

# Balancing Act

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**Reporting Category** Patterns, Functions, and Algebra

**Topic** Identifying equivalent and nonequivalent quantities

**Primary SOL** 2.22 The student will demonstrate an understanding of equality by recognizing that the symbol = in an equation indicates equivalent quantities and the symbol  $\neq$  indicates that quantities are not equivalent.

## Materials

- Balance scales
- Blue and green linking cubes
- Balancing Act: Equal or Not Equal? (attached)
- Balancing Act Card Set (attached)
- Scissors
- Balancing Act Work Mat (attached)
- Balancing Act Recording Sheet (attached)

## Vocabulary

*equal, equality, equation, equivalent, inequality, nonequivalent*

## Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. To begin, display a balance scale, and ask students to explain its use. If students are unfamiliar with the balance scale, demonstrate how it is used to weigh objects by placing an equal number of linking cubes on each side.
2. Display Example 1 on the Balancing Act: Equal or Not Equal? sheet. Choose a volunteer to come up and place the designated numbers of cubes on the balance scale to match the example. Ask whether the quantities of cubes on the two sides of the scale are equal or not equal. In the space provided in the center of the diagram of the scale, write the correct symbol. Challenge the class to prove their answer in some way other than reading the scale. Possible explanations may include: "I know that  $2 + 3 = 5$ , so there are 5 cubes on the left side. Since the right side is  $5 + 2$ , I know there will be more than 5 cubes on the right, so the numbers of cubes on the two sides of the scale are not equal;" or "I know  $2 + 3 = 5$  and  $5 + 2 = 7$ . Because 5 is smaller than 7, they are not equal."
3. Repeat this process for Example 2, using another volunteer.
4. Put student in small groups or pairs, and give each group a balance scale, a set of 10 blue and 10 green linking cubes, copies of the card set, a work mat, and the recording sheet. Have each group cut out, shuffle, and place the cards face down. Then, have students take turns drawing two cards, placing one on one side of the work mat and the other on the other side. Students arrange the cubes on the balance scale to determine whether the quantities written on the two cards are equal or not equal. Direct students to record all information from the work mat on their recording sheets. Instruct students to prove how they know that each pair of quantities is equivalent or nonequivalent.

5. Review and summarize with the class what students did and learned in the activity. Have students share some of the proofs they wrote and any discoveries they made.

### Assessment

- **Questions**
  - How can someone determine whether two quantities are equal or not equal?
  - Were you able to predict whether two quantities were equal or not equal before placing the cubes on the balance scale? If so, how?
- **Journal/Writing Prompts**
  - Sam puts 3 green cubes and 3 blue cubes on one side of a balance scale. Draw a picture of the scale, and show what Sam could place on the other side to make the quantities equal. Explain how you know your solution will work. Are there any other solutions that will work?
  - Kyree puts 9 green cubes and 4 blue cubes on one side of a balance scale. Draw a picture of the scale, and show what Kyree could place on the other side to make the quantities *not* equal. Explain how you know your solution will work. Are there any other solutions that will work?
- **Other**
  - Circulate as students are creating and recording their own equations and inequalities, and observe their strategies and rationales. Ask questions to determine whether students are absorbing the key points. Note who is having difficulty, and give help, as needed. Collect the papers as an assessment.
  - Create signal cards (green, yellow, and red) to check for understanding. Green means “I got it,” yellow means “I’m not sure” or “Maybe,” and red means “I’m lost. I need more help.” Pause at different points in the activity and ask students to hold up their signal cards.
  - Have the class form a circle to participate in a discussion. Have students take turns telling something that they learned and will remember, and why this discovery is important.

### Extensions and Connections (for all students)

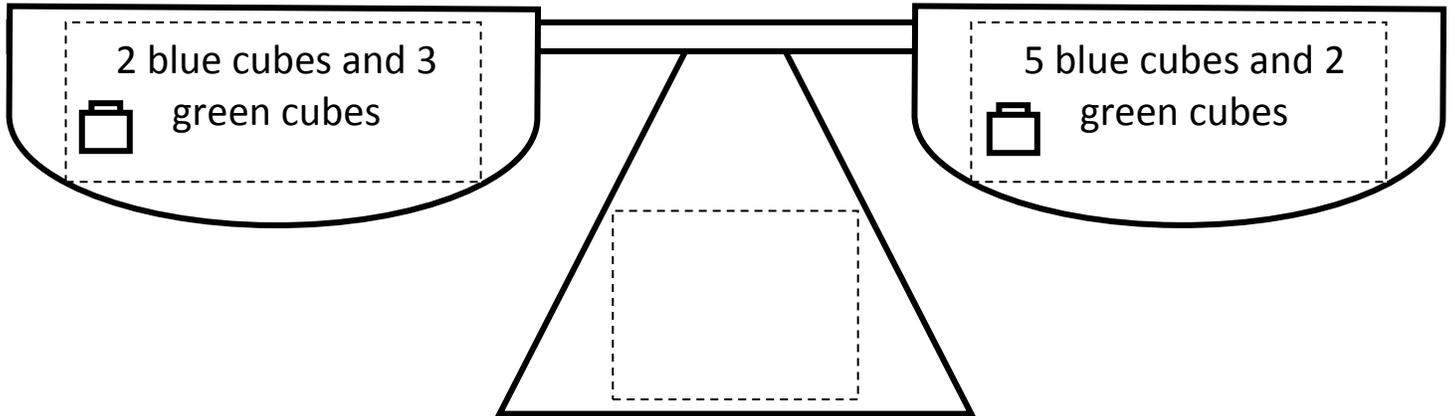
- Have students work in pairs to see whether they can make the scale balance using a bucket balance. The first student will place a known number of cubes plus a “mystery” number of cubes on one side of the bucket scale (e.g.,  $3 + \underline{\quad}$ ). The student will need to cover the bucket so that his/her partner cannot see the cubes inside. The partner must then use the scale and the known number of cubes placed to determine the “mystery” number.
- Have one partner create a number sentence, and have the other partner create a different number sentence equal to the one made by his/her partner.
- Explore the commutative property for addition and the identity property of addition using linking cubes and the balance scale.

### Strategies for Differentiation

- For a greater challenge, have students use weighted counters instead of connecting cubes.
- Allow students struggling to understand equal or not equal to connect the cubes on each side of the balance and compare them to each other, using one-to-one correspondence.

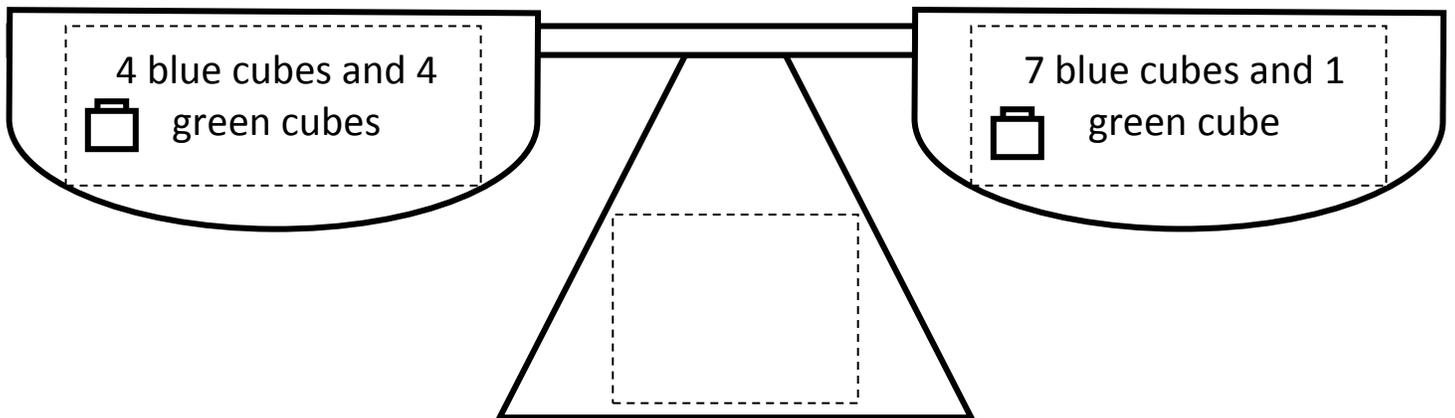
# Balancing Act: Equal or Not Equal?

**Example 1:**



**Prove your answer:**

**Example 2:**

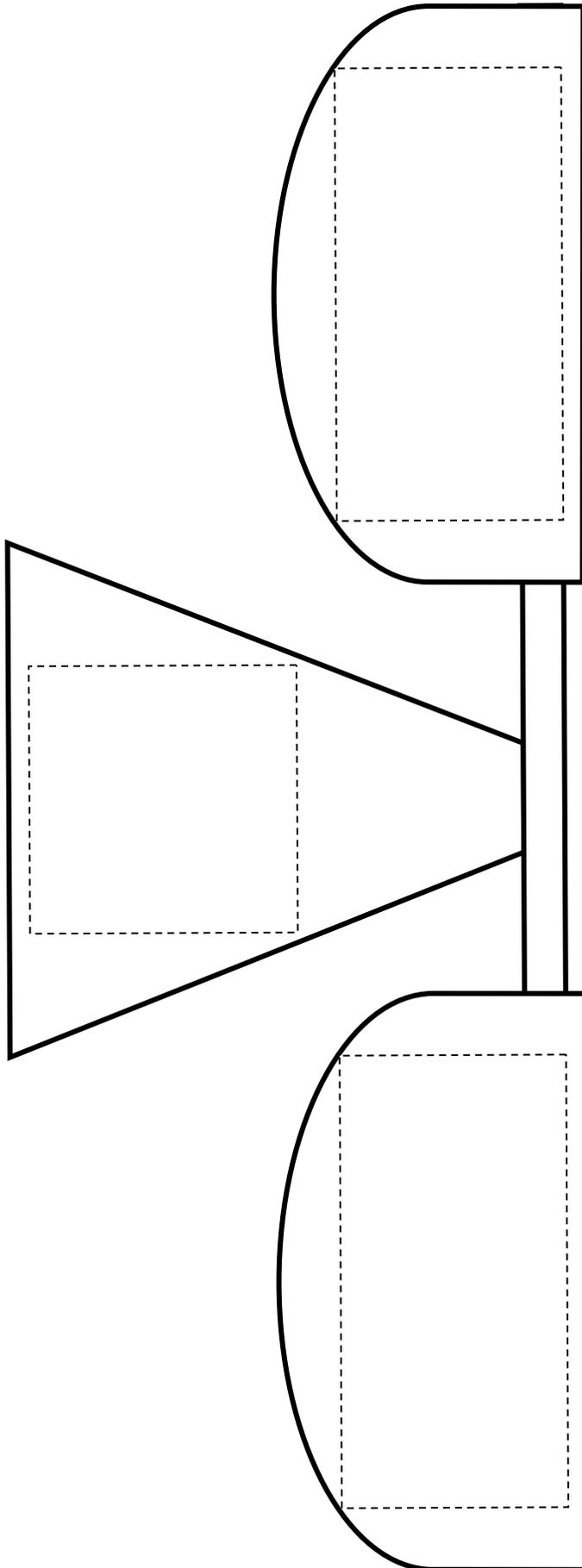


**Prove your answer:**

# Balancing Act Card Set

Cut cards apart on the dotted lines.

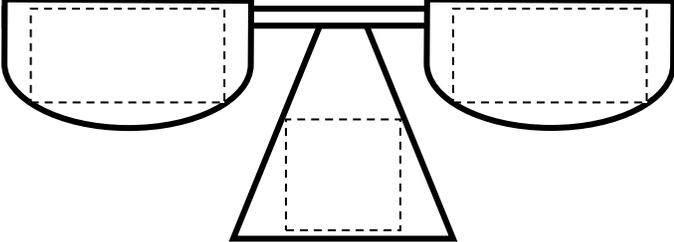
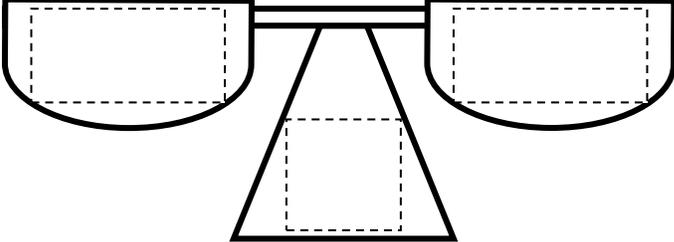
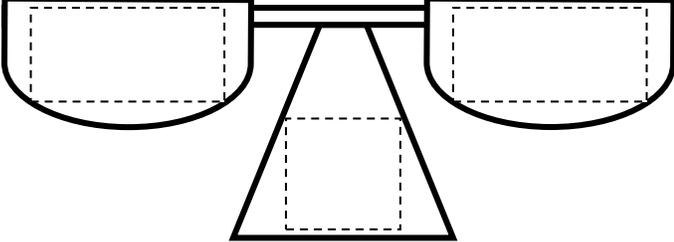
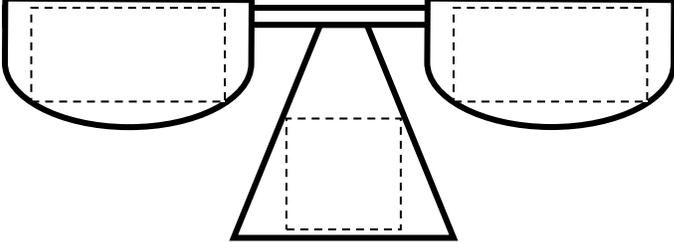
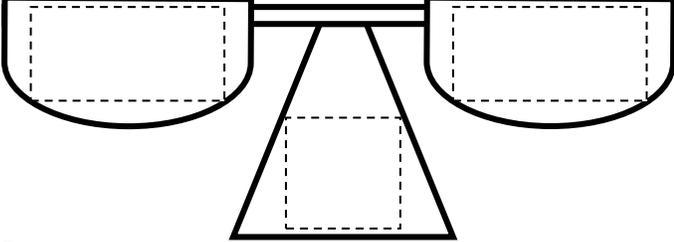
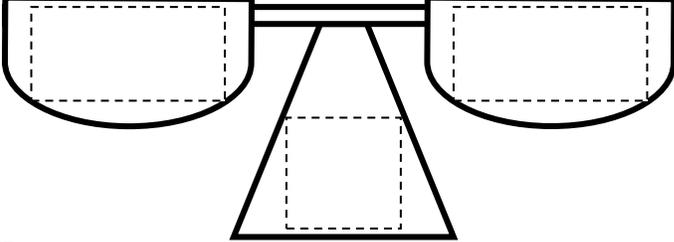
4 blue cubes and 6 green cubes 	6 blue cubes and 4 green cubes 	<b>Equal</b> =
2 blue cubes and 8 green cubes 	8 blue cubes and 1 green cube 	<b>Not Equal</b> ≠
5 blue cubes and 5 green cubes 	4 blue cubes and 4 green cubes 	
3 blue cubes and 7 green cubes 	5 blue cubes and 2 green cubes 	
6 blue cubes and 3 green cubes 	0 blue cubes and 8 green cubes 	
4 blue cubes and 3 green cubes 	1 blue cube and 9 green cubes 	



# Balancing Act Work Mat

# Balancing Act Recording Sheet

In each box below, record the information from your work mat, and prove each answer.

 <p>Prove your answer:</p>	 <p>Prove your answer:</p>
 <p>Prove your answer:</p>	 <p>Prove your answer:</p>
 <p>Prove your answer:</p>	 <p>Prove your answer:</p>