Providing Pathways to Excellence for Each Student

MATH 6

UNWRAP A STANDARD: *WHAT DO STUDENTS HAVE TO KNOW AND BE ABLE TO DO?*

Domain: Expressions and Equations

Domain/Reporting Category Weight (if applicable): 29% - 33% AASA items

Cluster: 6.EE.B Reason about and solve one-variable equations and inequalities.

Standard: 6.EE.B.5 Understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Performance/Achievement Level Descriptors

Emerging (1)	Developing (2)	Proficient (3)	Distinguished (4)
I can understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. I can use substitution to identify a whole number in a specified set that makes an equation or inequality true.	I can understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. I can use substitution to identify a number in a specified set that makes an equation or inequality true.	I can understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. I can use substitution to determine if a set of numbers contains only solutions of an inequality or equation.	I can explain how solving an equation or inequality is the process of reasoning to find the value(s) of the variables that make that equation or inequality true.

AASA Item types: EQR, MCR, MIR, MSR

BUILDING BACKGROUND KNOWLEDGE AND SKILLS: FLASHBACK STANDARD

Standard: **5.OA.A.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognize that 3 x (18,932 + 921) is three times as large as (18,932 + 921), without having to calculate the indicated sum or difference.

EXTENDING KNOWLEDGE AND SKILLS: PREVIEW STANDARD

Standard: **7.EE.B.4** Use variables to represent quantities in mathematical problems and problems in real-world context and construct simple equations and inequalities to solve problems.

ESSENTIAL KNOWLEDGE/CONCEPTS ***What Do Students Need to Know/Understand?*** **List the underlined nouns.**	**ESSENTIAL SKILLS** ***What Do Students Need to Be Able to Do?*** **List the circled (or *italicized*) verbs.**
	DOK LEVEL **Level of content complexity rather than content difficulty.**
WONDER QUESTIONS ***How can we capture student wonder?*** ***Including open-ended and 'second' questions**	**ESSENTIAL VOCABULARY** ***What Do Students Need to Comprehend?*** **List all key vocabulary**
LEARNING OBJECTIVES ALIGNED TO THE STANDARD ***What are the Learning Intentions and Success Criteria that will guide student progress?***	
EVIDENCE OF STUDENT MASTERY? ***How will we know when they know it?*** ***How will we encourage each student to try?***	
SPECIFIC INSTRUCTIONAL FRAMEWORK? ***What will we do to help them know/understand/can do it?*** ***What will we do for students who still don't know it?*** ***What will we do for students who already know it?***	

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Cluster: 6.EE.B Reason about and solve one-variable equations and inequalities.

Standard: 6.EE.B.5 Understand solving an equation or inequality as a process of **reasoning** to **find** the value(s) of the variables that make that equation or inequality true. **Use substitution** to **determine** whether a given number in a specified set makes an equation or inequality true.

Performance/Achievement Level Descriptors

Emerging (1)	Developing (2)	Proficient (3)	Distinguished (4)
I can **understand solving** an equation or inequality as a process of **reasoning** to **find** the value(s) of the variables that make that equation or inequality true. I can **use substitution** to **identify** a **whole number** in a specified set that makes an equation or inequality true.	I can **understand solving** an equation or inequality as a process of **reasoning** to **find** the value(s) of the variables that make that equation or inequality true. I can **use substitution** to **identify** a **number** in a specified set that makes an equation or inequality true.	I can **understand solving** an equation or inequality as a process of **reasoning** to **find** the value(s) of the variables that make that equation or inequality true. I can use **substitution** to determine if a set of numbers contains only solutions of an inequality or equation.	I can **explain** how **solving** an equation or inequality is the process of reasoning to **find** the value(s) of the variables that make that equation or inequality true.

AASA Item types: EQR, MCR, MIR, MSR

BUILDING BACKGROUND KNOWLEDGE AND SKILLS: FLASHBACK STANDARD

Standard: **5.OA.A.2 Write** simple expressions that record calculations with numbers, and **interpret** numerical expressions **without evaluating** them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). **Recognize** that 3 x (18,932 + 921) is three times as large as (18,932 + 921), **without having to calculate** the indicated sum or difference.

EXTENDING KNOWLEDGE AND SKILLS: PREVIEW STANDARD

Standard: **7.EE.B.4 Use** variables to **represent** quantities in mathematical problems and problems in real-world context and **construct** simple equations and inequalities to solve problems.

ESSENTIAL KNOWLEDGE/CONCEPTS

What Do Students Need to Know/Understand?

List the underlined nouns.

equation inequality variable value number whole number process solution solution set less than greater than equal to substitution unknown

ESSENTIAL SKILLS

What Do Students Need to Be Able to Do?

List the circled (or *italicized*) verbs.

understand solving solve reason find use substitution explain solve

DOK LEVEL

Level of content complexity rather than content difficulty.

DOK 1 DOK 2 DOK 3

WONDER QUESTIONS

How can we capture student wonder?

***Including open-ended and 'second' questions**

What are some similarities and differences in the solution of an equation and the solution of an inequality?
Why is substitution a useful strategy in solving equations?
Analyze a real-world scenario where solving an inequality is necessary.

ESSENTIAL VOCABULARY

What Do Students Need to Comprehend?

List all key vocabulary

equation inequality variable value number whole number process solution solution set less than greater than equal to substitution unknown reason

LEARNING OBJECTIVES ALIGNED TO THE STANDARD

What are the Learning Intentions and Success Criteria that will guide student progress?

See attached learning intention and success criteria

EVIDENCE OF STUDENT MASTERY?

How will we know when they know it?
How will we encourage each student to try?

See attached Diagnostic Formative Assessment

SPECIFIC INSTRUCTIONAL FRAMEWORK?

What will we do to help them know/understand/can do it?
What will we do for students who still don't know it?
What will we do for students who already know it?

See attached thinking routines

ARIZONA RESOURCES TO CONSIDER

AASA Item Specifications

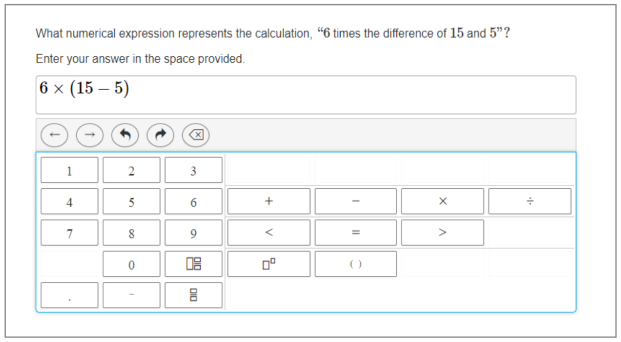
CONTENT STANDARDS	Understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
EXPLANATIONS	Beginning experiences in solving equations should require students to understand the meaning of the equation as well as the question being asked. Solving equations using reasoning and prior knowledge should be required of students to allow them to develop effective strategies such as using reasoning, fact families, and inverse operations. Students may use balance models in representing and solving equations and inequalities.
CONTENT LIMITS	Nonnegative rational numbers One-variable linear equations and inequalities An equation or inequality should be given if a context is included
CONTEXT	Context is allowed

SAMPLE TASK DEMANDS	**COMMON ITEM FORMATS**
Students will be required to choose which value(s) satisfy an equation or inequality.	• EQUATION RESPONSE • MULTIPLE CHOICE • MATCHING ITEM RESPONSE • MULTI-SELECT RESPONSE
Students will be required to choose a set of numbers which contains only solutions to an inequality	
Students will be required to determine the value of an expression that makes the equation true.	

AASA Sample Items (clarifying vertical articulation)

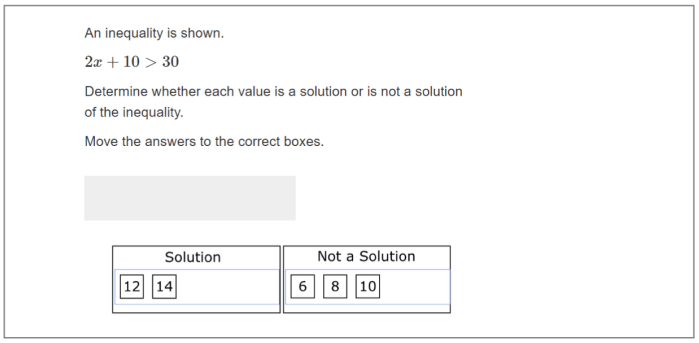
Flashback

Item Number	Cluster	Content Standard	DOK
25	5.OA.A	5.OA.A.2	2



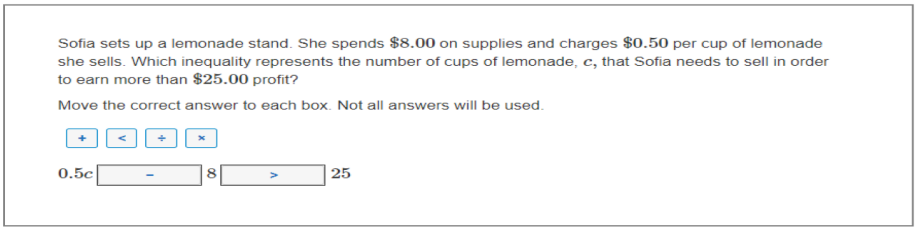
On Grade-level

Item Number	Cluster	Content Standard	DOK
3	6.EE.B	6.EE.B.5	2



Preview

Item Number	Cluster	Content Standard	DOK
14	7.EE.B	7.EE.B.4	2



CREATE A DIAGNOSTIC FORMATIVE ASSESMENT (DFA)

How will we know when they know it?
How will we encourage each student to try?

Item #1: Alignment to PLD 6.EE.B.5.**0** (Flashback to 5.OA.A.2)

What numerical expression represents the calculation, "4 times the sum of 8 and 7"?

Place your answer in the space provided.

Item #2: Alignment to PLD 6.EE.B.5.**1**

Maria used the substitution method to determine if 3 is in the solution set of the inequality: $x + 4 < 7$.

She showed her thinking by:

Step 1: Substituting 3 in place of x in the inequality $x + 4 < 7$
Step 2: That resulted in (3) + 4 = 7 and 7 = 7.
Step 3: She concluded 3 is in the solution set of $x + 4 < 7$

PART A. Do you agree with Maria? (yes or no) _____

PART B. Explain your thinking in the box below.

Item #3: Alignment to PLD 6.EE.B.5.**2**

PART A. Tonya challenged you to use the substitution method to find the solution of the equation $4x - 2 = 0$.
She provided a clue for you by saying the solution is either 0, $\frac{1}{2}$, or 2.
What is the solution to the equation?

PART B. Explain your thinking in the box provided.

Item #4: Alignment to PLD 6.EE.B.5.**3**

An inequality is shown.

$$3x + 7 > 18$$

Determine whether each value is a solution or not a solution of the inequality.

Move the answers to the correct boxes.

0, 4, 8, 12

Solution	Not a Solution

Item #5: Alignment to PLD 6.EE.B.5.**3**

Select each set of numbers which contains only solutions to the inequality:

$$2x + 8 \geq 12$$

- ☐ A. { 1, 2, 3 }
- ☐ B. { 0, 4, 6 }
- ☐ C. {2, 4, 6}
- ☐ D. { 8, 9, 10}

Item #6: Alignment to PLD 6.EE.B.5.**3**

Which of the following inequalities has a solution set of $\{3, 5, 7, 9\}$?

- ○ A. $x + 3 < 11$
- ○ B. $x > 8$
- ○ C. $x + 3 \leq 11$
- ○ D. $x < 8$

Item #7: Alignment to PLD 6.EE.B.5.**4**

A theme park has a log ride that can hold 12 people. They also have a weight limit of 1500 lbs. per log for safety reasons. If the average adult weighs 150 lbs., the average child weighs 100 lbs. and the log itself weighs 200, the ride can operate safely if the inequality $150A + 100C + 200 \leq 1500$ is satisfied (A is the number of adults and C is the number of children in the log ride together). There are several groups of children of differing numbers waiting to ride. Group one has 4 children, group two has 3 children, group three has 9 children, group four 6 children while group five has 5 children.

If 4 adults are already seated in the log, which groups of children can safely ride with them?

My Learning Intention and Success Criteria **6.EE.B.5**
Individual Component Version

My Learning Intention: I am learning to use substitution to determine whether a given number in a specified set makes an equation or inequality true.

My Success Criteria	Post	Why am I learning this?
I can write simple expressions that record calculations with numbers.	I'm There On My Way Getting Started	
I can interpret numerical expressions.	I'm There On My Way Getting Started	
I can choose which value(s) of a solution set satisfy an equation or inequality.	I'm There On My Way Getting Started	
I can choose a set of numbers which contains only solutions to an inequality.	I'm There On My Way Getting Started	
I can determine the value of an expression that makes an equation true using the substitution method.	I'm There On My Way Getting Started	
I can explain how solving an equation or inequality is the process of reasoning to find the value(s) of the variables that make that equation or inequality true.	I'm There On My Way Getting Started	

What do I want to remember?

Guided Group Lesson

Standard:6.EE.B.5 I am learning to use substitution to determine whether a given number in a specified set makes an equation or inequality true.

Group Members	Emerging	Developing	Proficient	Distinguished

Warm-Up:

With a partner, students use balance models in representing and solving equations and inequalities. Individual students then complete a 'What makes me say that' chart and use the chart to explain their findings to another student from a different pair of students.

Vocabulary

equation inequality variable value
number whole number process solution substitution method
solution set less than greater than

Emerging	Developing	Proficient	Distinguished
Students play a game of 'Where Do I Belong'. Each pair of students is provided with equation cards, solution cards, and possible rationale cards. Students place the cards in three columns labeled: Equation, Solution, and Rationale that make each row true.	Pairs of students use their Think Pads to record their predictions of 'Is a Solution', or 'Not a Solution' for a given list of inequalities and possible solution sets Then using the substitution method verify each prediction and place the final answer in a chart labeled, 'What makes me say this'.	Students use the 'Dinner Menu' template to choose whether to use balance models, the substitution method, or steps to solve equations/inequalities to determine the solution set of a series of given mathematical statements.	Play a game of 'Be the Teacher'. Students are given possible solutions. Student teams create more than one inequality that will b true for each given solution.

Observations:	Next Steps:
What you notice about your students during small group instruction.	What will you do with these students next? Change groups, repeat, etc.