Just In Time Quick Check

Standard of Learning (SOL) 8.14a

Strand: Patterns, Functions, and Algebra

Standard of Learning (SOL) 8.14a

The student will evaluate an algebraic expression for given replacement values of the variables.

Grade Level Skills:

- Use the order of operations and apply the properties of real numbers to evaluate algebraic expressions for the given replacement values of the variables. Exponents are limited to whole numbers and bases are limited to integers. Square roots are limited to perfect squares. Limit the number of replacements to no more than three per expression.
- Represent algebraic expressions using concrete materials and pictorial representations. Concrete materials may include colored chips or algebra tiles.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

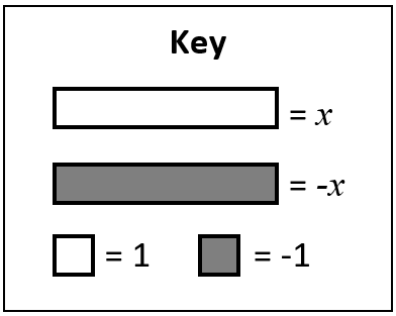
Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - 8.14a - Evaluating Algebraic Expressions (Word) PDF Version
- VDOE Algebra Readiness Formative Assessments
  - 8.14a (Word) PDF Version
- VDOE Algebra Readiness Remediation Plans
- Applying Properties to Simplify Algebraic Expressions (Word) / PDF
- Evaluating Algebraic Expressions (Word) / PDF
- Evaluating Expressions (Word) / PDF
- VDOE Word Wall Cards: Grade 8 (Word) | (PDF)
  - Term
  - Constant
  - Like Terms
  - Order of Operations
- VDOE Rich Mathematical Tasks: How Many Stones Will I Need?
  - 8.14 How Many Stones Will I Need Task Template (Word) / PDF Version
- Desmos Activities
  - Picture Perfect
  - Pentomino Puzzles

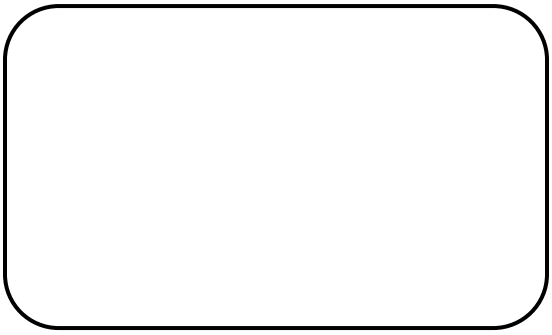
Supporting and Prerequisite SOL: 8.3b, 7.1d, 7.1e, 7.11, 6.3c, 6.5a, 6.6a, 6.6c

SOL 8.14a - Just in Time Quick Check

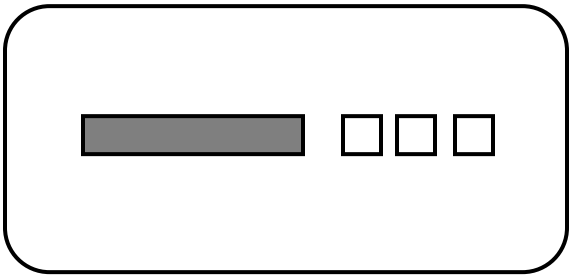
For questions 1 and 2, use the key provided.



1) Sketch a model for the expression $3x - 2$ in the expression mat.



2) Evaluate the expression modeled below when $x = 3$.



3) What is the value of the expression $x^y + z$ when $x = 5$, $y = 0$, and $z = \frac{5}{8}$.

4) Maria wants to fill a cylindrical pool with water and uses the expression $\pi r^2 h$ to determine how much water can fit into the pool. If $\pi = 3.14$, $r = 10\frac{1}{2}$ ft, and $h = 4\frac{2}{5}$ ft, approximately how many cubic feet of water did Maria determine she can fit into the pool?

5) Evaluate the expression $a^2 - 5b + \sqrt{c}$ when $a = -3$, $b = 6$, and c = 16.

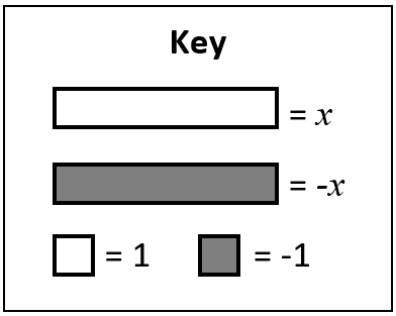
6) Evaluate the expression $\frac{-|r-t|}{2m}$ when $m = -1$, $r = -6$, and $t = -4$.

7) What is the value of the expression $m\{8 + [b(m-1) + 3]\}$ when $m = -2$ and $b = -\frac{2}{3}$.

SOL 8.14a - Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

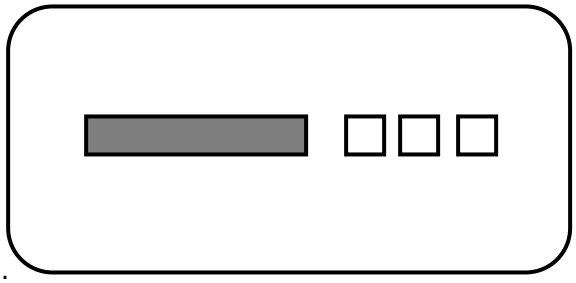
For questions 1 and 2, use the key provided.



1) Sketch a model for the expression $3x - 2$ in the expression mat.

A common misconception is for students to place three unit tiles followed by an x-tile when modeling 3x. This may indicate the student does not understand that 3x represents 3 groups of x. These students should be prompted to model the expression $3 + x$. They may also benefit from modeling numerical expressions like 3(2) to see that it represents 3 groups of 2.

Another common error is to place two unshaded tiles to represent the constant in the expression. This may indicate the student does not understand that subtracting 2 is the same as adding -2. Those students who misrepresent the constant in this expression should revisit their study of integer operations from the Mathematics 2016 Standards of Learning - Math 6 Curriculum Framework (SOL 6.6).



2) Evaluate the expression modeled below when $x = 3$.

A common error students may make when evaluating the modeled expression when $x = 3$ is neglecting to notice the shading and end up with a value of 6, rather than 0. Misinterpreting the sign in a model can cause problems as students continue to model and/or interpret models as they build on expressions to create equations.

Conversations regarding the fact that $-x$ is the opposite of x could help these students. Some may benefit from more hands-on experiences modeling and practicing replacing the $-x$ with 3 negative unit tiles. Modeling expressions is introduced SOL 7.11. For additional resources, refer to the Mathematics 2016 Standards of Learning - Grade 7 Curriculum Framework (SOL 7.11).

3) What is the value of the expression $x^y + z$ when $x = 5$, $y = 0$, and $z = \frac{5}{8}$.

Some students may make the common error of improperly evaluating a base with an exponent with a zero power. This may indicate that students do not understand why any nonzero base raised to the zero power is 1. Teachers may want to have students examine the pattern of exponents such as 2^4, 2^3, 2^2, 2^1, 2^0. Teachers need to ask guiding questions proving that any nonzero number to the zero power is just the product of no numbers at all, which is the multiplicative identity, 1. Some suggestions are, "How do we know this equals 1? Why is this true? Where does the 1 come from?" To give a visual, have students fill in a place value chart with the places represented by powers of 10. ($10^0 = 1$, $10^1 = 10$, $10^2 = 100$, $10^3 = 1000$ …)

4) Maria wants to fill a cylindrical pool with water and uses the expression $\pi r^2 h$ to determine how much water can fit into the pool. If $\pi = 3.14$, $r = 10$ ft, and $h = 4\frac{2}{5}$ ft, approximately how many cubic feet of water did Maria determine she can fit into the pool?

A common error is for students to incorrectly apply the order of operations after substituting in values, first multiplying 3.14 and 10, and then squaring their product. This may indicate a student lacking conceptual understanding of the order of operations when exponents are involved. Students making this error may need more experience simplifying expressions using the order of operations when exponents are involved. Teachers may consider using the Algebra Readiness Remediation Plan Simplify Numerical Expressions-Order of Operations as a review lesson.

5) Solve the expression $a^2 - 5b + \sqrt{c}$ when $a = -3$, $b = 6$, and c = 16.

One common error occurs when students are asked to square a negative base. Some will calculate -3^2 and get a result of -9 rather than the expected value of 9 when students calculate $(-3)^2$. This indicates that the student does not thoroughly understand the fact that the entire quantity, a, needs to be squared. These students may benefit from rewriting a^2 in its expanded form $a \cdot a$. Then, after replacing a with -3, they will realize that the positive answer is more appropriate.

Another common error some students may make is to divide the radicand by 2 instead of calculating the square root; therefore evaluating $\sqrt{16}$ as 8 rather than 4. Many students view the concept of a radical very abstractly and do not possess a concrete, geometric understanding of what a radical actually means. They may also struggle with the difference between squaring a number and taking the square root of a number. Teachers may want to consider activities such as 7.1 Square Roots as a review lesson. Square Roots; Number and Number Sense; 7.1d

6) Evaluate the expression $\frac{-|r-t|}{2m}$ when $m = -1$, $r = -6$, and $t = -4$.

Students may make the mistake of calculating the absolute value with the negative sign on the outside of the absolute value. Students confuse the negative sign outside of an absolute value, and question why it then becomes negative. This indicates that the student might be lacking a conceptual understanding of absolute

value. Teachers should show students that the negative sign outside the absolute value indicates multiplication of -1.

Students may also take the absolute value of r and t before subtracting because they do not view absolute value as a grouping symbol. Failure to recognize this grouping symbol will cause problems evaluating expressions. Teachers should take time to brainstorm types of grouping symbols with these students.

7) What is the value of the expression $m\{8 + [b(m - 1) + 3]\}$ when $m = -2$ and $b = -\frac{2}{3}$.

A common error when calculating order of operations is the confusion between braces and brackets. This may indicate that students are not understanding the grouping order within the expression. The innermost parentheses are calculated first, followed by the brackets followed by braces that form the third layer. These students may need more experience evaluating expressions with multiple grouping symbols.