

A.SSE.A.1: Terms, Factors, & Coefficients of Expressions

EQUATIONS AND INEQUALITIES

A.SSE.A.1: Terms, Factors, & Coefficients of Expressions

A. Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.
 - a. Interpret parts of an expression, such as terms, factors, coefficients, degree of polynomial, leading coefficient, constant term and the standard form of a polynomial (linear, exponential, quadratic).
 - b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P* (linear, exponential, quadratic).

Overview of Lesson

- activate prior knowledge and review learning objectives (see above)
 - explain vocabulary and/or big ideas associated with the lesson
 - connect assessment practices with curriculum
 - model an assessment problem and solution strategy
 - facilitate guided discussion of student activity
 - facilitate guided practice of student activity
 - [Selected problem set\(s\)](#)
 - facilitate a summary and share out of student work
- Homework – Write the Math Assignment**

Vocabulary

Equation An **equation** consists of two *expressions* connected by an equal sign. The equal sign indicates that both *expressions* have the same (equal) value. The two expressions in an **equation** are typically called the *left expression* and the *right expression*.

Expression An **expression** is a mathematical statement or phrase consisting of one or more *terms*. *Terms* are the building blocks of **expressions**, similar to the way that letters are the building blocks of words.

Term A **term** is a *number*, a *variable*, or the *product* of numbers and variables.

- **Terms** in an expression are always separated by a plus sign or minus sign.
- **Terms** in an expression are always either positive or negative.
- Numbers and variables connected by the operations of division and multiplication are parts of the same **term**.
- **Terms**, together with their signs, can be moved around within the same expression without changing the value of the expression. If you move a **term** from the left expression to the right expression, or from the right expression to the left expression (across the equal sign), the plus or minus sign associated with the term must be changed.

Variable A variable is a quantity whose value can change or vary. In algebra, a letter is typically used to represent a variable. The value of the letter can change. The letter x is commonly used to represent a variable, but other letters can also be used. The letters s , o , and sometimes l are avoided by some students because they are easily confused in equations with numbers.

Variable Expression A mathematical phrase that contains at least one variable.

Lesson Plan

Example: The equation $2x+3 = 5$ contains a left expression and a right expression. The two expressions are connected by an equal sign. The expression on the left is a variable expression containing two terms, which are $+2x$ and $+3$. The expression on the right contains only one term, which is $+5$.

Coefficient: A **coefficient** is the numerical factor of a term in a polynomial. It is typically thought of as the number in front of a variable.

Example: 14 is the **coefficient** in the term $14x^3y$.

Leading Coefficient: A **leading coefficient** is the coefficient of the first term of a polynomial written in descending order of exponents.

Factor: A **factor** is:

- 1) a whole number that is a **divisor** of another number, or
- 2) an algebraic expression that is a **divisor** of another algebraic expression.

Examples:

- o 1, 2, 3, 4, 6, and 12 all divide the number 12, so 1, 2, 3, 4, 6, and 12 are all factors of 12.
- o $(x-3)$ and $(x+2)$ will divide the trinomial expression $x^2 - x - 6$, so $(x-3)$ and $(x+2)$ are both factors of the $x^2 - x - 6$.

BIG IDEA

Recognizing and using academic vocabulary to communicate the structure of mathematics and to relate parts of mathematical equations and expressions to real world contexts are important skills in mathematics.

REGENTS PROBLEMS TYPICAL OF THIS STANDARD

1. To watch a varsity basketball game, spectators must buy a ticket at the door. The cost of an adult ticket is \$3.00 and the cost of a student ticket is \$1.50. If the number of adult tickets sold is represented by a and student tickets sold by s , which expression represents the amount of money collected at the door from the ticket sales?
 - a. $4.50as$
 - b. $4.50(a+s)$
 - c. $(3.00a)(1.50s)$
 - d. $3.00a + 1.50s$

2. An expression of the fifth degree is written with a leading coefficient of seven and a constant of six. Which expression is correctly written for these conditions?
 - a. $6x^5 + x^4 + 7$
 - b. $7x^6 - 6x^4 + 5$
 - c. $6x^7 - x^5 + 5$
 - d. $7x^5 + 2x^2 + 6$

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Answer Section

1. ANS: D

Strategy: Translate the words into mathematical expressions.

$a \times 3.00 + s \times 1.50$
 The cost of an adult ticket is \$3.00 and the cost of a student ticket is \$1.50.

$$a(3.00) + s(1.50)$$

$$3.00a + 1.50s$$

PTS: 2 REF: 081503ai NAT: A.SSE.A.1 TOP: Modeling Linear Equations

2. ANS: D

The degree of a polynomial is determined by the largest exponent of a term within a polynomial. A polynomial expression of the fifth degree can have not exponent larger than 5, so choices b and c can be eliminated.

A leading coefficient is the coefficient of the first term of a polynomial written in descending order of exponents. Since the leading coefficient is seven, choices a and c can be eliminated, leaving choice d as the only possible answer.

Does it make sense? Yes. $7x^5 + 2x^2 + 6$ has a leading coefficient of seven, is a fifth degree polynomial because 5 is the highest exponent, and a constant term of six.

PTS: 2 REF: 061602ai NAT: A.SSE.A.1 TOP: Modeling Expressions

Homework - Write the Math Assignment

START Write your name, date, topic of lesson, and class on your paper.
 NAME: Mohammed Chen
 DATE: December 18, 2015
 LESSON: Missing Number in the Average
 CLASS: Z

PART 1a. Copy **the problem** from the lesson and underline/highlight key words.
 PART 1b. State your understanding of **what the problem is asking**.
 PART 1c. **Answer** the problem.
 PART 1d. Explanation of **strategy** with all work shown.

PART 2a. Create **a new problem** that addresses the same math idea.
 PART 2b. State your understanding of **what the new problem is asking**.
 PART 2c. **Answer** the new problem.
 PART 2d. Explanation of **strategy** used in solving the new problem with all work shown.

Clearly label each of the eight parts.

Grading Rubric

Each homework writing assignment is graded using a four point rubric, as follows:

Part 1. The Original Problem	Up to 2 points will be awarded for: a) correctly restating the original problem; b) explicitly stating what the original problem is asking; c) answering the original problem correctly; and d) explaining the math.
Part 2. My New Problem	Up to 2 points will be awarded for: a) creating a new problem similar to the original problem; b) explicitly stating what the new problem is asking; c) answering the new problem correctly; and d) explaining the math.

This assignment/activity is designed to incorporate elements of [Polya's four step universal algorithm](#) for problem solving with the idea that writing is thinking. Polya's four steps for solving any problem are:

1. Read and understand the problem.
2. Develop a strategy for solving the problem.
3. Execute the strategy.
4. Check the answer for reasonableness.

EXEMPLAR OF A WRITING THE MATH ASSIGNMENT

Part 1a. The Problem

TOP Electronics is a small business with five employees. The mean (average) weekly salary for the five employees is \$360. If the weekly salaries of four of the employees are \$340, \$340, \$345, and \$425, what is the salary of the fifth employee?

Part 1b. What is the problem asking?

Find the salary of the fifth employee.

Part 1c. Answer

The salary of the fifth employee is \$350 per week.

Part 1d. Explanation of Strategy

The arithmetic mean or average can be represented algebraically as:

$$\bar{X} = \frac{x_1 + x_2 + \dots + x_n}{n}$$

I put information from the problem into the formula. The problem says there are 5 employees, so $n = 5$. The problem also gives the mean (average) salary and the salaries of 4 of the employees. These numbers can be substituted into the formula as follows:

$$360 = \frac{340 + 340 + 345 + 425 + x_5}{5}$$

$$1800 = 340 + 340 + 345 + 425 + x_5$$

$$1800 = 1450 + x_5$$

$$1800 - 1450 = x_5$$

$$350 = x_5$$

$$\text{Check: } 360 = \frac{340 + 340 + 345 + 425 + 350}{5} = \frac{1800}{5} = 360$$

Part 2a. A New Problem

Joseph took five math exams this grading period and his average score on all of the exams is 88. He remembers that he received test scores of 78, 87, 94, and 96 on four of the examinations, but he has lost one examination and cannot remember what he scored on it. What was Joseph's score on the missing exam?

Part 2b. What is the new problem asking?

Find Joseph's score on the missing exam.

Part 2c. Answer to New Problem

Joseph received a score of 85 on the missing examination.

Part 2d. Explanation of Strategy

I substitute information from the problem into the formula for the arithmetic mean, as follows:

$$88 = \frac{78 + 87 + 94 + 96 + x_5}{5}$$

$$440 = 355 + x_5$$

$$85 = x_5$$

$$88 = \frac{78 + 87 + 94 + 96 + 85}{5} = \frac{440}{5} = 88$$

The answer makes sense.