Just In Time Quick Check

Standard of Learning (SOL) 6.13

Strand: Patterns, Functions, and Algebra

Standard of Learning (SOL) 6.13

The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.

Grade Level Skills:

- Identify examples of the following algebraic vocabulary: equation, variable, expression, term, and coefficient.
- Represent and solve one-step linear equations in one variable, using a variety of concrete materials such as colored chips, algebra tiles, or weights on a balance scale.
- Apply properties of real numbers and properties of equality to solve a one-step equation in one variable. Coefficients are limited to integers and unit fractions. Numeric terms are limited to integers.
- Confirm solutions to one-step linear equations in one variable.
- Write verbal expressions and sentences as algebraic expressions and equations.
- Write algebraic expressions and equations as verbal expressions and sentences.
- Represent and solve a practical problem with a one-step linear equation in one variable.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 6.13 – Equation Vocabulary (Word) / PDF
  - 6.13 – Modeling One-Step Linear Equations (Word) / PDF
  - 6.13 – One Step Equations (Word) / PDF
- VDOE Algebra Readiness Formative Assessments
  - SOL 6.13 (Word) / PDF
- VDOE Algebra Readiness Remediation Plans
  - Applying Properties of Real Numbers When Solving Equations (Word) / PDF
  - Practice 1: Solving One-Step Equations with an Equation Balance Mat (Word) / PDF
  - Practice 2: Solving One-Step Equations with an Equation Balance Mat (Word) / PDF
  - Solving Equations – Applying Properties (Word) / PDF
  - Solving Equations Using Algebra Tiles (Word) / PDF
- VDOE Word Wall Cards: Grade 6 (Word) / PDF)
  - Equation
  - Expression
  - Variable
  - Coefficient
  - Term
  - Verbal and Algebraic Expressions
  - Equations
- Desmos Activity
  - Balancing the Hangar

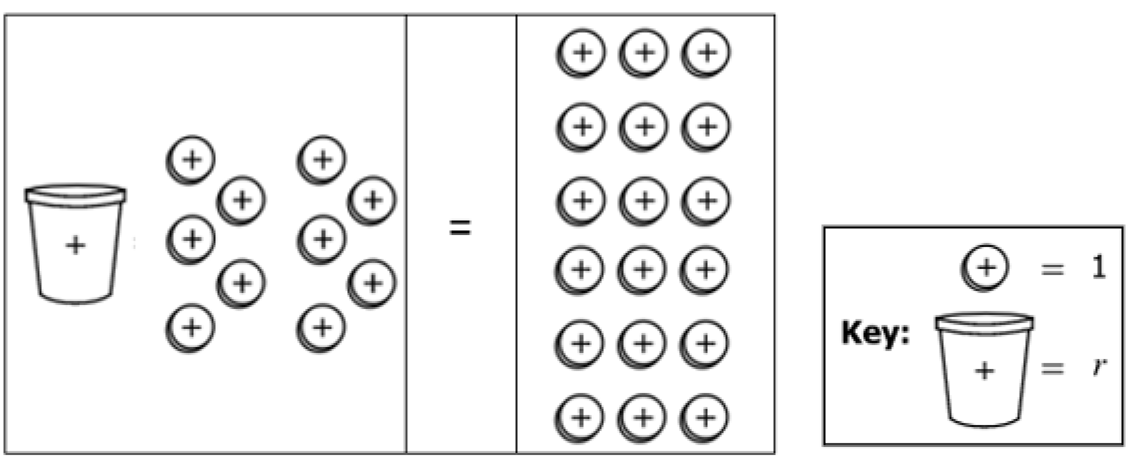
Supporting and Prerequisite SOL: 6.6a, 5.6b, 5.19a, 5.19b, 5.19c, 5.19d, 4.4b, 4.4c, 4.4d, 4.16

SOL 6.13 - Just in Time Quick Check

1. For each of the following, fill in the chart with a related verbal expression/sentence or algebraic expression/equation:

Verbal Expression/Sentence	Algebraic Expression/Equation
Marco is twice as old as Ella.	
x is 5 fewer than y	
	$\frac{r}{3}$
	$z = 5 + p$

2. Write an equation to represent the model shown.

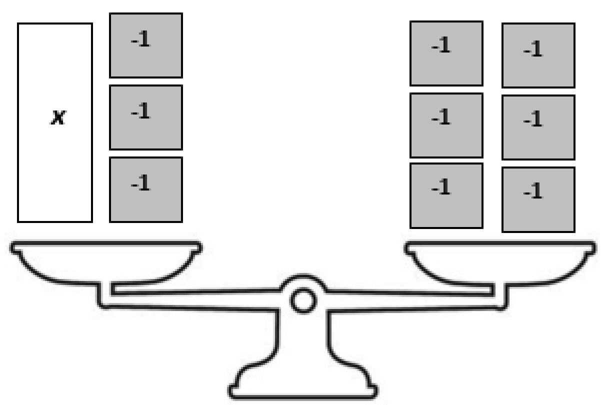


3. Solve each of the following:

$-10 = h + 14$ $\qquad$ $2b = 48$ $\qquad$ $\frac{n}{5} = -10$

4. Ashton determines that 32 is the solution to the equation $\frac{1}{4}x = 8$.
   How can Ashton confirm his solution is correct?

5. Complete the missing parts of the grid using the information provided about the practical situation.

<table>
<tr><th>Practical Situation</th><th>Model</th></tr>
<tr><td>The temperature dropped three degrees. Now the thermometer says -6 degrees. What was the temperature before it dropped?</td><td>
</td></tr>
<tr><th>Equation</th><th>Solution</th></tr>
<tr><td></td><td>x = ___________</td></tr>
<tr><th colspan="2">Explain why your solution makes sense:</th></tr>
<tr><td colspan="2"></td></tr>
</table>

6. Complete the missing parts of the grid using the information provided about the practical situation.

Practical Situation	Model
There are 11 girls in a class. There are 3 more girls than boys. How many boys are in the class?	
Equation	**Solution**
$11 = b + 3$	$b =$ ___________
Explain why your solution makes sense:	

SOL 6.13 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. For each of the following, fill in the chart with a related verbal expression/sentence or algebraic expression/equation.

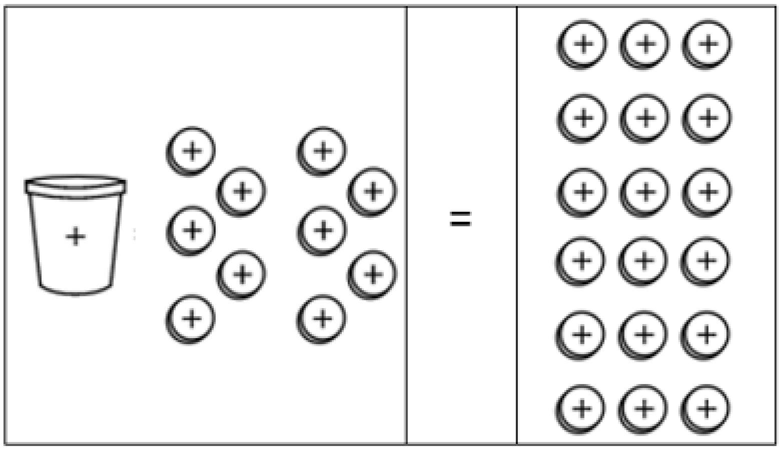
Verbal Expression/Sentence	Algebraic Expression/Equation
Marco is twice as old as Ella.	
x is 5 fewer than y	
	$\frac{r}{3}$
	$z = 5 + p$

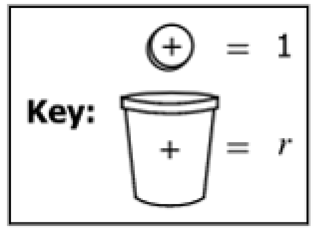
Writing words to represent equations and expressions in story problems and verbal expressions can be especially challenging for students. For the first one, a student might write the question 2M = E might be recorded, or x-5=y for the second problem. To help students make the connection between verbal expressions and sentences, use concrete materials, such as algebra tiles, balance scales, or tiles/unifix cubes. Starting with contextual problems, students can use post-its or larger paper to add labels to the models they are creating. What exactly is showing us Marco's age? Ella's age? How does your representations show the relationship between Marco's and Ella's ages?

Additionally, it is helpful to have the students say the meaning of the equation or expression in their own words. What is the relationship between Marco and Ella's ages? What is the relationship between x *and* y*? How do you know? Which is fewer/greater?*

Lastly, students can work to correct this misconception by comparing examples and non-examples. Have students engage in discussions about why they decided certain examples were correct or incorrect. For example, for x *= 5 + y, students could compare two different written descriptions: Paula is 5 years older than Zoe and Zoe is 5 years older than Paula. Which one makes sense and why? Again, to support students further, manipulatives can be used to model each scenario with labels to strengthen students' discussion.*

2. Write an equation to represent the model shown.





A common misconception some students may have is to interpret the left side of the equation mat as 10r. This may indicate a student believes the number of unit tiles on the left side of the mat represents the coefficient of r. It may be beneficial to have students think about the shapes that are used in the model and replace each shape in the mat with the value as designated in the available key. Making a connection between like shapes in the equation mat and like terms of an equation would be helpful as well. For additional support, the Mathematics Instruction Plan, "Modeling One-Step Linear Equations" would provide students with ample practice.

3. Solve each of the following:

$-10 = h + 14$ $\qquad$ $2b = 48$ $\qquad$ $\frac{n}{5} = -10$

A common misconception some students may have when solving -10 = h + 14 is to add fourteen to both sides of the equation. A common misconception some student may have when solving $\frac{n}{5} = -10$ is to divide both sides of the equation by 5. Each of these misconceptions may indicate that the student sees an addition and division type equation, h + 14 and $\frac{n}{5}$, and uses the same operation as a means to solve the equation instead of using an inverse operation. A common misconception that some students may have when solving 2b = 48 is to subtract both sides of the equation by two. This may indicate that a student interprets the coefficient as a +2 but thinks subtracting two is the appropriate inverse operation to solve the equation.

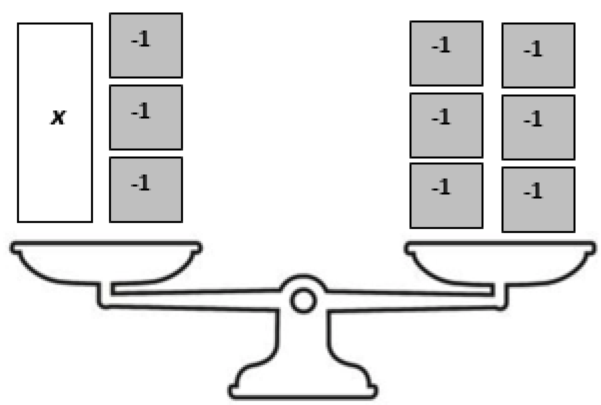
It may be beneficial to have students use models to represent the equations when applicable. It would also be helpful to have students work with balance scales in conjunction with open sentences to develop the connection between the equal sign and the expression on each side of the equals sign. In addition, as students are solving equations, include verbal descriptions that explain the meaning of the equation. Encourage students to explain their thinking and even try to determine more than one way to solve each equation. Daily Number Talks are a great way to engage students in mental mathematics for fluency where the teacher can record equations in varied ways. Additionally, have students write equations in more than one way in connection to the models that they are working with across this standard.

4. Ashton determines that 32 is the solution to the equation $\frac{1}{4}x = 8$.

How can Ashton confirm his solution is correct?

A common misconception some students may make is to interpret that 32 must equal the product of $\frac{1}{4}x$. *This may indicate that a student interprets eight as the value of x and incorrectly multiplies eight times four to obtain a value of thirty-two in the denominator,* $\left(\frac{1}{4 \cdot 8}\right) = 32$. *It may be beneficial to have students write the given equation as* $\frac{x}{4} = 8$. *The teacher can facilitate a discussion with students to help them translate or mean sense of this equation. Have students think about a context that might fit the equation. For example, how many objects would be needed to make four equal groups of eight objects? Each of eight students received the same number of crayons, how many total crayons would be needed for each student to receive four crayons?*

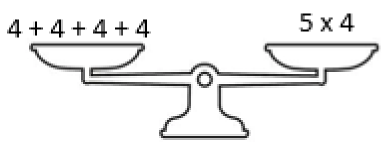
5. Complete the missing parts of the grid using the information provided about the practical situation.

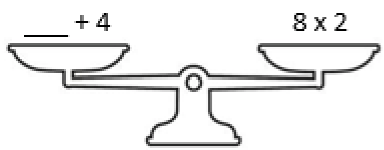
Practical Situation	Model
The temperature dropped three degrees. Now the thermometer says -6 degrees. What was the temperature before it dropped?	
Equation	**Solution**
	$x =$ ____________

Explain why your solution makes sense:

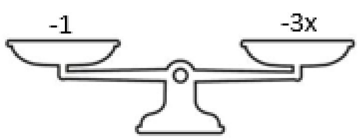
In justifying a solution for this problem, students must be able to make sense of the model and context in order to explain why their solution makes sense. Confirming solutions can prove to be difficult for students if they are only thinking procedurally.

If students need more support in connecting models and equations, consider using true/false sentences. This can also be used as a Number Talk. Use a balance scale with a modeled equation or concrete objects to represent an equation (such as algebra tiles) and ask: is this true or false? How do you know? Students should support their reasoning by explaining their thinking. Here are some examples: True or false? What would make this tilt? Which way would it tilt? What would make it balance?





Students could benefit from using balance scales when solving equations. Having a concrete tool to model if something is only performed to one side of the balance scale; it changes the balance (relationship). To maintain balance, you would also have to make a change to the other side. Consider giving scales with variables to students and asking them, how could we change these to keep the balance? For example, here we would divide both sides by -3:



Lastly, plotting the value of x (or any variable) on a number line might help students to see the value of the variable, keeping in mind that sometimes variables can be multiple values and sometimes only one value makes the equation true.

Note: this problem might present misconceptions around integer operations. Look for more information about misconceptions in SOL 6.6.

6. Complete the missing parts of the grid using the information provided about the practical situation.

Practical Situation	Model
There are 11 girls in a class. There are 3 more girls than boys. How many boys are in the class?	
Equation	**Solution**
$11 = b + 3$	$b =$ ___________
Explain why your solution makes sense:	

Problems in similar structure to the one above can help to identify whether or not students fully understand the relationships of a given situation and if they are using a model to make sense of that relationship. A student may be able to model the equation on the scale, but how do they explain the connection of their representation with the relationship of girls and boys in the class?

To support students in understanding and using their representations, they should be exposed to many opportunities for mathematical modeling where they are able to reflect on and discuss a problem to collectively choose how to represent it. Telling students how to use a manipulative step-by-step will not lead to relational thinking or help them in understanding the use of models. Encourage students to use multiple representations for modeling equations (i.e. balance scales, equation mats, 2-color counters, algebra tiles) and allow them to select the ones that make the most sense to them when modeling different equations or practical situations. Ask them many open-ended questions to support them in their modeling: How did you model the problem? Why does this make sense? How does this show the relationship between ______ and ______? How could this help you solve the problem? Where is the "+" in your model? Where are the girls? To probe further into student understanding, consider removing the given equation or the practical situation.