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Lesson 16: Write Expressions in Which Letters Stand for Numbers

Student Outcomes

* Students write algebraic expressions that record all operations with numbers and letters standing for the numbers.

Lesson Notes

In general, key word readings should be avoided. However, at this initial phase it is important for students to understand the direct relationship between words in a written phrase and their appearance in an algebraic expression.

Classwork

Opening Exercise (5 minutes)

Students underline the key math vocabulary words in each statement.

**Opening Exercise**

**Underline the key words in each statement.**

* 1. The sum of twice and .

The sum of twice and .

* 1. The quotient of and .

The quotient of and .

* 1. raised to the fifth power then increased by the product of and .

raised to the fifth power then increased by the product of and .

* 1. The quantity of plus divided by .

The quantity of plus divided by .

* 1. less than the product of and .

less than the product of and .

* 1. times then increased by .

times then increased by .

**Mathematical Modeling Exercise 1 (10 minutes)**

Model how to change the expressions given in the opening exercise from words to variables and numbers.

Mathematical Modeling Exercise 1

* 1. The sum of twice and .
* Underline key words: The sum of twice and .
* Identify the operations each key word implies.

MP.6

* + *“Sum” indicates addition and “twice” indicates multiplication by .*
* Write an expression.

* 1. The quotient of and .
* Underline key words: The quotient of and .
* Identify the operation the key word implies.
  + *“Quotient” implies division.*
* Write an expression.

* 1. raised to the fifth power then increased by the product of and .
* Underline key words: raised to the fifth power, increased by the product of and .
* Identify the operations each key word implies.
  + *“Power” indicates exponents, “increased” implies addition, and “product” implies multiplication.*
* Write an expression.

* 1. The quantity of plus divided by .
* Underline key words: The quantity of plus divided by .
* Identify the operations each key word implies.
  + *“Quantity” indicates parentheses, “plus” indicates addition, and “divided by” implies division.*
* Write an expression.

* 1. less than the product of and .
* Underline key words: less than the product of and .
* Identify the operations each key word implies.
  + *“Less than” indicates subtraction and “product” implies multiplication.*
* Write an expression.

MP.6

* Would also be correct? Why or why not?
  + *This expression would not be correct. If the amount of money I have is less than someone else, I would take the money the other person has and subtract the .*
  1. times then increased by.
* Underline key words: times then increased by .
* Identify the operations each key word implies.
  + *“Times” indicates multiplication and “increased” implies addition.*
* Write an expression.

**Mathematical Modeling Exercise 2 (10 minutes)**

Mathematical Modeling Exercise 2

Model how to change each real-world scenario to an expression using variables and numbers. Underline the text to show the key words before writing the expression.

Marcus has more dollars than Yaseen. If is the amount of money Yaseen has, write an expression to show how much money Marcus has.

* Underline key words.
  + *Marcus has more dollars than Yaseen.*
* If Yaseen had , how much money would Marcus have?

MP.6

* How did you get that?
  + *Added*
* Write an expression using for the amount of money Yaseen has.

Mario is missing half of his assignments. If represents the number of assignments, write an expression to show how many assignments Mario is missing.

* Underline key words.
  + *Mario is missing half of his assignments.*
* If Mario was assigned assignments, how many is he missing?
* How did you get that?
* Write an expression using for the number of assignments Mario was assigned.
  + or

Kamilah’s weight has tripled since her first birthday. If represents the amount Kamilah weighed on her first birthday, write an expression to show how much Kamilah weighs now.

* Underline key words.
  + *Kamilah’s weight has tripled since her first birthday.*
* If Kamilah weighed pounds on her first birthday, how much does she weigh now?

MP.6

* + pounds
* How did you get that?
  + *Multiply by* .
* Write an expression using for Kamilah’s weight on her first birthday.

Nathan brings cupcakes to school and gives them to his five best friends who share them equally. If represents the number of cupcakes Nathan brings to school, write an expression to show how many cupcakes each of his friends receive.

* Underline key words.
  + *Nathan brings cupcakes to school and gives them to his five best friends who share them equally.*
* If Nathan brings cupcakes to school, how many will each friend receive?
* How did you determine that?
* Write an expression using to represent the number of cupcakes Nathan brings to school.
  + or

Mrs. Marcus combines her atlases and dictionaries and then divides them among different tables. If represents the number of atlases and represents the number of dictionaries Mrs. Marcus has, write an expression to show how many books would be on each table.

* Underline key words.
  + *Mrs. Marcus combines her atlases and dictionaries and then divides them among different tables.*
* If Mrs. Marcus had atlases and dictionaries, how many books would be at each table?
* How did you determine that?
  + *Added the atlases and dictionaries together and then divided by .*
* Write an expression using for atlases and for dictionaries to represent how many books each table would receive.
  + or

MP.6

To improve in basketball, Ivan’s coach told him that he needs to take four times as many free throws and four times as fmany jump shots every day. If represents the number of free throws and represents the number of jump shots Ivan shoots daily, write an expression to show how many shots he will need to take in order to improve in basketball.

* Underline key words.
  + *To improve in basketball, Ivan needs to shoot times more free throws and jump shots daily.*
* If Ivan shoots free throws and jump shots, how many will he need to shoot in order to improve in basketball?
* How did you determine that?
  + *Added the free throws and jump shots together and then multiplied by* .
* Write an expression using for free throws and for jump shots to represent how many shots Ivan will have to take in order to improve in basketball.
  + or

Exercises (10 minutes)

Have students work individually on the following exercises.

Exercises

Mark the text by underlining key words, and then write an expression using variables and/or numbers for each statement.

1. decreased by squared.

decreased by squared.

1. divided by the product of and .

divided by the product of and .

or

1. decreased by the quantity of plus .

decreased by the quantity of plus .

1. The sum of twice and .

The sum of twice and .

1. Marlo had but then spent .

Mario had but then spent .

1. Samantha saved her money and was able to quadruple the original amount, .

Samantha saved her money and was able to quadruple the original amount, .

1. Veronica increased her grade, , by points, and then doubled it.

Veronica increased her grade,, by points, and then doubled it.

1. Adbell had pieces of candy and ate of them. Then, he split the remaining candy equally among friends.

Adbell had pieces of candy and ate of them. Then, he split the remaining candy equally among friends.

or

1. To find out how much paint is needed, Mr. Jones must square the side length, , of the gate, and then subtract .

To find out how much paint is needed, Mr. Jones must square the side length, , of the gate, and then subtract .

1. Luis brought cans of cola to the party, Faith brought cans of cola, and De’Shawn brought cans of cola. How many cans of cola did they bring altogether?

Luis brought cans of cola to the party, Faith brought cans of cola, and De’Shawn brought cans of cola. How many cans of cola did they bring altogether?

Closing (5 minutes)

* How is writing expressions with variables and numbers similar to writing expressions using words?
  + *Possible answers: The same vocabulary words can be used; identifying parts of the expression before writing the expression is helpful.*
* How is writing expressions with variables and numbers different than writing expressions using words?
  + *Possible answers: When an expression with words is provided, it is possible that it might be represented mathematically in more than one way. However, when an algebraic expression is written, there can only be one correct answer.*

Exit Ticket (5 minutes)

Name Date

Lesson 16: Write Expressions in Which Letters Stand for Numbers

Exit Ticket

Mark the text by underlining key words, and then write an expression using variables and/or numbers for each of the statements below.

1. Omaya picked amount of apples, took a break, and then picked more. Write the expression that models the total number of apples Omaya picked.
2. A number is tripled and then decreased by .
3. Sidney brings carrots to school and combines them with Jenan’s carrots. She then splits them equally among friends.
4. less than the quotient of and .
5. Marissa’s hair was inches long, and then she cut inches.

Exit Ticket Sample Solutions

Mark the text by underlining key words, and then write an expression using variables and/or numbers for each of the statements below.

1. Omaya picked amount of apples, took a break, and then picked more. Write the expression that models the total number of apples Omaya picked.

Omaya picked amount of apples, took a break, and then picked more.

1. A number is tripled, and then decreased by .

A number is tripled, and then decreased by .

1. Sidney brought carrots to school and combined them with Jenan’scarrots. She then split them equally among friends.

Sidney brought carrots to school and combined them with Jenan’s carrots. She then split them equally between friends.

or

1. less than the quotient of and .

less than the quotient of and .

or

1. Marissa’s hair was inches long, and then she cut inches.

Marissa’s hair was inches long, and then she cut inches.

Problem Set Sample Solutions

Mark the text by underlining key words, and then write an expression using variables and numbers for each of the statements below.

1. Justin can type words per minute. Melvin can type times as many words as Justin. Write an expression that represents the rate at which Melvin can type.

Justin can type words per minute. Melvin can type times as many words as Justin. Write an expression that represents the rate at which Melvin can type.

1. Yohanna swam yards yesterday. Sheylin swam yards less than half the amount of yards as Yohanna. Write an expression that represents the number of yards Sheylin swam yesterday.

Yohanna swam yards yesterday. Sheylin swam yards less than half the amount of yards as Yohanna. Write an expression that represents the number of yards Sheylin swam yesterday.

or or

1. A number is decreased by and then doubled.

A number is decreased by and then doubled.

1. Nahom had baseball cards and Semir had baseball cards. They combined their baseball cards and then sold of them.

Nahom had baseball cards and Semir had baseball cards. They combined their baseball cards and then sold of them.

1. The sum of and is divided by cubed.

The sum of and is divided by cubed.

or