2.2
teacher notes

$$\Delta = .00\,\pi + \frac{1}{200000}\sqrt{xy}$$

Objective

- **Write word phrases as algebraic expressions.**

$$\frac{1}{\Omega\,13750} \qquad \overline{5-b}\,|\,\sqrt{xy}\,\tfrac{1}{12}\,\Delta$$

Vocabulary

Algebraic expression (Lesson 2-1)

Variable (Lesson 2-1)

Product (Lesson 1-2)

Quotient (Lesson 1-2)

Base (Lesson 1-4)
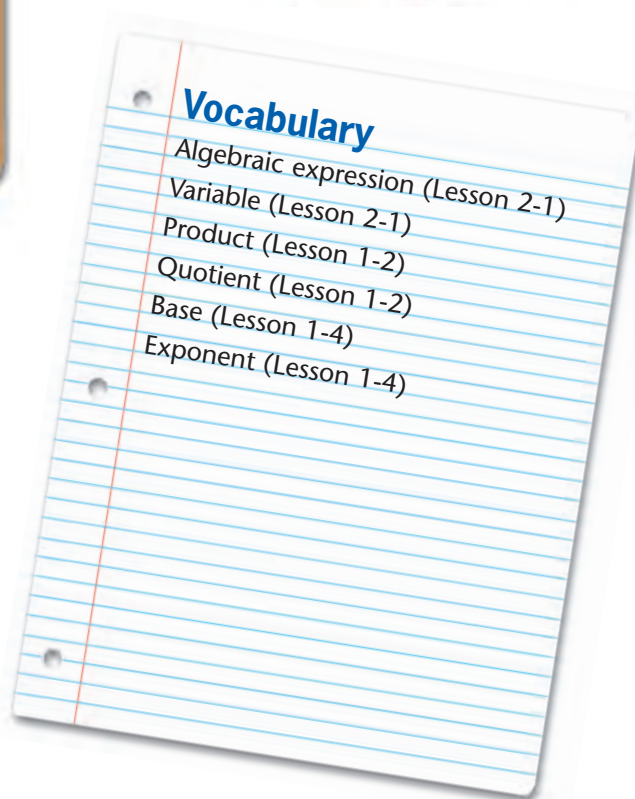
Exponent (Lesson 1-4)
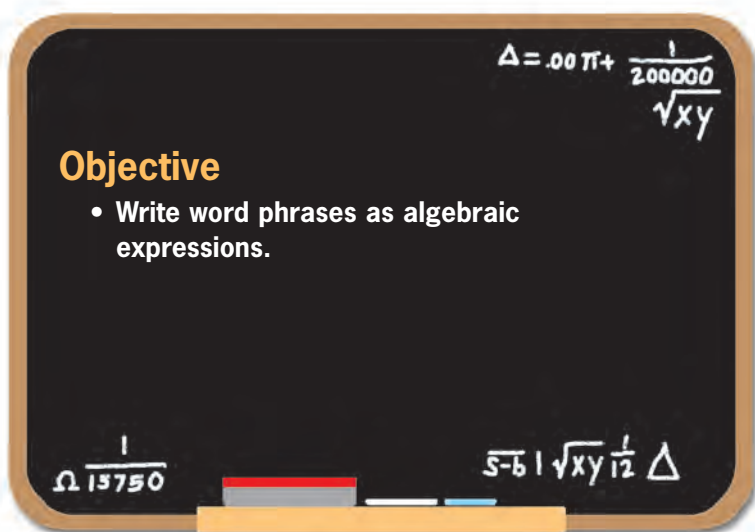
Prerequisites

Expressing operations in different ways

Applying the order of operations
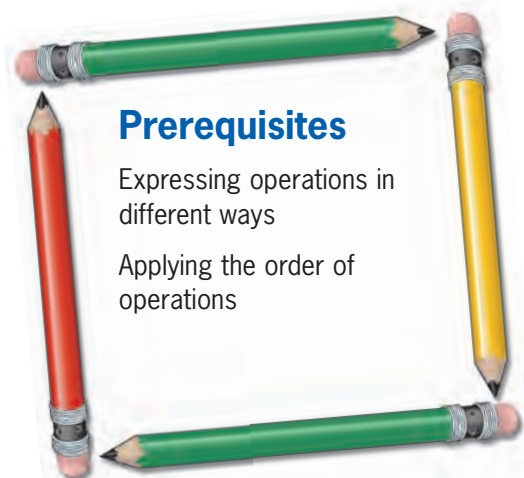
Get Started

- Pick a number between 1 and 10.

- Add 3 to the number.

- Multiply the result by 2.

- Subtract 6.

- Divide the result by 2.

- If you have the number you picked at the beginning of this exercise, you are ready to translate word phrases into algebraic operations.

Section 1

Expand Their Horizons

In this lesson students will learn to translate word phrases, requiring one and two operations, into algebraic expressions. Stress the importance of this skill to the students. The process of translating word phrases into algebraic expressions allows algebra to be very useful for solving problems in the real-world.

Learning the key words for the different operations will help students be successful in translating word phrases.

The sum of a number and 10 can be written using any variable. Pause the video and have students think of other word phrases that can be written as $p + 10$. This would be a good activity to do in pairs so that each student could be involved.

Compare the sentence "3 **is** less than 50" and the phrase "3 less than 50". Emphasize how one word can change a meaning.

Common Error Alert

Students will often write subtraction phrases in the reverse order.

Practice using phrases that do not include variables to help students understand subtraction phrases. For example, 1 subtracted from 6 is $6 - 1 = 5$. The number 8 decreased by 2 is $8 - 2 = 6$. The number 7 less than 11 is $11 - 7 = 4$.

Prepare students for future lessons by discussing the different ways of indicating multiplication. Be sure they understand that hk means h times k. This does not mean a number with h in the tens place and k in the ones place, such as the number 23. Also, multiplication can be indicated by parentheses. Show all these ways to indicate 3 times 5:

$$3 \times 5 = 3 \cdot 5 = 3(5) = (3)5 = (3)(5).$$

It might be necessary to review exponents. $d^3 = d \cdot d \cdot d$.

1 The phrase "more than" indicates addition. Any variable is acceptable. Twelve more than a number is $m + 12$. Although algebraic properties have not been formally introduced, most students will be familiar with the commutative property. If they are not, remind them that it means that in addition and multiplication, order does not matter. Because of the commutative property, 12 more than a number can be written either $m + 12$ or $12 + m$. However, it is better to use $m + 12$ so that when a phrase using "less than" is translated, good habits have been established.

2 If students are struggling with the order of this phrase, replace "a number" with ten. Students will see that five less than ten is written as $10 - 5$. Then, they should be able to replace the ten with a variable to get $j - 5$. Show that $10 - 5 \neq 5 - 10$.

3 In this phrase the variable is specified. 3 times a number y is $3y$.

4 This may be the first time that students are introduced to the relationship between fractions and division. They should understand that a fraction is another way to write a division problem.

Connections

To be able to solve problems in science, engineering, economics, business, and other fields, you need the ability to translate written language into algebraic expressions. For example, in any given amount of water, the mass of oxygen is 8 times the mass of hydrogen. To translate "8 times the mass of hydrogen," you can write $8x$.

DIGITAL

The rest of the problems involve translations having more than one operation. Have students read the phrase and then work with only a small portion of the phrase at a time in order to gain confidence. It may help them to cover the part of the phrase that is not being translated.

To translate "three more than five times a number *h*," cover all of the phrase except "three more than". This is written as, "__ + 3". Then cover all the phrase except "five times a number *h*". This is written as 5*h*. Combining these two expressions yields 5*h* + 3.

Point out that in the phrase "the sum of *p* and *q* decreased by the product of *p* and *q*", the words *sum of* indicate that parentheses should be written. Then, *p* and *q* indicate that *p* + *q* should be written inside the parentheses.

5 First, write the square of *k* as k^2. If this quantity is decreased by 7, then the expression is $k^2 - 7$.

6 Encourage students to use either a dot or parentheses for the phrase "4 times 2". To translate "4 times 2 plus 7", write 4 · 2 + 7 or (4)(2) + 7.

7 First, write 5 times as "5 · ". Then write the sum of a number and 2 as "*r* + 2". Since the 5 is multiplied by the entire sum, *r* + 2 should be in parentheses. The phrase translates to 5 · (*r* + 2) or 5(*r* + 2).

Look Beyond

In future lessons, students will translate full sentences into algebraic equations and solve them in order to solve real-world problems.

Additional Examples

1. **Write an algebraic expression for: the product of a number and –2**

   Product indicates multiplication. The product of a number and –2 is written as –2*y*.

2. **Write an algebraic expression for: 5 less than 8 times a number**

   5 less than a number indicates a "– 5" at the end of the expression. 5 less than 8 times a number is written as 8*q* – 5.