, draw/write what the students share so the thinking is visible for all.

If not demonstrated by a student, you may say *I saw someone drawing groups or sets to decide if it was true, like in our balloon situation.* Proceed by showing with drawings or manipulatives. This will allow students to make connections and will allow for those struggling with the expressions to see the equation and equality more clearly.

As the discussion flows, be sure to draw out the idea of equality – how what is on one side of the equal sign must be the same, or have the same value, as what is on the other side of the equal sign. Explain this is the purpose of the equal sign, to show amounts as being the same, not to indicate an answer or a total. You may even consider showing the same equation, but with the expressions switched (5+3 = 4+4). Ask students: *Is this equation true?* Hopefully they will immediately respond **Yes** since all you did was switch the sides the addends are on.

 **Additional Activities (if needed)**

1. Practice and Application (10 minutes)

In order to allow students to extend this idea and practice, one option is to give students another equation and ask them to determine if it is true. This will allow some students to try another method for determining or proving/disproving equality that they did not use previously but was highlighted during group discussion. An example could be:

 **2 + 4 =** **3 + 2**

To provide an opportunity for students to apply what they are learning, show them the following numbers and ask them to write a true equation using only these numbers and symbols.

 **8 11 3**

The resulting true equations could be 11 = 8 + 3 or 8 + 3 = 11. Be sure to highlight both ways to reinforce that the equal sign is a symbol meaning the same amount and not just preceding the total.

If students are grasping this idea of equality with general ease, consider using four numbers for this activity instead of three. Have students write a true equation with the four numbers.

 **2 6 7 3**

These numbers could result in an equation using addition or subtraction. It would be interesting to see how students respond. 2 + 7 = 6 + 3 or 6 – 2 = 7 – 3

**Evaluation of Student Understanding**

**Informal Evaluation**:

Observe students to see what strategies they use to determine and prove or disprove equality with each equation. Students will likely fall into the following categories:

 -those that lack an understanding of equality in general and/or the symbols used (=, +)

 -those that grasp equality but use pictures and counting to check whether equations are true

 -those that understand equality and have a good grasp of computation so they are able to

 see equality through mental computation or using what they know about the operations to

 arrive at a total to check for equality

As needed, use questioning to further understand students’ thinking. Make note of the category students tend to be in and also strategies they are using when solving or computing.

**Formal Evaluation/Exit Ticket:**

Give the students the following task and ask them to show and justify their thinking.

 *Yasmine says the equation 12 = 7 + 4 is true because 12 is the same amount as when you*

 *add 7 and 4 together. Tell whether Yasmine is correct or incorrect and justify your answer*

 *using pictures, numbers, and/or words.*

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

**Intervention:**

For students who are struggling, continue to encourage the use of manipulatives to count and also the use of drawing pictures to show quantities before determining if the amounts are equal. The use of a number balance to demonstrate the meaning of the equal sign as “same” is also highly recommended for students.

**Extension:**

Continue to give students equations such as the practice equation 2 + 4 = 3 + 2. This example can give insight into students’ number sense. For example, students may simply notice different numbers both added to two will not yield you the same total. They would not need to actually do the computation or draw groups but are able to see the inequality using what they know of numbers and operations. You may ask students to simply use words to explain how they know whether the equation is true or not true without doing any computation.

Another option is to begin mixing operations in equations for students who need to be challenged with this concept. For example, 9 – 4 = 2 + 2

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students see the number after the equal sign as being the total or the only number. For example, 4 + 4 = 5 + 3 is seen as 4 + 4 = 5 which would not be true. | Expose children to more equations where theequal sign is toward the beginning of the equation. (4 = 2 + 2 rather than 2 + 2 = 4)Also use a number balance to show two quantitieson each side which creates a balance (or animbalance) |

**Special Notes:**

* The goal of this standard is for students to apply understanding of the equal sign. They should equate the equal sign with equality, balance, or the same as. They use this understanding to then determine if equations are true.
* This lesson could be repeated (at least in part) using subtraction, as subtraction is often more of a stumbling block for students. This lesson focuses on equality with mainly addition. To meet the full extent of the standard, students must be able to apply their understanding of the equal sign and equality to both addition and subtraction equations.

**Activity Sheet**

   **=** 



   **=** 



**Activity Sheet**

chocolate vanilla

4 + 4 = 5 + 3

chocolate vanilla

4 + 4 = 5 + 3

**Exit Ticket**

**Yasmine says the equation 12 = 7 + 4 is true because 12 is the same amount as when you add 7 and 4 together. Tell whether Yasmine is correct or incorrect and justify your answer using pictures, numbers, and/or words.**

**correct incorrect**

**Yasmine says the equation 12 = 7 + 4 is true because 12 is the same amount as when you add 7 and 4 together. Tell whether Yasmine is correct or incorrect and justify your answer using pictures, numbers, and/or words.**

**correct incorrect**