

Evaluating Algebraic Expressions

Strand:	Patterns, Functions, and Algebra
Topic:	Represent algebraic expressions using concrete materials. Use the order of operations and apply the properties of real numbers to evaluate expressions for given replacement values of the variables.
Primary SOL:	7.11 The student will evaluate algebraic expressions for given replacement values of variables.
Related SOL:	7.2, 7.4ab

Materials

- Snack-size baggies
- Different colored cubes (green, blue, dark brown, red, orange, yellow)
- Calculators
- Algeblocks
- Evaluating Expressions with Cubes activity sheet (attached)
- Student Expressions sheet (attached)

Vocabulary

expression, order of operations, properties, variable (earlier grades)

Student/Teacher Actions: What should students be doing? What should teachers be doing?

Note: Before the lesson, make baggies that include the various colored cubes. There should be a different number of cubes for each color, and be sure that the number of red cubes is a perfect square.

1. Use Algeblocks to represent $2b + c$ with two orange rods and a yellow rod. Ask students if they can simplify this expression. Now ask students to suppose that five greens equal an orange and three greens equal a yellow. Change the representation and ask whether they can simplify now. Now use a pictorial representation of the example using the blocks. Provide the students with a value for b and c . Possible values could be $b = 5$ and $c = 3$. Discuss with students whether they can simplify the expression now. Review the order of operations with students. Provide additional examples.
2. Continue the discussion by asking students how they might simplify the expression if they knew that $b = -5$ and $c = 3$? Discuss what happens when the teacher is absent – a “substitute” takes her place. Could the same thing happen here? Could -5 take the place of b ? Could 3 take the place of c ? Now could we use order of operations to simplify the expression?
3. Distribute the Evaluating Expressions with Cubes activity sheet and the snack-size baggies of colored cubes. The colors will represent the variables. Have students sort their cubes according to color and record the values on the activity sheet. The teacher should emphasize that they are using the “opposite” of the value for the dark brown cubes.
4. Students will evaluate each expression, using the quantities of the cubes. Be sure students showed all steps in evaluating the expression.

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5. Review the Evaluating Expressions with Cubes activity, and then distribute the Student Expressions activity sheet that students will complete in pairs.

Assessment

- **Questions**
 - When evaluating an expression, what is the first step?
 - Why is the order of operations important when evaluating an expression?
- **Journal/writing prompts**
 - Explain a situation in which you would have to evaluate an expression in real life.
 - Explain to a classmate that has been absent how to evaluate expressions.
- **Other Assessments**
 - Have students create a domino-type game for evaluating expressions.

Extensions and Connections (for all students)

- Connect the expressions to real-life scenarios and evaluate.
- Allow the students to use number cubes or candy instead of cubes to complete the Evaluating Expressions with Cubes Activity.
- Students can apply concepts through various formulas.

Strategies for Differentiation

- Emphasize the correct use of the parenthesis when substituting to represent multiplication.
- Have students create their own problems and solve. Students should use negative numbers as their substitutions. Then, have them exchange problems with partners and solve each other's problems. Students should use calculators to check the student created problems.
- In the Evaluating Expressions with Cubes activity, have students find the "opposite" of the number of cubes for red, orange, and yellow. Discuss with students what happens when positive numbers are replaced with negatives.
- Start with problems that involve substituting only one variable, and then progress to multiple variables.
- Have students use a different color highlighter for each variable when completing a problem with multiple variables.
- Assign each student a partner for learning activities, ensuring each partner participates fully in each activity.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Evaluating Expressions with Cubes

Name _____ Date _____

Separate your bag of cubes into color sets designated with the following variables.

g = green b = blue d = dark brown r = red o = orange y = yellow

Record the number in each set to find the values of each variable.

g = _____ b = _____ $-(d)$ = _____

r = _____ o = _____ y = _____

Evaluate each expression for the replacement values found above. Be sure to show all of your work.

$$\sqrt{r} + bd$$

$$d + \frac{1}{2}(y + g)$$

$$3(-y) - 5b$$

$$b^3 - y - o$$

$$(3r + 4.5) - |d|$$

$$(4g - o)^2$$

Student Expressions

Name _____ Date _____

1. Create four expressions on your own and write them on the lines below.
2. Each expression should contain at least three variables, three operations, and the replacement values for each variable.
3. Have a classmate evaluate the expressions using the replacement values.
4. The classmate should use the box to show their work.

1 _____	2 _____
3 _____	4 _____