SECONDARY MATH CASE STUDY

Mathematics Standard for Algebra 1

What are the students learning?

Grade level standard: M.HS.R.ACED-1 - Efficiently, flexibly, and accurately create equations and inequalities in one variable that model a situation, and use them to solve problems. Include equations arising from linear, quadratic, and exponential functions.

Example Learning Progression for Secondary Math

Educator adapts instruction to meet the needs of students and deepen learning toward grade level standard

WA-AIM Access Points			Teacher adjusted	Grade Level Standard
Less Complex	**Intermediate**	**More Complex**	**Further Complexity**	**Grade Level Standard**
Student will identify an algebraic equation involving addition and subtraction (up to 20) that represents a modeled real-world situation.	Student will solve a one-step algebraic equation involving addition and subtraction representing a real-world situation	Student will write and solve a one-step algebraic equation representing a real-world situation.	Create equations in one variable and use them to solve problems in real-world situations (not yet inequalities)	Efficiently, flexibly, and accurately create equations and inequalities in one variable that model a situation, and use them to solve problems. Include equations arising from linear, quadratic, and exponential functions.

How could I teach this standard in general education to all students?

- **Concrete or representations**: Use manipulatives such as counters or blocks to visually demonstrate how to form equations. For instance, if students are solving for x in the equation x + 3 = 7, they could use blocks or algebra tiles to represent the equation physically. This helps students grasp the concept of balancing equations in a tactile or visual way.
- **Interactive technology**: Incorporate math software or apps that allow students to explore equations and inequalities through interactive activities. For instance, tools like Polypad Algebra Tiles allow students to represent and solve algebraic equations using virtual algebra tiles, balance scales allow them to explore equality and inequality, and Desmos enables students to manipulate equations in real-time and see the effects graphically. This can aid in understanding the relationship between algebraic expressions and their graphical representations.
- **Project-based learning:** Assign a project where students must investigate a real-world problem that can be modeled with equations or inequalities. Get creative! For instance, students could analyze data related to local environmental issues (like water usage) or even data related to their favorite athlete and create equations to represent their findings. This method encourages critical thinking and application of math in meaningful contexts.
- **Role-playing:** Create role-playing activities where students act out scenarios that require the use of equations or inequalities. For instance, they could simulate a market scenario where they negotiate prices using inequalities to express limits and budgets. This method makes the learning process dynamic and engages students' social skills.
- **Visual storytelling**: Encourage students to create a comic strip or storyboard that illustrates a problem involving equations or inequalities. By telling a story visually, they can deepen their understanding of the problem-solving process and the relevance of math in everyday life.

How could I measure understanding of the standard for students with significant cognitive disabilities?

Start with how you measure student understanding for all students and adapt from there. For example, if students are given word problems to build algebraic equations that they will then solve, start there for your students who have significant cognitive disabilities. If the student requires scaffolds to support their engagement, you might give them fewer word problems altogether and use the WA-AIM Access Point Framework to design scaffolded supports and prompts. If a student needs scaffolds at a certain Access Point for one standard, don't assume they will need this level of scaffolding for every other standard.

Further Complexity towards the Grade-Level Standard

Students may be able to do more than the WA-AIM Most Complex Access Point. In this case, it is essential to challenge them to reach toward the grade level content standard.

In this case, they may be solving equations and inequalities that look very similar to what is required in the grade-level curriculum; however, the equations may be simplified (e.g., only involving addition and subtraction) and the student may require the use of supportive strategies and materials. For example, this problem shows a mathematical problem that requires the student to build an algebraic equation

and solve for a variable *x*.

Problem:

> Jordan has $60 saved up. They want to buy snacks and a bus ticket for a scouts trip. The bus ticket costs $45. How much can Jordan spend on snacks? Let *x* represent the amount Jordan can spend on snacks.
>
> $45 + x \leq 60$

A student could use various strategies to solve for the inequality, including the use of a calculator, a hundreds chart, or number line.

> *If the student requires additional scaffolding, consider the More Complex Access Point.*

More Complex (WA-AIM Access Point)

To measure the student's demonstration of the standard according to the More Complex Access Point, the student is required to not only solve the one-step algebraic equation but write it out as well. The More Complex Access Point says: "Student will write and solve a one-step algebraic equation representing a real-world situation."

Given the word problem:

> Jamie is at the store buying fruit. She picks up a bag of apples. Then, Jamie decides to return 2 apples to the shelf. Jamie has 12 apples left. How many apples did Jamie start with?

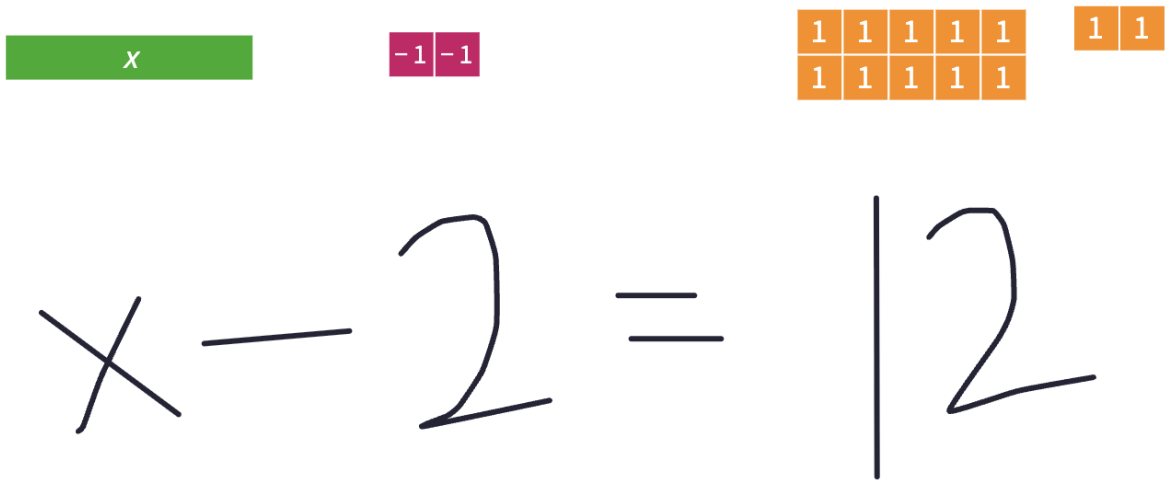
The student would need to write out the algebraic equation based on the word problem. This may involve them writing the equation without supports. It may also involve them putting pre-selected numbers and symbols together in an equation frame or selecting the equation from a choice of 3-5.

Equation frame example:

x	-	2	=	12

After the student develops an equation, they will then solve it. The student may use various strategies to solve the algebraic equation. For example, they could use more traditional problem-solving methods by balancing out the equation, using algebra tiles (either virtual or tangible), or act out various options for x to determine which one is correct.

Algebra tiles example:



4

If the student requires additional scaffolds beyond the More Complex Access Point, consider using the Intermediate Access Point.

Intermediate (WA-AIM Access Point)

To measure the student's Intermediate Access Point understanding of the standard, the WA-AIM Access Point says the "student will solve a one-step algebraic equation involving addition and subtraction representing a real-world situation." In this case, they can take the real-world situation from the More Complex Access Point and solve it to find out how many apples were in Jamie's first bag of apples. See the More Complex Access Point for ideas on options for solving the equation through balancing the equation, using algebra tiles, or by acting it out. Students may need repeated exposure to various strategies to be able to consistently solve algebraic equations.

Word Problem:

> Jamie is at the store buying fruit. She picks up a bag of apples. Then, Jamie decides to return 2 apples to the shelf. How many apples did Jamie start with?

Student Answer:

$x - 2 = 12$

If the student continues to require additional scaffolding given the Intermediate Access Point, consider the Less Complex Access Point.

Less Complex (WA-AIM Access Point)

The Less Complex Access Point for this standard is to "identify an algebraic equation involving addition and subtraction (up to 20) that represents a modeled real-world situation."

To measure this Access Point aligned to the standard, students with significant cognitive disabilities will need a modeled real-world situation. For example, take this word problem about a person at a

[4] Virtual Algebra Tiles. Available at https://polypad.amplify.com/p#algebra

grocery store.

Word Problem:

> Jamie is at the store buying fruit. She picks up a bag of apples. Then, Jamie decides to return 2 apples to the shelf. There are 12 pieces of fruit at the end. Which equation will help you find how many apples were in the bag to start?

Throughout the word problem, work with the student to act out the problem. This may include the use of real-world objects (e.g., apples), photos, or representations of objects (e.g., manipulatives). Students may build their algebraic equations in various ways, including writing, using an equation frame (example shown) with number and symbol cards, or using tools like algebra tiles (example shown).

If assessing the standard, you may also offer the student choices regarding which equation represents the word problem.

- $x + 4 = 2$
- $x - 2 = 12$ (correct answer)
- $2x + 4 - 6 = 10$

Reducing Barriers for Learners who have Significant Cognitive Disabilities in Large Group Lessons

Make reducing barriers an ongoing practice embedded in the instructional process - take a few minutes to think about your process! Is there a barrier related to:

- **Interest or engagement?** Think about how to incorporate the student's lived experiences, culture, and interests into word problems, instruction, and materials.
- **Background knowledge?** Think about how to highlight key ideas (e.g., similarities and differences) and define key vocabulary (e.g., compare, contrast) in a way that's engaging and not stigmatizing.
- **Showing what they know?** Think about having options for how they use learning tools (e.g., graphic organizers) and technology to communicate what they know and what they've learned.

For example, one possible barrier with this algebra standard may occur when information is presented in a way that prevents students from reading or understanding the information, like when a student does not grasp that a variable (such as *x*) represents an unknown value.

Ideas to reduce this barrier could include classroom educators:

- Continuing to act out word problems in a concrete way. For example, in a word problem where a person is shopping in a grocery store and they grab a bag of fruit with an unknown quantity, a teacher might demonstrate the word problem with an actual bag.
- Writing out the equation with a bag drawn in place of the variable or writing out the word *bag* in place of the variable letter.
- Use engaging word problems that include objects that are interesting to students.

Expanded Learning Progression for Secondary Math

	WA-AIM Access Points			Teacher adjusted	Grade Level Standard
	Less Complex	**Intermediate**	**More Complex**	**Further Complexity**	**Grade Level Standard**
Student Skill	Student will identify an algebraic equation involving addition and subtraction (up to 20) that represents a modeled real-world situation.	Student will solve a one- step algebraic equation involving addition and subtraction representing a real-world situation.	Student will write and solve a one-step algebraic equation representing a real-world situation.	Student will write and solve one-variable equations and inequalities involving addition and subtraction that model real-world situations.	Efficiently, flexibly, and accurately create equations and inequalities in one variable that model a situation, and use them to solve problems. Include equations arising from linear, quadratic, and exponential functions.
Complexity Details	• Matching with visuals • Addition and subtraction only	• Simple real-world scenarios • Solve for single operations/whole numbers	• Basic word problems • Write and solve single operations	• Word problems requiring one-variable equations and inequalities • Write and solve single operations	• Multiple operations and inequalities
Success Criteria Ex.	• Matches equations to situations • Recognizes equation structure	• Solves equations correctly • Shows systematic work • Explains solution step	• Translates words to equations • Solves independently • Verifies solutions	• Translates words to equations • Solves independently • Verifies solutions	• Solves one variable equations and inequalities independently • Verifies solutions

Instructional Strategy Examples	Visual Supports • Use large real-world manipulative • Picture cards for equations Scaffolds • Pre-made equation cards • Fill in the blank templates • Word banks Technology • Interactive equation builders	Visual Supports • Balance scale models • Step by step solution guides • Use algebra tiles Scaffolds • Equation solving mats • Guided practice worksheets • Think-aloud Technology • Virtual manipulatives • Self-checking apps	Visual Supports • Color coded word problems • Equation building templates Scaffolds • Keyword highlighting guides • Problem solving checklists • partner work • simplified text complexity Technology • Virtual manipulatives • Digital word problem creators	Visual Supports • Multi-step problem flowcharts • Strategic reference cards Scaffolds • Guided worksheets • Solution planning templates • Small group instruction Technology • Virtual manipulatives • Math modeling software	Visual Supports • Multi-step problem flowcharts • Strategic reference cards Scaffolds • Guided worksheets • Solution planning templates • Small group instruction Technology • Graphing calculators • Math modeling software