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FREE LEARNING NOTES FOR ZAMBIA

FORM 1

Mathematics

Algebraic expressions

Lesson notes for learners · Competence-Based Curriculum

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When a school plans a trip, a shop adds up a bill or a bus fills with passengers, we often do not know every number in advance. Algebra uses letters to stand for the unknown numbers so that we can write the whole situation as one expression. This note shows how to form, read and simplify algebraic expressions.

AFTER THESE NOTES YOU SHOULD BE ABLE TO

- Write an algebraic expression for a real-life situation and say what each letter stands for
- Identify terms, coefficients, variables and constants in an expression
- Group like terms and unlike terms
- Simplify an expression by adding and subtracting like terms

KEY WORDS

variable	a letter that stands for an unknown number
term	a part of an expression, such as 4x or 5
coefficient	the number that multiplies a variable, as 4 in 4x
constant	a term that is just a number, as 5 in 4x + 5
expression	a group of terms joined by addition or subtraction
like terms	terms with the same variable raised to the same power
unlike terms	terms with different variables, or the same variable with different powers

1 Forming algebraic expressions

To make an algebraic expression, choose a letter for the unknown quantity, then use numbers and the operations of addition, subtraction, multiplication and division to show how the quantities are related. Always say what each letter represents.

Suppose a class plans a tour. Let x be the cost of transport, y the cost of each ticket and z the cost of lunch for one learner, and let n be the number of learners. One learner's cost is x + y + z, so the cost for the class can be written as n(x + y + z).

Other situations give simple expressions. One pencil costs K2, so n pencils cost 2n kwacha. A number increased by 7 becomes n + 7. A packet of 14 plates, with x packets and 22 plates already at home, gives 14x + 22 plates altogether.

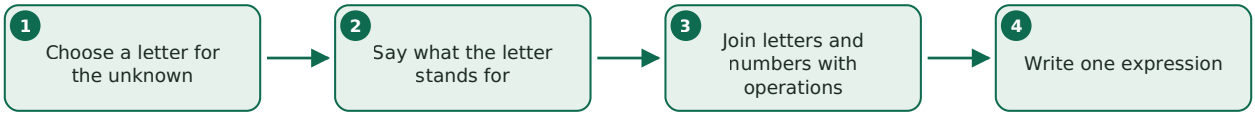

Figure 1. Forming an expression

WORKED EXAMPLE

The temperature at sunrise is T degrees. By noon it rises by 5 degrees and by evening it drops by 8 degrees. Write an expression for the evening temperature.

Sunrise: T

Noon: T + 5

Evening: T + 5 − 8 = T − 3 degrees

2 Terms, coefficients and constants

The parts of an expression that are added or subtracted are its terms. In 4x + 5 the terms are 4x and 5. The 4 in front of the variable is the coefficient, x is the variable, and 5 is a constant because it is only a number.

When no number is written before a variable, the coefficient is 1. So in z the coefficient is 1. Changing 3x to 5x changes the coefficient, but the letter stays the same, because the letter shows what is being counted.

Part	What it is
4x	a term with variable x
4	the coefficient of x
x	the variable
5	a constant term

Figure 2. The parts of 4x + 5

3 Like and unlike terms

Fruit prices show the idea. Let a banana cost x, an orange y and an apple z. A pineapple costs the same as a banana, a lemon the same as an orange and a mango the same as an apple. Spiwe buys 3 bananas, 4 oranges and 5 apples, so she pays 3x + 4y + 5z. Shift buys 1 pineapple, 2 oranges and 1 mango, so he pays x + 2y + z. Shams buys 10 bananas, 3 lemons and 7 apples, so he pays 10x + 3y + 7z.

Fruits with the same price give like terms, for example 3x, x and 10x. Like terms have the same variable and the same power. Unlike terms have different variables, or the same variable with different powers. So 5x and $25x^2$ are unlike terms.

Terms	Like or unlike
3x, x, 10x	like terms (all in x)
4y, 2y, 3y	like terms (all in y)
3x and 4y	unlike terms
5x and $25x^2$	unlike terms (different powers)

Figure 3. Sorting terms

4 Simplifying expressions

To simplify an expression, group the like terms and add or subtract their coefficients. The three shoppers together pay 3x + 4y + 5z + x + 2y + z + 10x + 3y + 7z. Group the like terms: x terms 3 + 1 + 10 = 14, y terms 4 + 2 + 3 = 9 and z terms 5 + 1 + 7 = 13. The total bill is 14x + 9y + 13z.

Unlike terms cannot be combined, so they stay as separate terms in the answer.

WORKED EXAMPLE

Shams buys 10 bananas, 3 oranges and 7 apples. He gets a discount equal to the cost of 2 bananas. Write his new bill in its simplest form.

Bill: 10x + 3y + 7z

Subtract the discount: 10x + 3y + 7z − 2x

Group like terms: 10x − 2x = 8x

New bill: 8x + 3y + 7z

TRY THIS

In groups, make cards with terms such as 3x, −2y, 5x, 25x², 7y, −4x, 6y and x². Sort them into groups of like terms and explain your choices. Then each group writes a shopping situation of its own with three kinds of item, forms an expression for each shopper, and simplifies the total.

REMEMBER

- A variable is a letter that stands for an unknown number; say what it represents.
- The terms of an expression are added or subtracted.
- In 4x + 5, 4 is the coefficient and 5 is the constant.
- When no number is written before a variable, the coefficient is 1.
- Like terms have the same variable and the same power.
- Simplify by adding and subtracting the coefficients of like terms.

? Check yourself

1. Write an expression for the cost of n pencils if one pencil costs K2.
2. In the expression 4x + 5, name the coefficient and the constant.
3. What is the coefficient of z in the term z?
4. Are 5x and 25x² like terms? Give a reason.
5. Simplify 3x + 4y + 5z + x + 2y + z.
6. A bus leaves Lusaka for Monze with 50 passengers. In Kafue, a passengers get on. In Mazabuka, b passengers get off. (a) Write an expression for the number of passengers who reach Monze. (b) State what each letter represents. (c) Find the number when a is 12 and b is 9.
7. Let a banana cost x, an orange y and an apple z. Spiwe buys 3 bananas, 4 oranges and 5 apples. She returns to the shop, keeps her list and adds 5 bananas and 2 apples. (a) Write her new total in its simplest form. (b) Name the like terms you grouped. (c) Explain why the 4y term did not change.

ANSWERS

1. 2n kwacha.
2. The coefficient is 4 and the constant is 5.
3. 1.
4. No, because the power of x is different.
5. 4x + 6y + 6z.
6. (a) 50 + a − b. (b) a is the number who get on at Kafue and b is the number who get off at Mazabuka. (c) 50 + 12 − 9 = 53 passengers.
7. (a) 3x + 4y + 5z + 5x + 2z = 8x + 4y + 7z. (b) The x terms 3x and 5x, and the z terms 5z and 2z. (c) No oranges were added, so there are no other y terms to combine it with.

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