# **Expressions and Equations Discussion Guide (for use during or after reading)**

1. What are expressions? Create an example of an expression with two or more terms and at least one variable. (Variables and Expressions, p. 4-9)
   1. An expression is a combination of numbers, variables, and operations like addition, subtraction, multiplication, and/or division.
   2. Students’ examples will vary. A possible answer is 3x2 + 2x – 5.
2. Determine the variables, coefficients, constants, exponents, and number of terms in the following expression: 32 + 2x3 – 7y + 3z – 2. (Expressions, p. 4-9)
   1. Variables: x, y, and z
   2. Coefficients: 2, 7, and 3
   3. Constants: 32 and 2
   4. Exponents: 2 and 3
   5. Number of Terms: 5
3. What does it mean to evaluate an expression? Evaluate the expression 2( + 1) for = 2, = 4, and = 6. (Evaluate Expressions, p. 10-13)
   1. To evaluate an expression is to find its value when the variable is replaced by a specific number. For example, to evaluate the provided expression, we will replace a with different values, and then use what we know about the order of operations (PEMDAS) to solve.
   2. 2( + 1) for = 2 🡪 2(2 + 1) 🡪 2(3) = 6
   3. 2( + 1) for = 4 🡪 2(4 + 1) 🡪 2(5) = 10
   4. 2( + 1) for = 6 🡪 2(6 + 1) 🡪 2(7) = 14
4. Use what you know about PEMDAS and combining like terms to simplify the expression 3 + 4x + 3y – x + 6. (Simplify Expressions with Variables, p. 16-17)
   1. PEMDAS represents the order in which we apply operations to evaluate or simplify expressions and equations. Combining like terms requires us to add or subtract terms with the same variable parts.
   2. 3 + 4x + 3y – x + 6 🡪 we can use the associative property to rearrange the expression: 4x – x + 3y + 3 + 6 🡪 we can combine like terms: 3x + 3x + 9
5. What is an equation? (Solve One-Variable Equations, p. 18-19)
   1. An equation is a math sentence with an equal sign. The expressions on either side of the equal sign have the same value. For example, 3x + 2 = 10 + 1 is an equation because the expression 3x + 2 is equivalent to the expression 10 + 1.
6. How can substitution be used to solve the equation 3 + n = 7? (Solve One-Variable Equations, p. 18-19)
   1. One way to solve equations is with substitution. This can be an efficient strategy when the numbers are simple or when patterns are easily recognizable.
   2. To solve 3 + n = 7 using substitution, we can try different values of n until the equation is true: 3 + **1** = 4, so false; 3 + **2** = 5, so false; 3 + **3** = 6, so false; 3 + **4** = 7, so true. In the equation 3 + n = 7, n = 4.
7. Why is isolating the variables often considered an efficient strategy for solving equations? (Solve One-Step Equations, p. 20-25)
   1. Isolating the variables is often considered an efficient strategy when solving equations because you do not need to use the guess-and-check based substitution strategy. Often, especially with equations involving multiple terms, variables, or exponents, using inverse or opposite operations to isolate the variable will be the quickest and most accurate way to determine the value of a variable.
8. In general, how do you isolate the variable when solving equations? (Solve One-Step Equations, p. 20-25)
   1. In general, it is best to isolate the variable by first evaluating any constants. For example, evaluate any terms with a non-variable base and exponent. Next, use what you know about PEMDAS to apply opposite operations than those in the original equation. This will help “undo” certain steps, leaving you with the variable isolated on one side of the equation and its equivalent value on the other.

1. Look at the example on pages 28 and 29. What is the distributive property and how does one use it to efficiently solve equations? (Solve Two-Step Equations, p. 26-29)
   1. The distributive property tells us how to evaluate and solve expressions in the form of *a(b + c)* or *a(b – c)*. We can use the distributive property by “distributing” the value outside of the parentheses to those inside the parentheses, getting *ab +* ac or *ab – ac*, respectively. For example, 3(2 + x) can be rewritten as 3(2) + 3x, or 6 + 3x. This can be helpful, especially when solving complex or multi-step equations because it allows us to isolate the variable more easily.
2. A rectangle with a perimeter of 16 cm has a length of 3 cm and a width longer than that. Create an equation to match this situation and use it to determine the width of the rectangle. (Solve Word Problems, p. 32-35)
   1. In order to solve this problem, we can create and solve an equation. We know the perimeter is 16 cm, so that will be the value on one side of the equal sign. We also know the formula for the perimeter of a rectangle as P = 2*l* + 2*w*, with P = perimeter, *l* = length, and *w* = width. We can rewrite that equation using our values: 16 = 2(3) + 2*w*. Solve by using inverse, or opposite, operations.
   2. 16 = 2(3) + 2*w* 🡪 evaluate constants: 16 = 6 + 2*w* 🡪 use inverse operations to subtract the constant from both sides: 10 = 2*w* 🡪 use inverse operations to divide each side by 2, isolating the variable: 5 = *w*