



National Center and State Collaborative

# **NCSC Curriculum Resource to Prepare Students for AA-AAS**

## **Mathematics Content: Equations**

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# Curriculum Resource to Prepare Students for AA-AAS

## Mathematics Content: Equations

### The purposes of the Curriculum Resource Guides Are:

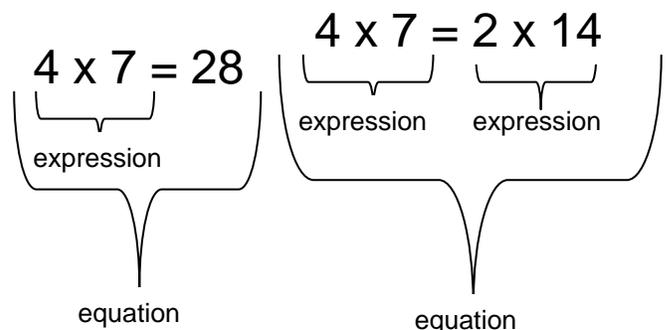
- To provide guidance for teaching the Florida Standards (FLS) to students with Significant Cognitive Disabilities (SWSCD) that both aligns with these standards and provides differentiation for individual student needs
- To provide examples for differentiating instruction for a wide range of SWSCD. These examples can be used in planning specific lessons, alternate assessment items, and professional development.
- To delineate the necessary skills and knowledge students need to acquire to master these indicators

## 1. What are “equations” and how are they taught in general education settings?

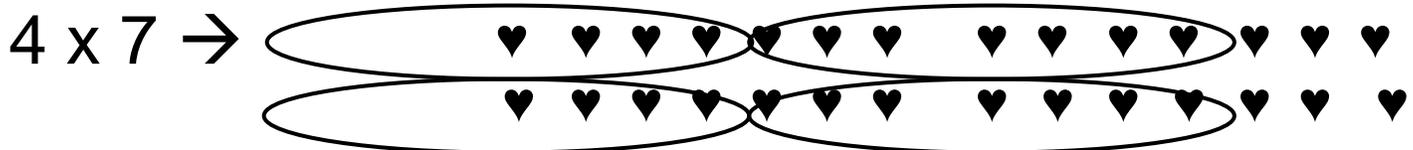
### 1a.1 The essential knowledge in this content area

Equations are a statement that the values of two mathematical expressions are equal. Expressions can be thought of as a phrase while an equation is a complete sentence.

Comparison of Terms <sup>1</sup>	
Expression	Equation
mathematical phrase: $x + 3$	mathematical sentence: $x + 3 = 9$
word phrase: a number plus three	word sentence: a number plus three is nine
number, operation, variable	number, operation, variable, equal sign
evaluate: 1. substitute 2. simplify	solve for/isolate the variable
	one solution



Students can use models (objects or drawings) to represent expressions or equations.



<sup>1</sup> Commonwealth of Pennsylvania, 2012. Retrieved from <http://www.pdesas.org/module/content/resources/6028/view.ashx>.  
Curriculum Resource Guide – Equations, Reposted April 26, 2013

## ***Multiplication and Division Equations***

The standards require students to understand that “x” or “times” means “groups of” and  $4 \times 7$  means 4 groups of 7. Also, “÷” or “divided by” means “how many in each group” or “how many groups can you make?” Example: The children rode in 4 cars to the museum. There were 3 children in each car. How many children went to the museum? 4 groups of 3,  $4 \times 3 = 12$ .

When given word problems, students will need to be able to identify the key word in order to determine what operation is required to represent and solve the problem. Key words for multiplication include: product, of, multiplied, times, as much, by, and twice. Key words for division include: divide evenly, cut, split, each, every, average, equal pieces, out of, ratio, share, and quotient. Students need practice reading word problems to identify the key words and match the correct operation to the problem.

Examples: Circle the key word and write the correct operation.

Jon gets a \$12 allowance per month. How much allowance does he get each week? (4 weeks in a month)

Operation: ÷

Nasir wants to play cars with his friends. He has 9 cars that he wants to share with his 3 friends. How many cars will each friend receive?

Operation: ÷

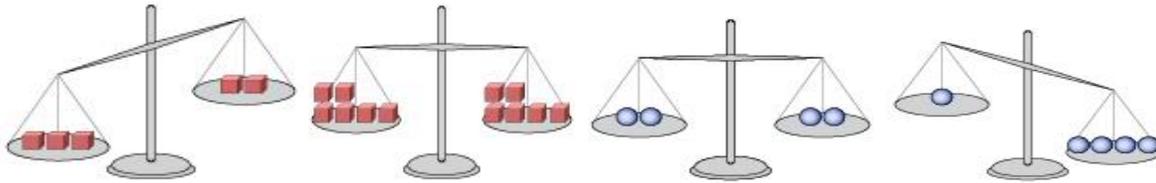
Esteban finished 4 math problems. Cecily finished 2 times as much. How many math problems did Cecily finish?

Operation: ×

## ***Identify when two expressions are equivalent***

The expressions on either side of the equal sign must represent the same quantity. Students can first be taught this as a rule (e.g., “You must have the same amount on both sides of the equal symbol.”) Then provide students with practice in determining whether sets are equal. Another way to describe equality is that there must be “fair shares” on either side of the equals sign. One way to teach equality is to use a balance. For example, provide the following chart then use a balance and weights to represent the amounts. Then discuss whether the numbers are equal (fair shares) or not equal and fill in the third column.

Left side	Right side	Equation
3	2	$3 \neq 2$
6	6	$6 = 6$
2	2	$2 = 2$
1	4	$1 \neq 4$



Once students are firm on their understanding of equality using single whole numbers, then they can better determine whether expressions are equivalent. Students can do this by simplifying or solving the expression.

For example:

Are the expressions equivalent?

$8 - 4$  and  $3 + 2$

Expression	Simplifying Expression
$8 - 4$	4
$3 + 2$	5

$4 \neq 5$

No, the expressions are not equivalent.

### *Solving for Variables in Equations*

In equations, variables are often used as placeholders for unknown quantities. When given a word problem or real life situation, students can be taught to assign a variable to the unknown quantity. In an equation, this variable represents a specific value. For example:

Shelby wrote some thank you letters in the afternoon. She wrote 3 more that night. She wrote 10 thank you letters in all. How many letters did Shelby write that afternoon?

Students can use “n” to represent the unknown quantity of letters written in the afternoon. “In all” is a key word that indicates this is an addition problem.

$$n + 3 = 10$$

### *Using inverse operations to solve equations*

In order to solve an equation by determining the value of the variable, students must learn to isolate the variable, or work the problem so that the variable is “alone” on one side of the equal symbol. To isolate a variable, students need to use inverse operations. Inverse operations can be thought of as “opposite” operations. The inverse operation of addition is subtraction and the inverse operation of multiplication is division. For example:

$$\begin{array}{l} \text{inverse operation} \longrightarrow n + 3 = 10 \\ \qquad \qquad \qquad \qquad \qquad \quad - 3 \quad - 3 \\ \qquad \qquad \qquad \qquad \qquad \quad n = 7 \end{array}$$

In the example above, the inverse operation of minus 3 was used on both sides of the equation. Students must be taught the rule that “what you do on one side of the equals symbol, you must do on the other side.” To help students comprehend this, you can use the scale example again. Teachers can set up a scale with equal amounts of items so that the scale is balanced. Have students take away a few items from one side and observe that the scale becomes unbalanced (i.e., the sides are unequal). Then have the students take away the same amount from the other side and observe that the scale is balanced again (i.e., the side are equal).

## 1a.2 Common misunderstandings in this content area

Students often think that the equals sign means “get an answer.” It is important to provide repeated opportunities to demonstrate equality (as described above) to ensure they comprehend the meaning of equality.

## 1a.3 Prior knowledge/skills needed (can be taught concurrently)

- Performing basic operations (addition, subtraction, multiplication, and division)
- Number and symbol identification

## 2. What are some of the types of activities general educators will use to teach this skill?

### 2.1 Activities from General Education Resources

-  **2**  **2** “Story translations”<sup>2</sup> – students are given a math story and asked to write an equation that means the same thing.
-  **4**  **2** “Names for numbers”<sup>2</sup> – students are given a number and asked to write several expressions to represent the number (e.g., given number 10, student writes the following expressions:  $2+8$ ,  $20\div 2$ ,  $17-7$ )
-  **3**  **1** “Tilt or balance”<sup>2</sup> – draw a balance on the board and write an expression above each pan and ask students whether it will tilt or balance. (e.g., left pan says  $2 \times 7$  and right pan says  $6 + 6$ ; students call out “tilt”)
-  **2**  **1** Given a story problem and a list of items/concepts related to the story problem, the student is asked to identify which items are variables (unknown quantities). For example, if the story problem says “Nina worked for thirty minutes, and then she took a break. Then she worked for another 45 minutes. She was at work a total of one and a half hours.” Circle the variable: first work session, break, or second work session.
-  **5**  **3** Given a formula and batting statistics for a player, the student is asked to substitute the variables for the correct values and then solve the problem to determine a player’s batting average.

### Links Across Content Areas

<sup>2</sup> Walle, J. A. V. de, & Lovin, L. A. H. (2005a). *Teaching Student-Centered Mathematics: Grades K-3* (1<sup>st</sup> ed.). Allyn & Bacon.

Walle, J. A. V. de, & Lovin, L. A. H. (2005b). *Teaching Student-Centered Mathematics: Grades 3-5 Volume* (1<sup>st</sup> ed.). Allyn & Bacon.

Walle, J. A. V. de, & Lovin, L. A. H. (2005c). *Teaching Student-Centered Mathematics: Grades 5-8* (1<sup>st</sup> ed.). Allyn & Bacon.

- Science – use formulas, substitute values for variables, and solve equation to determine: acceleration, mass, volume, friction, orbit, etc.

### 3. What Access Points to the Florida Standards Are Addressed in Teaching “Equations”?

Grade Differentiation	Access Points	Florida Standards
3 <sup>rd</sup> grade	MAFS.3.NBT.1.AP.2a Use the relationships between addition and subtraction to solve problems.	MAFS.3.NBT.1.2
	MAFS.3.NBT.1.AP.2b Solve multi-step addition and subtraction problems up to 100.	MAFS.3.NBT.1.2
	MAFS.3.OA.1.AP.1a Find the total number inside an array with neither number in the columns or rows greater than five.	MAFS.3.OA.1.1
	MAFS.3.OA.1.AP.1b Solve multiplication problems with neither number greater than five.	MAFS.3.OA.1.1
	MAFS.3.OA.1.AP.2a Determine the number of sets of whole numbers, five or fewer, which equal a dividend.	MAFS.3.OA.1.2
	MAFS.3.OA.1.AP.2b Use objects to model division situations involving up to five groups, with up to five objects in each group, and interpret the results.	MAFS.3.OA.1.2
	MAFS.3.OA.4.AP.8a Solve and check one-step word problems using the four operations within 100.	MAFS.3.OA.4.8
4 <sup>th</sup> grade	MAFS.4.OA.1.AP.2b Determine the number of sets of whole numbers, ten or fewer, which equal a dividend.	MAFS.4.OA.1.2
	MAFS.4.OA.1.AP.3a Solve and check one- or two-step word problems requiring the four operations within 100.	MAFS.4.OA.1.3
	MAFS.4.OA.1.AP.1a Use objects to model multiplication involving up to five groups with up to five objects in each, and write equations to represent the models.	MAFS.4.OA.1.1
	MAFS.4.OA.1.AP.2a Solve multiplicative comparisons with an unknown using up to two-digit numbers with information presented in a graph or word problem (e.g., an orange hat costs \$3. A purple hat costs two times as much. How much does the purple hat cost? [ $3 \times 2 = p$ ]).	MAFS.4.OA.1.2
5 <sup>th</sup> grade	MAFS.5.OA.1.AP.1a Evaluate a simple expression involving one set of parentheses.	MAFS.5.OA.1.1
6 <sup>th</sup> grade	MAFS.6.EE.1.AP.2a Write or select an algebraic expression that represents a real-world situation.	MAFS.6.EE.1.2
	MAFS.6.NS.2.AP.6a Use a variable to represent numbers and write expressions when solving real-world problems.	MAFS.6.EE.2.6
	MAFS.6.EE.3.AP.9a Write an equation using variables to represent two quantities where one variable represents the dependent variable and the second represents the independent variable.	MAFS.6.EE.3.9
	MAFS.6.EE.3.AP.9b Write an expression that illustrates the relationship between two variables from a provided table.	MAFS.6.EE.3.9
	MAFS.6.EE.2.AP.7b Solve real-world, single-step linear equations involving positive rational numbers.	MAFS.6.EE.2.7
7 <sup>th</sup> grade	MAFS.7.EE.2.AP.4a Set up equations with one variable based on real-world problems.	MAFS.7.EE.2.4
	MAFS.7.EE.2.AP.4b Solve equations with one variable based on real-world problems.	MAFS.7.EE.2.4
8 <sup>th</sup> grade	MAFS.8.EE.2.AP.5a Define rise/run (slope) for linear equations plotted on a coordinate plane.	MAFS.8.EE.2.5
	MAFS.8.EE.3.AP.7a Simplify linear equations and solve for one variable.	MAFS.8.EE.3.7
Grades 9-12	MAFS.912.A-REI.1.AP.2a Solve simple rational and radical equations in one variable.	MAFS.912.A-REI.1.2
	MAFS.912.A-REI.1.AP.1a Solve equations with one or two variables and explain the process.	MAFS.912.A-REI.1.1

<b>Grade Differentiation</b>	<b>Access Points</b>	<b>Florida Standards</b>
	MAFS.912.A-CED.1.AP.1a Create linear, quadratic, rational, and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems.	MAFS.912.A-CED.1.1
	MAFS.912.A-REI.2.AP.3a Solve linear equations in one variable, including coefficients represented by letters.	MAFS.912.A-REI.2.3
	MAFS.912.A-CED.1.AP.2a Graph equations in two or more variables on coordinate axes with labels and scales.	MAFS.912.A-CED.1.2

**Performance Examples for Priority Access Points**

Grade 3			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
MAFS.3.OA.1.AP.1b Solve multiplication problems with neither number greater than five.	Student solves simple multiplication.  "This says four times five. What is four times five?" $4 \times 5$	<b>Concrete Understandings:</b> <ul style="list-style-type: none"> <li>• Create an array of sets (e.g., three rows of two objects) from a set of objects.</li> <li>• Use graph paper or draw an array that has up to five columns and up to five rows.</li> <li>• Count a set of objects within 25.</li> </ul>	<b>Representation:</b> <ul style="list-style-type: none"> <li>• Identify or draw pictorial representation of an array that matches the multiplication problem.</li> </ul>
MAFS.3.OA.4.AP.8a Solve and check one-step word problems using the four operations within 100.	Student selects expression that matches word problem, solves problem, then selects equivalent expression that can be used to check work.  Kunius had 3 weeks to sell cookies for school. He sold 6 boxes each week. Which of these will show how many boxes Kunius sold? $3 + 6$ $3 \times 6$ $3 - 6$ How many boxes did Kunius sell?  Which one of these can be used to check your work? $3 + 3 + 3$ $18 - 3$ $6 + 6 + 6$	<b>Concrete Understandings:</b> <ul style="list-style-type: none"> <li>• Combine (+), decompose (-), and multiply (x) with concrete objects; use counting to get the answers</li> <li>• Match the action of combining with vocabulary (i.e., in all; altogether) or the action of decomposing with vocabulary (i.e., have left; take away; the difference) in a word problem</li> </ul>	<b>Representation:</b> <ul style="list-style-type: none"> <li>• Draw or use a representation of the word problem</li> <li>• Understand symbols: +, =, -, x</li> <li>• Add on or count back depending upon the words in the problem</li> </ul>

Grade 4			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
<p>Patterns: MAFS.4.OA.1.AP.1a Use objects to model multiplication involving up to five groups with up to five objects in each, and write equations to represent the models.</p>	<p>Present a paper with the following printed on it and read it aloud: “Ms. Smith is an art teacher. She is preparing to teach an art lesson to five students. Each student will need four markers to complete the art activity. You need to find out how many markers Ms. Smith will need all together.”</p> <p>Give the student 24 markers. “Use these markers to show me how five students would each get four markers. You may not use all the markers.” If the student makes an error, model the correct answer and say “There should be five groups of four markers, like this.”</p> <p>“How many markers does the teacher need all together?”</p>	<p><b>Concrete Understandings:</b></p> <ul style="list-style-type: none"> <li>• Create an array of sets (e.g., three rows of two objects) from a set of objects.</li> <li>• Count a set of objects within 25.</li> </ul>	<p><b>Representation:</b></p> <ul style="list-style-type: none"> <li>• Understand the following vocabulary and symbols: multiplication (x), division (<math>\div</math>), equal (=).</li> <li>• Use graph paper or draw an array that has up to five columns and up to five rows.</li> </ul>
<p>Numbers: MAFS.4.OA.1.AP.2b Determine the number of sets of whole numbers, ten or fewer, which equal a dividend.</p>	<p>“Bethany and her friends decided to start a dog walking business after school to earn some spending money. “Bethany has three friends, for a total of four people who want to walk dogs.” Point to the picture of Bethany and her friends. “There are eight dogs that need to be walked.” Point to the picture of the dogs. “Each person will walk an equal number of dogs. How many dogs will each person walk? You can use these blocks to help solve the problem.”</p>	<p><b>Concrete Understandings:</b></p> <ul style="list-style-type: none"> <li>• Use manipulatives to separate sets.</li> <li>• Count a set of objects within 100</li> <li>• Group a set of objects into equal sets (division).</li> </ul>	<p><b>Representation:</b></p> <ul style="list-style-type: none"> <li>• Understand the following vocabulary: divide, separate, total, etc.</li> <li>• Identify or draw a pictorial representation of the problem.</li> </ul>

Grade 6			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
<p>Patterns: MAFS.6.EE.2.AP.7b Solve real-world, single-step linear equations involving positive rational numbers.</p>	<p>Show students the following word problem and read it aloud: "Hans has \$10 to spend while playing mini-golf. He spent \$7 on the ticket and spent the rest on candy. Write an equation to show how much Hans spent on snacks. Use the letter S to represent the amount he spent on snacks."</p> <p>Student writes an appropriate equations (e.g., <math>10-s=7</math>, <math>10-7=s</math>, <math>10=7+s</math> etc.).</p> <p>After student write the equation (if student gets this portion wrong, write an appropriate equation for the student) ask: "Solve this equation to see how much money Hans spent on snacks. Show your work."</p>	<p><b>Concrete Understandings:</b></p> <ul style="list-style-type: none"> <li>Use objects to solve one-step addition and subtraction equations with whole numbers.</li> </ul>	<p><b>Representation:</b></p> <ul style="list-style-type: none"> <li>Match a representation of an equation with a variable to a real-world problem.</li> <li>Set up an equation in which both sides are equal (adding or subtracting the same number/value from both sides of the equation).</li> <li>Understand the following vocabulary and symbols: +, -, ×, ÷, =.</li> <li>Understand the following concepts and vocabulary: variable, solution, equation.</li> </ul>

Grade 7			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
<p>Patterns: MAFS.7.EE.2.AP.4b Solve equations with one variable based on real-world problems.</p>	<p>Show the students the following word problem and read it aloud:</p> <p style="text-align: center;">Barney wants to buy a new video game. He has 24 dollars. He needs 50 dollars to buy the new video game.</p> <p>Present the student with the equation template and cut out response cards (below) and say: "Use these cards to make the equation. Use the letter d to represent how much more money he needs because that's an unknown variable."</p> <div style="display: flex; justify-content: center; gap: 20px; margin: 10px 0;"> <div style="border: 1px solid black; padding: 5px;">24</div> <div style="border: 1px solid black; padding: 5px;">50</div> <div style="border: 1px solid black; padding: 5px;">D</div> </div> <div style="display: flex; justify-content: center; align-items: center; margin: 10px 0;"> <div style="border: 1px solid black; width: 40px; height: 30px; margin-right: 5px;"></div> <span style="margin: 0 5px;">+</span> <div style="border: 1px solid black; width: 40px; height: 30px; margin-right: 5px;"></div> <span style="margin: 0 5px;">=</span> <div style="border: 1px solid black; width: 40px; height: 30px; margin-left: 5px;"></div> </div> <p>Say: "Use the equation to solve for how much more money Barney needs to buy the video game."</p>	<p><b>Concrete Understandings:</b></p> <ul style="list-style-type: none"> <li>Identify when quantities are equal or unequal in a real-world situation.</li> <li>Record/replace a variable in an equation with a fact from a story on a graphic organizer.</li> </ul>	<p><b>Representation:</b></p> <ul style="list-style-type: none"> <li>Create a pictorial array of a simple equation to translate wording.</li> <li>Understand the following concepts, vocabulary, and symbols: +, -, ×, ÷, =, ≠, &lt;, &gt;, equation, equal, inequality.</li> </ul>

Grade 8			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
Patterns: MAFS.8.EE.3.AP.7a Simplify linear equations and solve for one variable.	Present the equation to the student and say “You are going to solve a problem using a variable. Remember, a variable is a letter that represents an unknown number.” Read the equation to the student and have them solve it.  $54 = 9x$	<b>Concrete Understandings:</b> <ul style="list-style-type: none"> <li>• Use manipulatives or graphic organizer to solve a problem.</li> <li>• Identify the reciprocal operation in order to solve one-step equations.</li> </ul>	<b>Representation:</b> <ul style="list-style-type: none"> <li>• Create a pictorial array of a simple equation to translate wording to solve for x or y. □            Understand the following concepts, vocabulary, and symbols: +, -, x, ÷, =, variable, equation.</li> </ul>

High School			
Access Points	Performance Example	Essential Understandings: Concrete Understandings and Representations	
<p>Patterns: MAFS.912.A-CED.1.AP.1a Create linear, quadratic, rational, and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems.</p>	<p>Show the student the following word problem and read it aloud:</p> <p>Omar picked 7 baskets of apples. He gave 20 apples to his teacher, 40 apples to his the debate team, and 80 apples to the football team.</p> <p>Write an equation to show how many apples were in each basket. Use the letter “a” to represent the unknown variable. You do not need to solve the equations, just write it.</p>	<p><b>Concrete Understandings:</b></p> <ul style="list-style-type: none"> <li>Match an equation with one variable to the real-world context.</li> </ul>	<p><b>Representation:</b></p> <ul style="list-style-type: none"> <li>Create a pictorial array of a simple equation to translate wording.</li> <li>Understand the following vocabulary and symbols: +, -, ×, ÷, =, linear, variable.</li> </ul>

## 4. What are Some Additional Activities That Can Promote Use of this Academic Concept in Real World Contexts?

-  **5**  **4** Use a formula and solve the equation to determine the cost of additional text message charges.
-  **5**  **4** Solve an equation to determine amount of paint needed to paint a room.
-  **5**  **4** Solve an equation to determine how much a sale item will cost.
-  **5**  **4** Solve an equation to determine how much mulch is needed to cover a section of lawn.
-  **5**  **4** Given a recipe, determine how long a roast must be cooked based on the weight of the meat and the time per pound that is required to cook the meat to a safe temperature.

## 5. How Can I Further Promote College and Career Readiness when Teaching “Equations”?

### Ideas for Promoting Career/ College Ready Outcomes

#### Communicative competence

Students will increase their vocabulary to include concepts related to “equations.” In addition, they will be learning concepts such as: “equal”, “multiply”, “divide”, “add”, “subtract”, “balance”, “same”, “each”, “times”, “more”, and “take away.”

#### Fluency in reading, writing, and math

Students will have an opportunity to increase their numeracy and sight word fluency while participating in problem solving related to “equations” such as number recognition, symbol identification, reading comprehension, composing equations, and identifying key words.

#### Age appropriate social skills

Students will engage in peer groups to solve problems related to “equations” that will provide practice on increasing reciprocal communication and age appropriate social interactions. For example, students might work together with their peers to develop equations based on story problems and substitute values for variables when given a science formula and values.

#### Independent work behaviors

By solving real life problems related to “equations” students will improve work behaviors that could lead to employment such as landscaping, working as a cashier, stocking shelves, or a chef. When providing opportunities for real life problems, leave some materials out and prompt/teach the students to determine who they should ask and what they should ask for to be able to solve the problem.

#### Skills in accessing support systems

At times, students will need to ask for assistance to complete activities related to “equations” which will give them practice in accessing supports. Students will gain practice asking for tools such as talking calculators, number lines, graphic organizers, and formulas. They can ask a peer to complete the physical movements of the tasks they are not able to do themselves. Be sure to teach students to ask versus having items or supports automatically given to them.

## **6. How Do I Make Instruction on “Equations” Accessible to ALL the Students I Teach?**

**6.1 Teach Prerequisites and Basic Equation Skills Concurrently: Remember that students can continue to learn basic numeracy skills in the context of this grade level content.**

Basic numeracy skills that can be worked on as a part of a lesson relating to equations:

- Number identification
- Equal and/or same
- Symbol identification (+, -, =, x, ÷)
- Addition and subtraction
- Creating sets

## 6.2 Incorporate Universal Design for Learning (UDL in planning, and provide for additional differentiated instruction when teaching equations.)

Some examples of options for teaching equations to students who may present instructional challenges due to:				
	<b>Sensory Differences such as Blindness, Visual Impairment, Deafness, or Deaf/Blindness</b>	<b>Physical Disability or Motor Differences (such as weakness or motor planning difficulty)</b>	<b>Extremely limited evidence of experience/skill or motivation/attention.</b>	<b>Lack of or extremely limited use of speech.</b>
<b>Options for Representation</b>	<p><b>Provide auditory options</b></p> <ul style="list-style-type: none"> <li>– Talking calculator when solving equations</li> <li>– Text-to-speech software or voice recordings to read aloud story problems</li> <li>– Single message sequence voice–output devices to count aloud</li> <li>– Captioning software that presents auditory information visually</li> </ul> <p><b>Provide tactile options:</b></p> <ul style="list-style-type: none"> <li>– Object cues, using miniature objects or other tangible symbols to assist with problem comprehension and operations</li> <li>– Tactile equation mat</li> <li>– Create numbers and symbols out of tactile materials such as sandpaper or wiki stix</li> </ul> <p><b>Provide visual and manipulative options to scaffold representation of concepts:</b></p> <ul style="list-style-type: none"> <li>– Color code equations and corresponding parts of calculator to support students correctly entering equations</li> <li>– Provide manipulatives for quantities, such as Cuisenaire rods.</li> </ul>	<p><b>Reduce Physical Effort</b></p> <ul style="list-style-type: none"> <li>– When reading word problems, student can scan array of key math operation words and select correct key word and operation for equation               <ul style="list-style-type: none"> <li>○ Place equations and graphic organizers on slant board or eye gaze board</li> </ul> </li> <li>– Display flip chart, interactive white board or other teaching materials at student eye level</li> <li>– Utilize a switch instead of a computer mouse or software that allows the mouse to be controlled with the students' head rather than their hands</li> </ul>	<p><b>Illustrate through multiple media</b></p> <ul style="list-style-type: none"> <li>– Utilize interactive whiteboard</li> <li>– Incorporate interactive websites that provide nonlinguistic tools for exploring math concepts:</li> </ul> <p>Illuminations  <a href="http://illuminations.nctm.org/ActivitySearch.aspx">http://illuminations.nctm.org/ActivitySearch.aspx</a></p> <p>Math Open Reference  <a href="http://www.mathopenref.com/">http://www.mathopenref.com/</a></p> <p>There are many resources listed here:  <a href="http://www.udlcenter.org/implementation/examples">http://www.udlcenter.org/implementation/examples</a></p> <ul style="list-style-type: none"> <li>– Use virtual manipulatives and technology to show equations</li> <li>– Incorporate computer representations, videos, and animations</li> </ul>	<p><b>Provide customized display of information</b></p> <ul style="list-style-type: none"> <li>– Consistent model by utilizing modes of communication used by students (point to symbols representing concepts, operations)</li> <li>– Teacher model competent use of AAC during instruction</li> </ul>

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<b>Options for Expression</b>	<p><b>Vary the methods for response by:</b></p> <ul style="list-style-type: none"> <li>– Student states answer or scans raised numbers to select correct answer; use voice output devices for student to select the correct answer <ul style="list-style-type: none"> <li>○ Provide manipulatives for student to respond or contribute to interaction</li> </ul> </li> <li>– Student states answer by selecting picture or symbol</li> <li>– Allow students who are deaf to videotape their answers/ process descriptions.</li> </ul>	<p><b>Provide options for responses/expression:</b></p> <ul style="list-style-type: none"> <li>– Student selects numbers versus writing them; matches numerals and operation symbols to equation</li> <li>– Choose response by pointing to, eye gazing, or selecting object or item</li> <li>– Place operations and symbols and/or equations on electronic whiteboard and have student use switch to select correct answer or create equation</li> </ul> <p><b>Optimize access to tools/ alternatives for responding:</b></p> <ul style="list-style-type: none"> <li>– Provide symbols, objects, manipulatives, and pictures for matching/ student responses</li> </ul>	<p><b>Provide multimedia options for responses/expression:</b></p> <ul style="list-style-type: none"> <li>– Allow the student to make selections by pointing to, gazing at, or selecting answers on the interactive white board</li> <li>– Utilize a switch or adapted computer mouse</li> </ul>	<p><b>Provide options for modes of communication:</b></p> <ul style="list-style-type: none"> <li>– Incorporate responses into student’s AAC device or eye gaze array</li> <li>– Phrase questions so that they require a “yes/no” response, these can easily be answered using an eye gaze, head turn, two switches, etc</li> <li>– Choose response by pointing to or selecting object or item</li> <li>– Use a blink response to count tiles or select answer; count tiles/cubes out loud having student move in some voluntary way (e.g., nod head, tap hand, tap foot) to count along</li> </ul>

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<b>Options for Engagement</b>	<p><b>Recruit interest by providing choices:</b></p> <ul style="list-style-type: none"> <li>– Digital/talking representations, videos, interactive websites</li> </ul> <p><b>Increase personal relevance:</b></p> <ul style="list-style-type: none"> <li>– Use items that are familiar and reinforcing to students.</li> <li>– Incorporate high preference items into story problems, as well as student names</li> </ul>	<p><b>Recruit interest by increasing personal relevance:</b></p> <ul style="list-style-type: none"> <li>– Ensure that engaging and high preference content is visible and accessible to student</li> <li>– Highlight key words in story problems</li> <li>– When creating response options make them large enough and separate them far enough so that student can make clear eye gaze or head nod to make intentional selection</li> <li>– Provide opportunities to work with typically developing peer on items (teach peer how to interpret student's responses)</li> </ul>	<p><b>Recruit interest by providing choices:</b></p> <ul style="list-style-type: none"> <li>– Digital/talking representations, videos, talking calculators</li> <li>– Use of computer representations, videos</li> <li>– Provide manipulatives that may be of high interest to the student and use high interest scenarios in word problems</li> </ul> <p><b>Provide options for sustaining effort and persistence:</b></p> <ul style="list-style-type: none"> <li>– Break tasks down to maximize student attention</li> <li>– Token economy system that embeds equations (You have 2 Justin Bieber tokens. You need 5 total. How many more do you need to earn before you can listen to a song?)</li> <li>– Vary demands and materials to maintain interest</li> <li>– Follow equation unit with a community-based instruction field trip which require the skills learned to be used</li> </ul>	<p><b>Recruit interest with modes of communication:</b></p> <ul style="list-style-type: none"> <li>– Allow students to choose items or subjects that are relevant to them via AAC devices, symbols, or eye gaze array</li> </ul>

Promoting Career and College Readiness	Standards for Mathematical Practice
 <b>1</b> Communicative Competence	 <b>1</b> Make sense of problems and persevere in solving them.
 <b>2</b> Fluency in reading, writing, and math	 <b>2</b> Reason abstractly and quantitatively.
 <b>3</b> Age appropriate social skills	 <b>3</b> Construct viable arguments and critique the reasoning of others.
 <b>4</b> Independent work behaviors	 <b>4</b> Model with mathematics
 <b>5</b> Skills in accessing support systems	 <b>5</b> Use appropriate tools strategically.
	 <b>6</b> Attend to precision.
	 <b>7</b> Look for and make use of structure.
	 <b>8</b> Look for and express regularity in repeated reasoning