Translate and Evaluate Expressions

Strand: Expressions and Operations

Topic: Representing verbal quantitative situations algebraically and evaluating and simplifying algebraic expressions

Primary SOL: A.1 The student will
- a) represent verbal quantitative situations algebraically; and
- b) evaluate these expressions for given replacement values of the variables.

Materials
- Sample Graphic Organizer for Mathematical Operations and Symbols activity sheet (attached)
- Mathematical Translations Matching activity sheet (attached)
- Snack-size bags of colored candies or number cubes
- Evaluating Expressions with Candy activity sheet (attached)
- Calculators

Vocabulary

algebraic expressions, algebraic equations, equivalence, minimum, symbolic representations (earlier grades)

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

1. Write a common word or phrase on the board in another language and ask students to translate it into English. Compare this sort of translation to the process of translating words into numbers and mathematical symbols.
2. Ask students to translate the following into numbers and mathematical symbols:
   - your allowance plus a bonus of $15.75
   - the number of dogs increased by 9 is 20
   - the cost of the pants at 30 percent off
   - 3 gallons of tea was poured into two containers of different sizes. Express the amount of tea in the smaller container in terms of the amount t poured into the larger container.

   Have students share their answers and discuss as a class. Discuss vocabulary terms as they arise.
3. Distribute the Sample Graphic Organizer for Mathematical Operations and Symbols activity sheet. Have students complete the sheet. Share responses and discuss as a class.
4. Distribute the Mathematical Translations Matching activity sheet. Have students cut out the squares and pair matching equations and expressions. After students make their matches, have them sort their piles into equations and expressions. Have students do a think-pair-share to compare their work with a partner. Discuss as a class.
5. Present students with the expression $2b – c$ and ask students whether it can be simplified. Students should realize that there is nothing they can do with this expression, because they do not know the values of the variables b and c.

6. Tell students that $b = 5$ and $c = -3$. Ask whether they can now simplify the expression. Be sure students use the correct order of operations. Provide other examples.
7. Distribute the Evaluating Expressions with Candy activity sheet and a snack-size bags of colored candies. The colors will represent the variables. Have students sort their candy according to color and record the values on the activity sheet. If you prefer not to use candy, have students roll a number cube six times to establish values for each of the variables.
8. Students will evaluate each expression, using the values of the candy (or rolls of a number cube). Be sure students show all steps in evaluating the expression.

Assessment

- **Questions**
  - What is the difference between an expression and an equation?
  - Why is it important to be able to write verbal expressions as algebraic expressions and sentences as equations and vice versa?
  - Which property justifies that Johnny and Matthew's expressions are equivalent?
    - Johnny: 2 + (6 + 4)
    - Matthew: (6 + 4) + 2
  - Paula was given the expression $(3x + 5) - 4$. She rewrote it as $3x + (5 - 4)$. Which property did she apply when she rewrote the expression?
- **Journal/Writing Prompts**
  - Jack says "six less than twice a number is four" is written as $6 - 2n = 4$. Jane says he is incorrect and that it should be written as $2n - 6 = 4$. Identify who is correct, and explain why. Would Jack and Jane arrive at the same answer if they both solve their equations?
  - Explain to a classmate that has been absent how to evaluate expressions.
- **Other**
  - Have students create their own matching expressions and equations game and give it to a partner to check for accuracy.
  - Have students create a domino-type game for evaluating expressions.

Extensions and Connections (for all students)

- Have students explore number magic games, and have them represent the number tricks numerically, visually, and algebraically.
- Play a Bingo-type game in which students translate expressions and equations.
- Have students play an "I Have, Who Has?" game for translating or substitution.

Strategies for Differentiation

- Use graphic organizers for vocabulary.
- Color code the different parts of an expression or equation written in words before translating it to mathematical symbols.
- Allow for flexible grouping (i.e. individual, partners, or small groups) for activities.
- Reduce the number of pairs in the Mathematical Translations Matching activity.

- Students who struggle with questions 1–3 on the Evaluating Expressions with Candy activity should eliminate questions 4–6.
- Have students do a think-pair-share to explain journal/writing prompts and arrive at a common answer.

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

Sample Graphic Organizer for Mathematical Operations and Symbols

Phrase	Mathematical Symbol	Example	Translation
A Number		Five times a number	
Sum		The sum of a number and three	
Difference		The difference of a number and nine	
Product		The product of six and a number	
Quotient		The quotient of a number and twelve	
Of		One fourth of a number	
Is		Two times a number plus six is fourteen.	

Turn Around Words

Word	Phrase	Translation
Than	Six less than a number	
From	10 subtracted from a number	

Mathematical Translations Matching

Five more than a number	$n + 6$	$n - 6$	The square of three less than six times a number
Twice a number diminished by five	Two third of a number is decreased by 11	Five times the sum of n and seven	$n + 5$
$\frac{50}{n+5}$	Six less than a number	The quotient of fifty and five more than a number	$3n - 8$
Seven more than one-half a number	$5(n + 7)$	$2n - 5$	$(6n - 3)^2$
$\frac{1}{2}n+7$	Three times a number minus eight	The sum of six and a number	$\frac{2}{3}n-11$
The square root of the product of two and x.	The product of the square root of two and x.	$\sqrt{2x}$	$x\sqrt{2}$

Three times the absolute value of two less than a number, increased by five.	$3\lvert x-2\rvert+5$	$\lvert x-2\rvert+3(5)$	The absolute value of two less than a number, increased by the product of three and five.

Evaluating Expressions with Candy

Name ____ **Date** ____________________________

Separate your bag of candy into color sets designated with the following variables:

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

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

g = ___________ b = ___________ d = ___________

r = ___________ n = ___________ y = ___________

Evaluate each expression for the replacement values found above.

1. $5r + 2\left(d - \sqrt[3]{8}\right)$
2. $6.2 + 5(y + g)$
3. $6.14y^2 - 5.2b^2$
4. $r^2 + 3b - (\frac{2}{3}y)$
5. $(3r + 6\frac{3}{4}) - d$
6. $\frac{(4g-2)^2}{\sqrt[3]{27}-3bn}$
7. $\frac{|7-2n|}{8-4b}$
8. $\sqrt{25}(gy) - rd$
9. $|2g^2 - 5b| - \sqrt[3]{125}$

Create two expressions of your own and have a classmate evaluate them using their data.

Evaluate two expressions created by a classmate using your data and show all work below.