What is Equal?

Strand: Patterns, Functions and Algebra

Topic: Exploring equivalencies

Primary SOL: 1.15 The student will demonstrate an understanding of equality through the use of the equal symbol.

Related SOL: 1.2b, 1.4a, 1.7a

Materials

- Two-colored counters, or beans painted on one side only
- Plastic cups
- Equal Means the Same Recording Sheet (attached)
- Exit tickets

Vocabulary

equal, equality, equals sign (=), false, fewer, more, the same, value, true

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Ask students what they think the word *equal* means. If they need prompting, ask them to think about a time when they had to divide something into two equal parts.
2. Show students six two-color counters—for example, four red and two yellow. Explain that you are going to put all six counters in a cup and then pour them out. Have students count with you as you drop each counter into the cup one by one. Ask a student to come up, shake the cup, and pour the counters out.
3. Have students count how many red counters there are (four) and how many yellow (two). Ask, *"Are there still six counters altogether? How can we be sure?"* (Count them.) Record on the board the equation 4 + 2 = 6. Ask students whether anyone can explain how these numerals relate to the counters they see. Ask what the equals sign means. Confirm that the equals sign tells us that the things we see on each side of it have the same value or are equivalent. Explain to students that saying four red counters plus two yellow counters is the same as six counters. Ask someone to come up and prove that the expressions on each side are equivalent, using the counters.
4. Ask another volunteer to come up and count as he/she puts the six counters back in the cup. Ask, *"How many counters are there altogether?"* Write this number on the board followed by the equal symbol. Have the volunteer shake the counters and pour them out again. Ask, *"How many red counters are there now (e.g., five) and how many yellow (e.g., one)?"* Add 5 + 1 to the equation on the board after the equal symbol. (6 = 5 + 1) Ask, *"How can we be sure?"* Ask your volunteer to prove 5 plus 1 is equal (or equivalent) to 6, using the counters.
5. Direct students to the equation on the board. Ask: *"What do you notice about this number sentence? Is that correct? Why or why not?"* Students should notice that it is whole-part-part. Ask, *"Does the equation still make sense – is it true?"*

6. Ask another volunteer to come up and count as he/she puts the six counters back in the cup. Have the volunteer shake the counters and pour them out again. Again, ask, *"How many red counters are there now (e.g., three) and how many yellow (e.g., three)?"* Ask: *"How many counters are there altogether? How can we be sure?"* Ask what number sentence you should write to represent what students see (3 + 3 = 6). Ask your volunteer to prove 3 plus 3 is equal (or equivalent) to 6, using the counters. Ask them what the equals sign means here. *"Who can tell me how to write this another way?"* (6 = 3 + 3) Ask your volunteer to prove that having six counters is the same as having three red counters and three yellow counters.
7. Repeat counting, shaking, and pouring the six counters until you believe students are ready to work on their own (or with a partner). Then, pass out six counters and a cup to each student (or pair), and have them count, shake, and pour the counters on their work space. Have students record in their mathematics journals the different combinations they were able to find, making sure they use the equals sign in their equations. Encourage students to record equations by writing 3 + 3 = 6 as well as 6 = 3 + 3.
8. After students have found all of the different combinations of 6, introduce the notation 6 = 6, and discuss: "*What does this mean?"* After you introduce 6 = 6, but before you show students a false equation, introduce the idea of writing 4 + 2 = 1 + 5 and discuss: "*What does this mean?"* Have students write as many equations as they can that show equivalent parts on both sides of the equation, using the equations they wrote in their journals to help them. Students can write these equations in their journals or use the attached Equal Means the Same recording sheet. Let students share the equations they have written, encouraging students to explain why each equation can be written that way. Follow this discussion by presenting the following: 4 + 2 = 6 + 1. Ask: *"What do you think about this one?"* Ask a volunteer to prove the statement as true or false. Under the equation, write 6 = 7. *"Is this a true statement? Is having seven counters the same as having six counters?"* Explain to students, *"These amounts are not equal, so it is false!"* Place an X over the false equation. Tell the students, *"Seven is not the same as six."* The teacher should put her arms up to make an X to show students that this does not work.
9. Show students two sets of counters. Explain to students that you will show two sets of counters on the document camera. If the two sets are equal, have the students use their arms to make an equals sign. (Place one arm above and parallel to the other arm.) If the sets are not equal, have students place their arms in an X. Model the following sets of counters. Ask students to justify how they know they are equal or not. If students decide that they are equal, have students write that equation in their journals.
    - 4 red and 2 yellow, 3 red and 3 yellow
    - 3 red and 3 yellow, 3 red and 4 yellow
    - 5 red and 2 yellow, 3 red and 4 yellow
    - 5 red and 3 yellow, 5 red and 2 yellow
    - 4 red and 4 yellow, 6 red and 3 yellow
    - 4 red and 4 yellow, 4 yellow and 4 red

10. To close the lesson, ask students to find a partner and discuss the following question: *How would you explain to someone what the equals sign means and how to use it?*

Assessment

- **Questions**
  - What does it mean to be equal?
  - How will you know when to use an equals sign?
  - Fill in the missing number to make this true: 3 + 5 = __ + 6
  - What number goes in the blank: ___ = 3 + 4?
  - How can you prove that 2 + 3 and 4 + 1 are equivalent, or equal?
- **Journal/writing prompts**
  - Write about what you discovered today when you were working with your group of counters.
  - Look at this number sentence 4 + 3 = 3 + 4. How are the numbers and symbols on each side of the equals sign the same? How are they different? Use words, pictures, and numbers to prove explain your thinking.
  - Jonna had six stickers. Three of her stickers were hearts and three were stars. Jonna wrote, 6 = 3 + 3. Explain what each of the numbers and symbols in this number sentence means.
- **Other Assessments**
  - Circulate as students work, and note those who are struggling and those who are working with ease. Are any students noticing or discussing how 1 + 5 and 5 + 1 have the same numerals in their number sentences? Are they making any observations or connections?
  - Use the attached exit tickets to have students model an equation that joins two equivalent addition expressions, find equations that model the correct use of the equals sign, and complete equations with missing numbers.

Extensions and Connections (for all students)

- Place seven two-colored counters in the cup, shake, and pour out. Record the number of yellow and the number of red counters showing, but do not use the equals sign or include the sum. Return the counters to the cup. Shake and pour a second time. Record the number of yellow and the number of red counters showing now. Ask students whether the total number of counters poured first equals the total number poured second. Ask, "How do you know? Can you prove it? How can you write the number sentence showing the relationship between the numbers of the first and second pours?" (3 + 4 = 2 + 5).
- Provide counters and cups in your mathematics center to allow students time to explore the different combinations they can find for a given number of counters.
- Explore a number sentence that joins an addition expression and an equivalent subtraction expression (3 + 3 = 7 – 1). Discuss what this expression means. Also explore a number sentence that joins two equivalent subtraction expressions. (5 – 1 = 6 – 2). Ask

children to suggest addition and subtraction expressions that show a given amount. List all of their ideas asking for each to be proved (for example, if given the number 10, students might suggest 5 + 5, 6 + 4, 3 + 7, 11 – 1, 4 + 6, 15 – 5, etc.). Then have children choose two expressions from the list and write a number sentence using the equals sign.

- Explore the idea of equality as being balanced. Use a number balance to model equivalent addition expressions. Place a weight on the 2 and a weight on the 4 on one side of the balance, and place two weights on the 3 on the other side of the balance.

Strategies for Differentiation

- Begin with a small number of counters and work up to larger numbers as students are ready.
- Provide students with multiple number bond bracelets with the same number of beads to represent the relationship of two expressions of equal value.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Equal Means the Same
Recording Sheet

Part + Part	Equals (The Same As)	Part + Part
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____
_____ + _____	=	_____ + _____

Exit Ticket 1

Use pictures, numbers, and words to show what this number sentence means.

$$2 + 3 = 4 + 1$$

Exit Ticket 2

Put an X on the equations that are not equal.

$7 + 2 = 8 + 1$ $\qquad$ $2 + 6 = 1 + 5$

$4 + 3 = 1 + 7$ $\qquad$ $9 + 1 = 6 + 3$

Exit Ticket 3

Fill in the missing addend.

$2 + 3 = 4 + \_\_$ $\qquad$ $9 + \_\_ = 5 + 5$ $\qquad$ $6 + 1 = \_\_ + 4$