

Topic B

Expressions and Real-World Problems

Students begin this module by writing and evaluating numerical expressions. They learn the conventional order of operations and how to evaluate powers. In topic B, students build upon this understanding and previous work from elementary grades with variables in formulas when they write, interpret, and evaluate algebraic expressions for given values of the variables.

In lesson 7, students first learn why and how variables are used to represent unknown numbers. Then students explain how numerical and algebraic expressions are similar and different. The first algebraic expressions that students write and evaluate for given values of the variables involve addition and subtraction. Next, students reason about descriptions that indicate addition, such as *sum*, *total*, and *more than*, and descriptions that indicate subtraction, such as *difference*, *fewer than*, and *less than*. Students recognize how subtle variations in words, such as *8 subtracted from a number* and *8 minus a number*, can have different mathematical meanings. By applying their understanding of the commutative property of addition, students understand why some expressions, such as $x + 8$ and $8 + x$, are equivalent, while others, such as $x - 8$ and $8 - x$, are not.

In lesson 8, students transition to writing algebraic expressions that involve multiplication and division and then to expressions that involve any combination of addition, subtraction, multiplication, and division. By using common conventions to write multiplication and division expressions, students develop an appreciation of efficiency. For example, students learn to write the product of 2 and 3 and x as $6x$ and the quotient of 3 and x as $\frac{3}{x}$. To extend their understanding of the connection between real-world and mathematical language, students write descriptions of expressions and analyze ambiguous descriptions. Students attend to precision by using mathematical terms and symbols appropriately when they write algebraic expressions to represent descriptions and write descriptions of algebraic expressions.

Blake's Age (years)	Jada's Age (years)
9	4
13	8
16	11
b	$b - 5$

Over the course of the next two lessons, students represent real-world situations with addition and subtraction expressions, and then with multiplication and division expressions. Students learn to precisely define variables and to identify constraints on variables. Students approach writing expressions by thinking about what quantity is unknown, what the variable represents, and how to determine whether to add, subtract, multiply, or divide. Students contextualize the coefficients, constants, and variables in their expressions by interpreting the expression's real-world meaning.

In lesson 11, students develop algebraic expressions with multiple operations that represent real-world situations. Through various contexts, students recognize when a real-world situation calls for multiple operations. Students decontextualize a real-world situation by thinking about known and unknown quantities and how the quantities relate to one another.

In the rest of the module, students apply what they know about algebraic expressions when they use properties to write and identify equivalent expressions, write and solve one-variable equations, and write and interpret two-variable equations.

Description	Expression
One-third of the sum of a number and 5	$\frac{1}{3}(n + 5)$
The sum of one-third of a number and 5	$\frac{1}{3}n + 5$

Progression of Lessons

Lesson 7 Algebraic Expressions with Addition and Subtraction

Lesson 8 Algebraic Expressions with Addition, Subtraction, Multiplication, and Division

Lesson 9 Addition and Subtraction Expressions from Real-World Situations

Lesson 10 Multiplication and Division Expressions from Real-World Situations

Lesson 11 Modeling Real-World Situations with Expressions