Mathematics Instructional Cycle Guide

1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.

Robin Moore, 2014 Connecticut Dream Team Teacher

CT CORE STANDARDS

This Instructional Cycle Guide relates to the following *Standards for Mathematical Content* in the *CT Core Standards for Mathematics*:

Work with addition and subtraction equations.
1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction equations.

This Instructional Cycle Guide also relates to the following *Standards for Mathematical Practice* in the *CT Core Standards for Mathematics*:

MP2 Reason abstractly and quantitatively.
MP3 Construct viable arguments and critique the reasoning of others.
MP6 Attend to precision.
MP7 Look for and make use of structure.

WHAT IS INCLUDED IN THIS DOCUMENT?

- A Mathematical Checkpoint to elicit evidence of student understanding and identify student understandings and misunderstandings **(page 2)**
- A student response guide with examples of student work to support the analysis and interpretation of student work on the Mathematical Checkpoint **(pages 3-7)**
- A follow-up lesson plan designed to use the evidence from the student work and address the student understandings and misunderstandings revealed **(pages 8-13)**
- Supporting lesson materials **(pages 14-21)**
- Precursory research and review of standard **1.OA.7** and assessment items that illustrate the standard **(pages 22-24)**

HOW TO USE THIS DOCUMENT

1) Before the lesson, administer the **True or False? *Mathematical Checkpoint*** individually to students to elicit evidence of student understanding
2) Analyze and interpret the student work using the ***Student Response Guide***
3) Use the next steps or ***follow-up lesson plan*** to support planning and implementation of instruction to address student understandings and misunderstandings revealed by the Mathematical Checkpoint
4) Make instructional decisions based on the checks for understanding embedded in the follow-up lesson plan

MATERIALS SUGGESTED

- Chart Paper
- Equal Shmequal by Virginia Kroll ISBN: 978-1570918926
- Balance
- Connecting Cubes
- Post-It Notes
- Dry erase boards for students

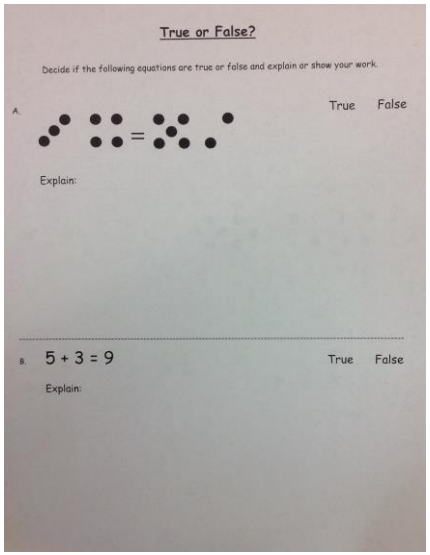
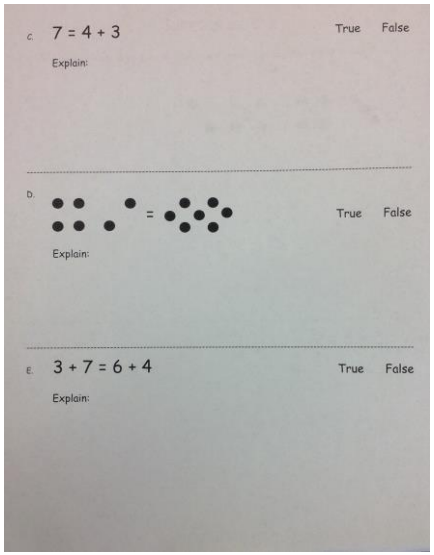
MATERIALS PROVIDED

- Sets of differentiated Equation Cards (True or False?-Set A and True or False?-Set B)
- Equation Starter Cards-Extension
- Recording Sheets
- Thinking About My Learning
- Exit Ticket

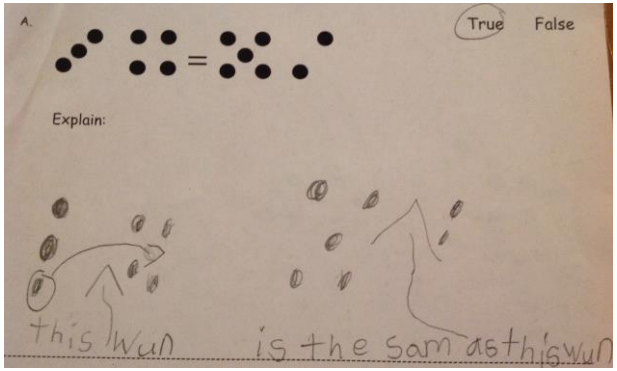
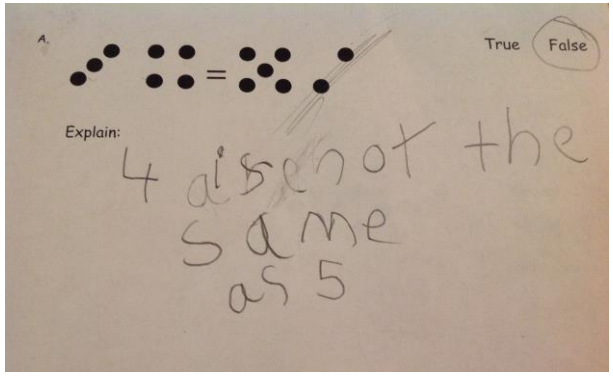
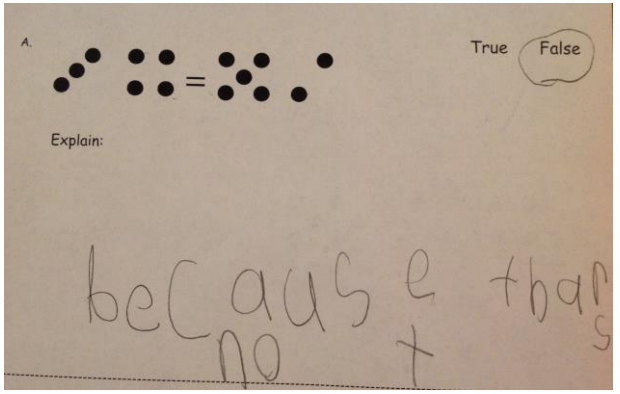
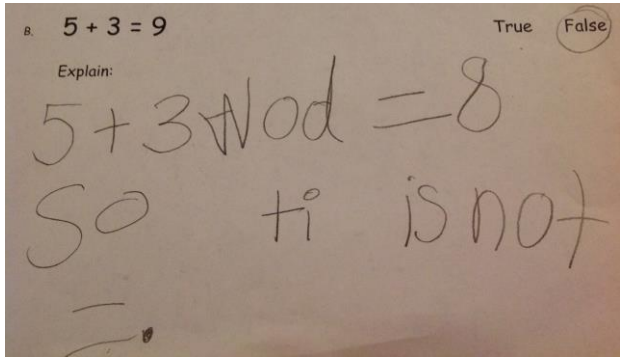
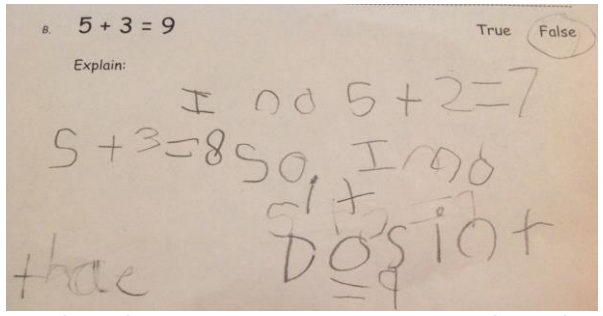
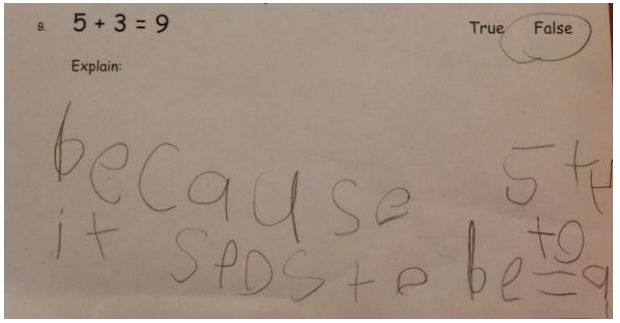
TIME NEEDED

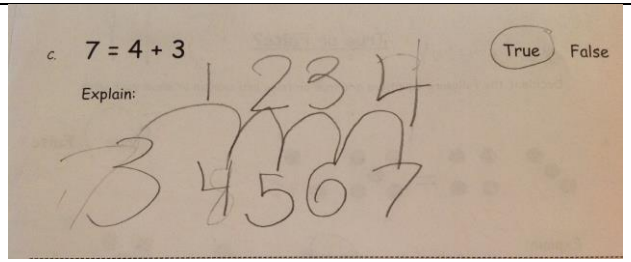
True or False ? Checkpoint administration: **5-10 minutes**
Follow-Up Lesson Plan: **1-2 instructional blocks**

Timings are only approximate. Exact timings will depend on the length of the instructional block and needs of the students in the class.

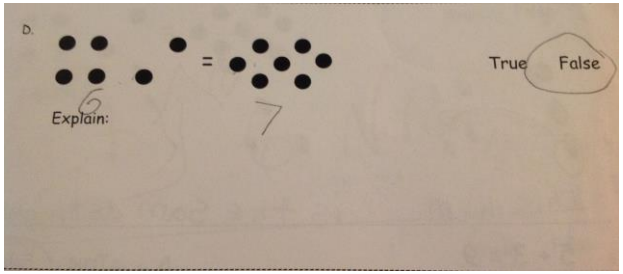
Step 1: Elicit evidence of student understanding		
Mathematical Checkpoint		
Question(s)	**Purpose**	
Decide if the following equations are true or false and explain your thinking.   	**CT Core Standard:**	CCSS.MATH.CONTENT.1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.
	Target question addressed by this checkpoint:	• Do students understand the meaning of the equal sign? • Do students accept equations other than a + b = c as true? (i.e. c = a + b, a + b = c + d, pictorial representations instead of numbers, etc.)

LearnZillion

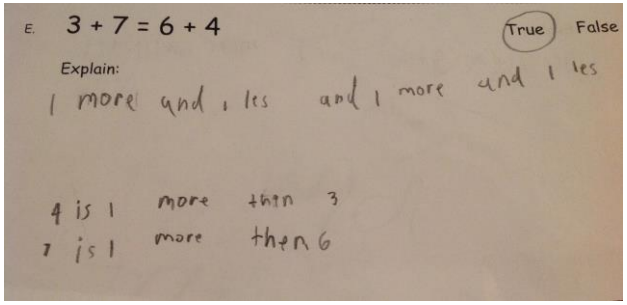
Step 2: Analyze and Interpret Student Work Student Response Guide		
Got It	**Developing**	**Getting Started**
Decide if the following equations are true or false and explain your thinking	Decide if the following equations are true or false and explain your thinking.	Decide if the following equations are true or false and explain your thinking.
 A. True: This one is the same as this one. *(This student visualized moving a dot from the group of three dots over to the middle of the four dots so that the image resembled the grouping of five and two dots to the right of the equal sign. A student may also explain that 3 + 4 = 7 and 5 + 2 = 7, in order to communicate that the statement is true.*	 A. False: 4 is not the same as 5. (*Student points to the group of 4 dots on left excluding the group of 3 dots and then points to the group of five dots on the right excluding the group of two dots.)*	 A. False: Because there is no plus sign.
 B. False: 5 + 3 would equal 8, so it is not equal.	 B. False: I know 5 + 2 = 7. 5 + 3 = 8, so I know it doesn't equal 9.	 B. False: Because it is supposed to be 5 + 4 = 9.



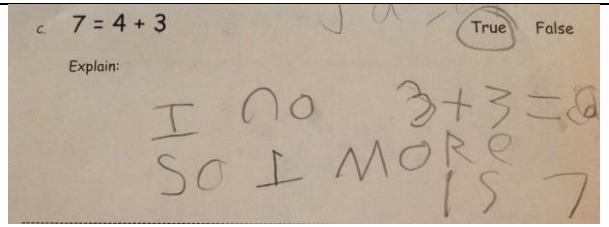
C. True: *("I started at three and counted on four more, and I landed at 7.")*



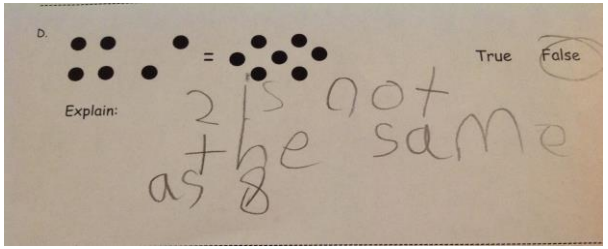
D. *False: ("There are 6 dots here and 7 dots there.")*



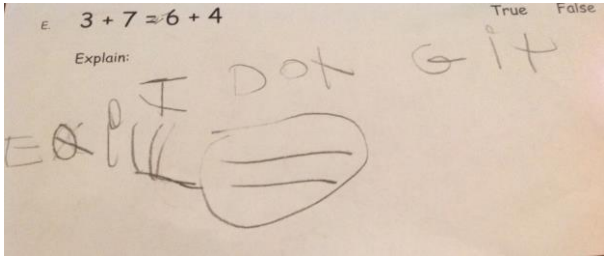
E. True: 1 more and 1 less and 1 more and 1 less. 4 is 1 more than 3. 7 is 1 more than 6. *('I know that four is one more than three, and seven is one more than 6, so they are equal.')*



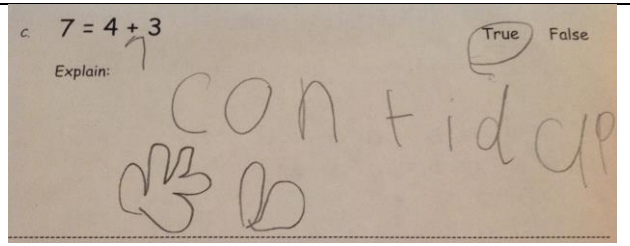
C. True: I know 3 + 3 = 6, so 1 more is 7.



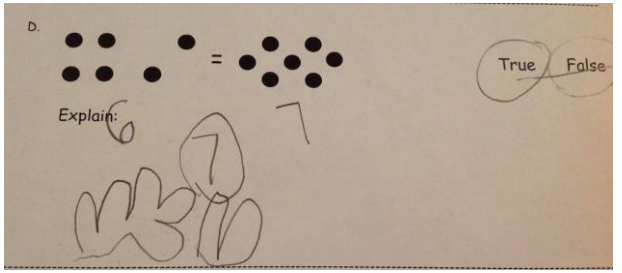
D. False: 2 is not the same as 8. *(Student points to the group of two dots on the left excluding the group of four dots, and then points to the group of dots on the right as eight dots).*



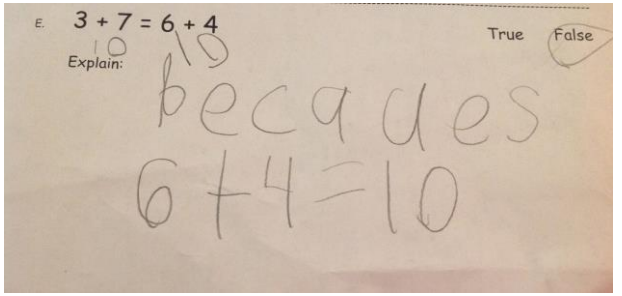
E: (Student did not know what to do.) I don't get equal sign.



C. True: 7 counted up ("*I used my fingers to count up. 4, 5, 6, 7.")*

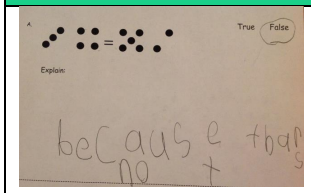
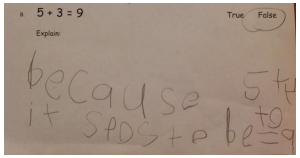
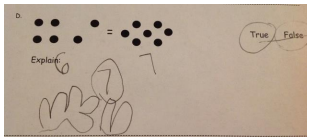
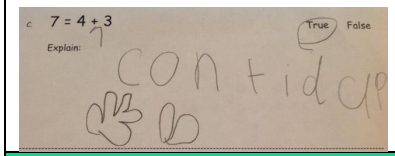
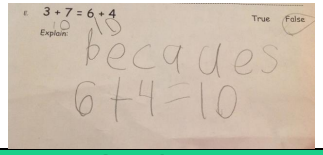


D. True: ("*I used my fingers to count up." Pointing to the left, "4, 5, 6." Pointing to the right, "3, 4, 5, 6, 7. So it is 7."*



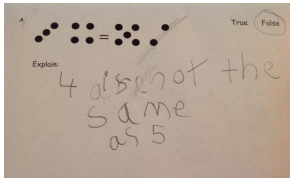
E. False: Because 6 + 4 = 10.

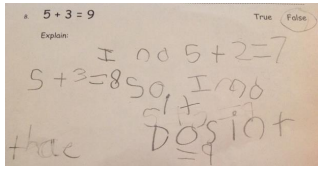
LearnZillion

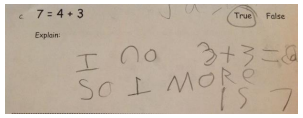
Getting Started	
Student Response Example	**Indicators**
    	• Student may provide some correct responses especially when the format follows the traditional a + b = c. • Student may or may not understand the meaning of "true" and "false". • Student may not understand the meaning of the equal sign. • Student may not yet understand that equations can follow a format other than a + b = c.
In the Moment Questions/Prompts	**Closing the Loop (Interventions/Extensions)**
Q: What does true mean? What does false mean? Q: Tell me something that is true. Tell me something that is false. P: (*For question A. or D.)* • How many dots do you see over here (circle dots to the left of the equal sign)? • How many dots do you see over there (circle the dots to the left of the equal sign)? • Are the groups of dots equal to each other? Q: (For question B, show 5 + 3 = ___) • How could I make this equation true? P: (Show student her work for problem C. and E.) • I noticed that for 7 = 4 + 3 you wrote a 7 under 4 + 3. Why? • Is 7=7 true or false? I notice that for 3 + 7 = 6 + 4 you wrote a 10 under 3 + 7 and a 10 under 6 + 4. Why? • Is 10 = 10 true or false? Q: (Show student her work for problem D.) I noticed that you put a 6 under these groups of dots and a 7 under this group of dots. Is 6 = 7 true or false?	Brainstorm real-life examples of statements that are true and false. (i.e. True: My hair is brown. False: My hair is purple.) Use a see-saw to investigate what happens when two people that weigh the same amount are in each seat. Discuss how it stays in the middle because it is balanced. Explore what happens when the two people are different amounts. (If a see-saw is not available, model with objects using a balance) **Be sure to interchange the words, balanced and equal.** Act out equations using connecting cubes and a balance to determine if they are true or false. Place an equal sign on the center of the balance. Examples: • Start with simple equations such as 6 = 7, and scaffold as necessary. Place 6 cubes one side of the balance. Attach a Post-it note with a 6 on this side. Place 7 cubes on the other side and attach a Post-it note with a 7. **Discuss whether or not the modeled equation is true or false.** • Work up to equations such as 2 + 3 = 5 or 5 = 2 + 3. For 2 + 3 = 5, place a tower of 2 red cubes and a tower of 3 blue cubes on one side of the balance. Attach a Post-it note with the expression 2 + 3 written out. On the other side of the balance, place a tower of 5 yellow cubes with the number 5 attached. **Discuss whether or not it is true or false.** https://www.illustrativemathematics.org/illustrations/1150

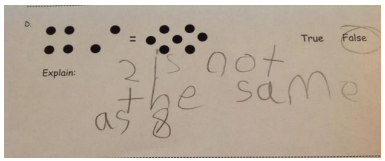
Developing

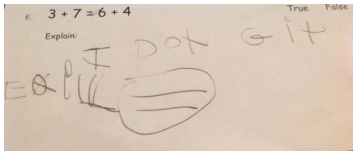
Student Response Example











Indicators

- Student understands the meaning of “true” and “false”.
- Student understands that in order for an equation to be true, the value on both sides of the equal side must be the same.
- Student may not yet understand that equations can follow a format other than a + b = c.
- Student may not take into account all components of an equation when determining whether it is true or false.
- Student miscounted one of the groups of dots.

In the Moment Questions/Prompts

P: In question A, I noticed that you said it was false because 4 is not the same as 5.

- **Can you show me where you see 4 dots? 6 dots?**
- **(Draw a red circle around the dots on the left of the equation. Draw a blue circle around the dots on the right of the equations.) How many dots are in the red circle? Blue circle?**
- **If we look at all of the dots, does 7=7? Is that true or false?**
- **Let’s look at Question D. If we look at all of the dots, is it true or false? Why?**

P: (For question E, circle 3 + 7 in red and 6 + 4 in blue.)

- **What does the red circle equal?**
- **Blue circle?**
- **Does 10=10?**
- **Why?**

Closing the Loop (Interventions/Extensions)

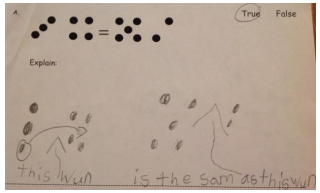
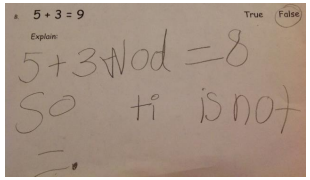
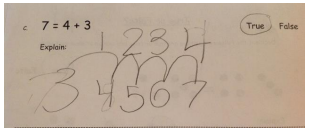
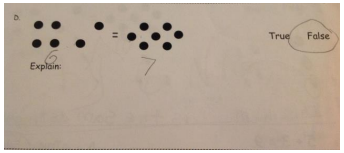
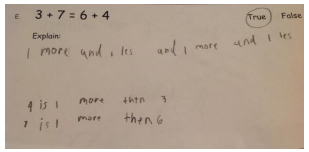
Act out equations by having students model each expression using cubes.
Example:

- For 2 + 4 = 3 + 3 Place an equal sign on the table and ask students to build 2 + 4 (2 blocks of one color and 4 blocks of a different color) on one side of the equal sign and 3 blocks of one color and 3 blocks of a different color.

Act out equations using a balance to determine if they are true or false. Place an equal sign on the center of the balance. Start with simple equations and build as necessary.
Examples:

- Start with an equation such as 2 + 3 = 5 or 5 = 2 + 3. For 2 + 3 = 5, place 2 cubes on the pan and 3 different colored cubes on the same pan with the expression 2 + 3 written out. On the other pan, place 5 cubes of one color with the number 5 written out. Discuss whether or not it is true or false.
- Work up to more complex equations such as 2 + 4 = 3 + 7. Discuss whether or not it is true or false.

https://www.illustrativemathematics.org/illustrations/475

Got it	
Student Response Example	**Indicators**
    	• Student understands the meaning of “true” and “false”. • Student understands that in order for an equation to be true, the value on both sides of the equal side must be the same. • Student accepts that equations other than a + b = c as true. • Student uses all information in an equation to determine whether it is true or false. • Student is able to correctly identify whether an equation is true or false. • Student is able to explain why an equation is true or false.
In the Moment Questions/Prompts	**Closing the Loop (Interventions/Extensions)**
Q: How could I make Question B true? **Q: How could I make Question C false?** **P: Show me how you could make Question D true.** **P: Show me a way to make the following equation true**: 2 **+ 6 =** ___ **+ 4**	Ask students to create examples of true and false equations. Provide opportunities for students to investigate how to find the unknown that would make each equation true. (i.e. 3 + 4 = __ + 6) Students may use cubes and a pan balance to explore. Have students determine if a variety of equations using subtraction (7 - 4 = 8 - 5) or a mix of addition and subtraction (3 + 2 = 9 - 4) are true or false. Allow students to create multiple ways to make a particular equation true. For example, start students off with 7 = ? or 6 + 4 = ?. Students see how many ways they can make each statement true. https://www.illustrativemathematics.org/illustrations/4 https://www.illustrativemathematics.org/illustrations/991

LearnZillion

Steps 3 and 4: Act on Evidence from Student Work and Adjust Instruction	
Lesson Objective:	Determine whether an equation is true or false.
Content Standard(s):	1.OA.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.
Targeted Practice Standard :	MP2 Reason abstractly and quantitatively. • Do students recognize that a number or expression represent a specific quantity? • Can students create a representation to go with a number or expression? MP3 Construct viable arguments and critique the reasoning of others. • Do students justify their conclusions, communicate them to others, and respond to the arguments of others? MP6 Attend to precision. • Do students use clear and precise language in their discussions with others and when they explain their own reasoning? MP7 Look for and make use of structure. • Do students see and use the structure of equations to recognize true and false equations?

Mathematical Goals	Success Criteria
• *Understand the meaning of the equal sign.* • *Solve expressions in order determine the values on both sides of an equation.* • *Identify an equation as being true or false.* • *Explain why an equation is true or false.*	• *Identify whether an equation is true or false.* • *Use pictures, numbers, or words to explain why an equation is true or false.*

Launch (Probe and Build Background Knowledge)

Purpose: Engage students in modeling with mathematics to probe and build background knowledge of what it means for things to be equal.

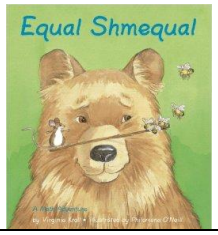
Display an equal sign and instruct students to use 30 seconds of private think time to think about what is this sign called and what does it mean?

Allow students to share their thinking with the whole group jotting down their ideas on a chart.

Tell the students that you are going to read them a story, Equal Shmequel, about some animals who wanted to play tug-of-war, but they were having difficulty trying to figure out how to make the teams equal.

(If you do not have access to this book, you may be able to substitute with a different book that illustrates this concept. You could also substitute the book with a class discussion on how to create equal teams for a game such as tug of war or soccer.)

Read out loud Equal Shmequel by Virginia Kroll.



Revisit the ideas that students had about the equal sign prior to reading the story. Allow students the opportunity to revise any of their ideas or add new thoughts regarding the equal sign.

Introduce students to a balance. Questions and prompts to guide this introduction of this new math tool could include:

- *Does anyone know what this is?*
- *Does anyone know what this can be used for?*
- *Has anyone ever been on a see-saw? How does it work?*
- *What will happen if I put some cubes over on this side? (other side is empty) Put 2 cubes in one side and leave other side empty.*
- *What will happen if I put more cubes on the other side? (one side has 2 cubes and the other side is empty) Put 5 cubes on the empty side.*
- *What will happen if I make both sides the same? (one side has 2 cubes and the other has 5 cubes) Put 3 more cubes in the side that has only 2, so that both sides have 5 cubes.*
- *Who can think of a word that means they are both the same?*

Tell the students that you are going to play "True or False?". Place a Post-It note with an equal sign on the center of the balance for the students to see.

Explain that in the story, the animals were trying to make the teams equal. You will model some possible scenarios representing the animals and see-saw using the balance and connecting cubes. Be sure to choose scenarios that demonstrate both unequal and equal teams. Possible scenarios to model could include:

- p. 4-Four children on each side of the tug-of-war rope. **TRUE**: Children = Children (4 white blocks on one side and 4 black blocks on the other side) **4 = 4**
- p. 5 & 6-Bear on one side of rope and Mouse on the other. **FALSE**: Bear = Mouse (10 brown blocks for Bear on one side, and 1 blue block on the other side for Mouse) **10 = 1**
- p. 19-Wolf on one side of see-saw and Turtle on the other. **FALSE**: Wolf = Turtle (5 yellow blocks for Wolf on one side and on the other side, 2 green blocks for Turtle) **5 = 2**
- p. 20-Turtle and Deer on one side of see-saw and Wolf on the other. **FALSE**: Turtle + Deer = Wolf (2 green blocks for Turtle and 9 orange blocks for Deer on one side and on the other side, 5 yellow blocks for Wolf) **2 + 9 = 5**
- p. 20-Turtle and Deer on one side of see-saw and Bobcat and Wolf on the other. **FALSE**: Turtle + Deer = Bobcat + Wolf (2 green blocks for Turtle and 9 orange blocks for Deer on one side and on the other side,4 red blocks for Bobcat and 5 yellow blocks for Wolf) **2 + 8 = 4 + 5**
- Turtle and Deer on one side of see-saw and Bear on the other. **True**: Turtle + Deer = Bear (2 green blocks for Turtle and 8 orange blocks for Deer on one side and on the other side,10 brown blocks for Bear) **2 + 8 = 10**
- Rabbit and Bobcat on one side and Turtle and Wolf on the other. **True:** Rabbit + Bobcat = Turtle + Wolf (3 purple blocks for Rabbit and 4 red blocks for Bobcat on one side and on the other side, 2 green blocks for Turtle and 5 yellow blocks for Wolf) **3 +4 = 2 + 5**

Questions and prompts to guide this game could include:

- *What does it mean if something is true? False?*
- *How do you know it is true? False?*
- *What would have to happen for it to be true? False*

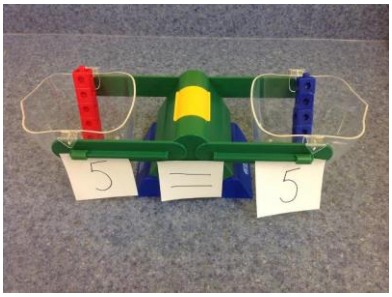
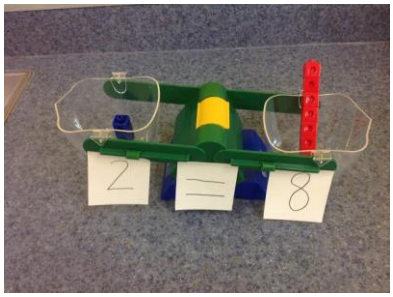
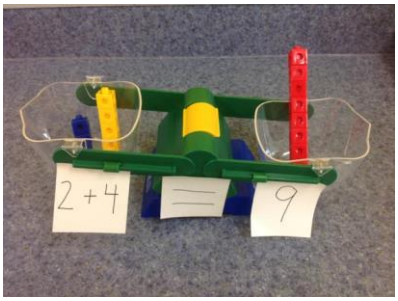
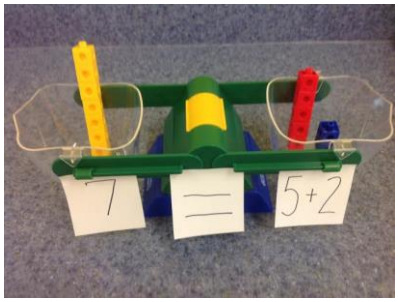
Instructional Task

Purpose: Students will identify whether their equations are true or false and explain their reasoning for their selection.

We just used a balance to help us determine whether or not the teams of animals in the story were equal. Sometimes the sides were not equal and sometimes they were equal. When we use an equal sign to write an equation, the equal sign is telling us that both sides of our equation are the same. This must be the case for equations to be true just like in the game we played. If both sides are not equal, then the equation is false. You are going to have a chance to continue playing "True or False" with some equations today.

Engage (Setting Up the Task)

Use the balance, connecting cubes, and Post-it notes to model the following equations:

5 = 5 	2 = 8 
2 + 4 = 9 	7 = 5 + 2 

For each equation, place a post-it note on each side of the balance to show the expression that matches that side and have the equal sign in the middle. Allow for students to determine whether the equation is true or false by giving a thumbs up for true and a thumbs down for false. Use the following questions to facilitate discussion:

- *Why do you think it is true? False?*
- *How could you make it true? False?*

Post the equation, 8 = 3 + 5, on a chart. Ask students to decide if it is true or false and be ready to explain their thinking for their choice on their dry erase board or paper. Select a few students to share their work; try to choose students who showed their thinking using different strategies or means to convey their ideas. Repeat the process for the equation, 4 + 2 = 5.

Before the lesson, create sets of True or False equation cards that are differentiated for each partnership. Be sure to have plenty of recording sheets available. You may also have some Equation Starter cards available for those who are ready for an extension.

Post the task directions below, and discuss how partner(s) should work together to complete the task. The following questions and prompts may be helpful to make sure students understand the task directions.

- *Tell your partner in your own words what you will do with the equation cards.*
- *What are questions that we could ask ourselves or think about as we decide if our equations are true or false? (You may want to post these questions for students to reflect on during their work.)*
- *How can we explain why an equation is true or false on our recording sheets?*

Explore (Solving the Task)

1.) Work with your partner to determine whether the equations on your set of cards are true or false.
2.) Write your equation on your recording sheet, circle whether it is true or false, and explain why you think it is true or false using pictures, words or numbers. You and your partner will need to agree about whether each equation is true or false.
3.) When you are done you can create some equations for your partner to determine if they are true or false.

Clarifying Questions/Prompts:

- *What do you know about this equation?*
- *Do you think this equation is true or false?*
- *How do you know this equation is true or false?*
- *What if the value to the left of the equal sign? What is the value to the right of the equal sign?*
- *How did you find the value of the left side of the equation? How did you find the value of the right side of the equation?*
- *Can you show me this equation on the balance?*

Advancing Questions/Prompts:

- *How could you make this equation true? How could you make this equation false?*
- *Can you think of another way to make this equation true? False?*
- *I noticed that you used pictures to explain your thinking. Can you think of a different way to show your thinking?*

Elaborate (Discuss Task and Related Mathematical Concepts)

Choose a few true and false equations that all students had in common as the focal point for discussion. Select a few students to share their work for these equations. Be sure to be purposeful in which student work is shown. Student work should be a variety of representations beginning with very concrete explanations that use pictures and moving toward more abstract representations that use numbers and equations. Facilitate whole class discussion to elicit evidence of student understanding and support students in making mathematical connections about how one can determine whether an equation is true of false.

- *What questions do you have about this explanation?*
- *Did anyone else explain it like this? Did someone use a different way to explain?*
- *What is the same about these explanations? What is different?*
- *What strategies did you and your partner use to figure out if an equation was true or false?*
- *What did you learn from this activity today?*

Checking for Understanding

Purpose: Pose the following problems to elicit evidence of student understanding of what makes an equation true.

Students will participate in a Four Corners game based on making equations true.
Display the following equation starter.

- 6 + 4 =

Also display each of the following expressions in each corner of the room.

- 7 + 3
- 12 – 2
- 8 + 3
- 9 - 1

Instruct students to go with a white board to one of the corners that display an expression that will make the equation true. Students must show their thinking on their dry erase board. Students who do not demonstrate understanding can model their equations on the balance. Be sure to allow students to discuss why they chose their corner to stand in. Have students explain what makes each corner true or false.

Game could be repeated with the following examples:

- Equation Starter: 4 + 3
  - Expressions to post in corners: 2 + 5, 10 – 3, 10 – 7, 2 + 6
- Equation Starter: 9 - 3
  - Expressions to post in corners: 10 - 4, 3 + 3, 3– 9, 9 + 3

Common Misunderstanding

Purpose: Use the game as an opportunity to engage students in defending their thinking, and addresses the importance of precision when problem solving.

During the Four Corners game, stand in the corner that is displaying an expression that would make the equation false. Model a common mistake that students make in their calculations and allow for students to defend their rationale for it being false. In the example from above, you may stand next to 8 + 3 and model your thinking on a number line counting the jumps on the number line beginning by counting 8, 9, 10 rather than counting 9, 10, 11.

Other possible misconceptions to model may include:

- computational mistakes
- not realizing that different operations can result in the same value on both sides of the equal sign (6 + 4 = 12 - 2)
- not all equations follow the format a + b = c (6 + 4 = 7 + 3)
- not relying on both the numbers and symbols in an expression (9 - 3=9 + 3)
- not understanding that the commutative property does not apply to subtraction (9 - 3 = 3 - 9)

Checking for Understanding

Purpose: Provide students with an exit ticket to elicit evidence of student understanding and ability to explain their thinking.

Circle all the true equations and explain your thinking.

A.) 8 = 5 + 3
B.) 5 + 3 = 7 + 2
C.) 10 – 6 = 5
D.) 9 – 2 = 2 + 5

Closure

Purpose: Provide students an opportunity to monitor and reflect on their own understanding using self-assessment prompts or in their journal.

I can explain what the equal sign means. Yes No

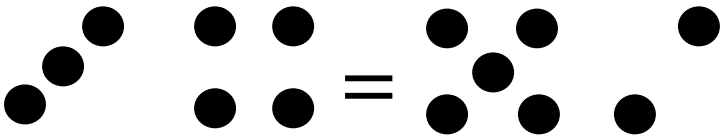
I can tell whether an equation is true or false. Yes No

Extension Task

Purpose: For students who are ready to deepen their understanding, provide them with equation starters and allow for them to find multiple was to make the equation true. If a student is given 6 + 4 =, they could complete it with 10, 8 + 2, 12 -2, etc. This work can be done on the recording sheets.

True or False?

Decide if the following equations are true or false and explain or show your work.

A.  True False

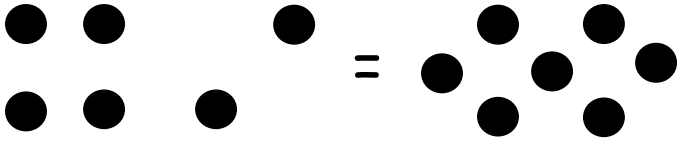
Explain:

B. $5 + 3 = 9$ True False

Explain:

C. $7 = 4 + 3$ True False

Explain:

D.  True False

Explain:

E. $3 + 7 = 6 + 4$ True False

Explain:

LearnZillion

True or False Equation Cards-Set A

2 + 8 = 9	8 = 6 + 2
9 - 4 = 5	6 - 3 = 2
4 = 7 - 3	2 + 7 = 9
6 + 3 = 4 + 5	4 + 4 = 5 + 2

LearnZillion

True or False Equation Cards-Set B

2 + 8 = 11 -1	8 - 4 = 3 + 1
9 - 4 = 7 - 2	5 + 3 = 2 + 7
4 + 2 + 1 = 7	3 + 3 + 2 = 9
6 + 3 = 4 + 5	4 + 4 = 5 + 2

Name _____

True or False?

Recording Sheet

=	True False

Explain:

=	True False

Explain:

LearnZillion

True or False Equation Starters-Extension

2 + 8 =	7 =
9 – 4 =	5 + 3 =
4 + 2 =	3 + 2 =
10 – 6 =	3 =

LearnZillion

Exit Ticket

Circle all of the equations that are true and explain your thinking for each.

A.) $8 = 5 + 3$	B.) $5 + 3 = 7 + 2$
C.) $10 - 6 = 5$	D.) $9 - 2 = 2 + 5$

LearnZillion

Thinking About My Learning

I can explain what the equal sign means.

Yes

No

I can tell whether an equation is true or false.

Yes

No

Research and review of standard	
Content Standard(s):	**Standard(s) for Mathematical Practice:**
Work with addition and subtraction equations. 1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 - 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.	MP2 Reason abstractly and quantitatively. MP3 Construct viable arguments and critique the reasoning of others. MP6 Attend to precision. MP7 Look for and make use of structure.

Assessment Task

The following example was taken from Illustrative Math. https://www.illustrativemathematics.org/illustrations/466

Decide if the equations are true or false. Explain your answer.

2+5=6
3+4=2+5
8=4+4
3+4+2=4+5
5+3=8+1
1+2=12
12=10+2
3+2=2+3
32=23

CPR Pre-Requisites
(Conceptual Understanding, Procedural Skills, and Representations)

Look at the Progressions documents, Learning Trajectories, LZ lesson library, unpacked standards documents from states, NCTM Essential Understandings Series, NCTM articles, and other professional resources. You'll find links to great resources on your PLC Platform.

Conceptual Understanding and Knowledge

- Understand and explain addition and subtraction expressions and equations as well as model and represent with objects and drawings.
- Understand that the equal sign means "equal to" and "the same as" as well as it representing a relationship between two equal quantities.

Procedural Skills

- Represent addition and subtraction situations with expressions and equations.
- Fluently add and subtract within 5; working toward fluency within 10, and with strategies for within 20.
- Apply properties of addition and subtraction. (identity property of addition, identity property of subtraction, commutative property of addition, associative property of addition)
- Accept equations other than a + b = c as true (a=a, c = a + b, a + b = b + a
- Write equations in a variety of formats other than just a + b = c.

Representational

- Use concrete and visual models to represent expressions and equations such as a balance.

Social knowledge

- Know the meaning of the plus sign, minus sign, and equal sign
- Know the meaning of equations, true, and false

Standards Progression *Look at LearnZillion lessons and expert tutorials, the Progressions documents, learning trajectories, and the "Wiring Document" to help you with this section*		
Grade(s) below	**Target grade**	**Grade(s) above**
K.OA.A.1 Represent addition and subtraction with objects, fingers, mental images, drawings1, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations. **K.OA.A.3** Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). **K.OA.A.4** For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation. **K.OA.A.5** Fluently add and subtract within 5.	**1.OA.B.3** *Apply properties of operations as strategies to add and subtract.2 Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)* ***1.OA.B.4*** *Understand subtraction as an unknown-addend problem. For example, subtract 10 - 8 by finding the number that makes 10 when added to 8.* ***1.OA.C.6*** *Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 - 4 = 13 - 3 - 1 = 10 - 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 - 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13* ***1.OA.D.8*** *Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ - 3, 6 + 6 = _.*	**2.OA.B.2** Fluently add and subtract within 20 using mental strategies.2 By end of Grade 2, know from memory all sums of two one-digit numbers.

Common Misconceptions/Roadblocks
What characteristics of this problem may confuse students? ● Students may not be familiar seeing equations in a format other than a + b = c. ● Students may not attend to what is happening on both sides of an equation. ● Students may not be sure how to interpret a pictorial representation such as dots rather than numbers when an equal sign is involved.

What are the common misconceptions and undeveloped understandings students often have about the content addressed by this item and the standard it addresses?

- Students view the equal sign as something that means the “do something signal” or “the answer is”.
- Students may not be able to represent addition and subtraction expressions.

What overgeneralizations may students make from previous learning leading them to make false connections or conclusions?

Students may use the equal sign as a way to continue their problem solving thought process rather than to represent equality.