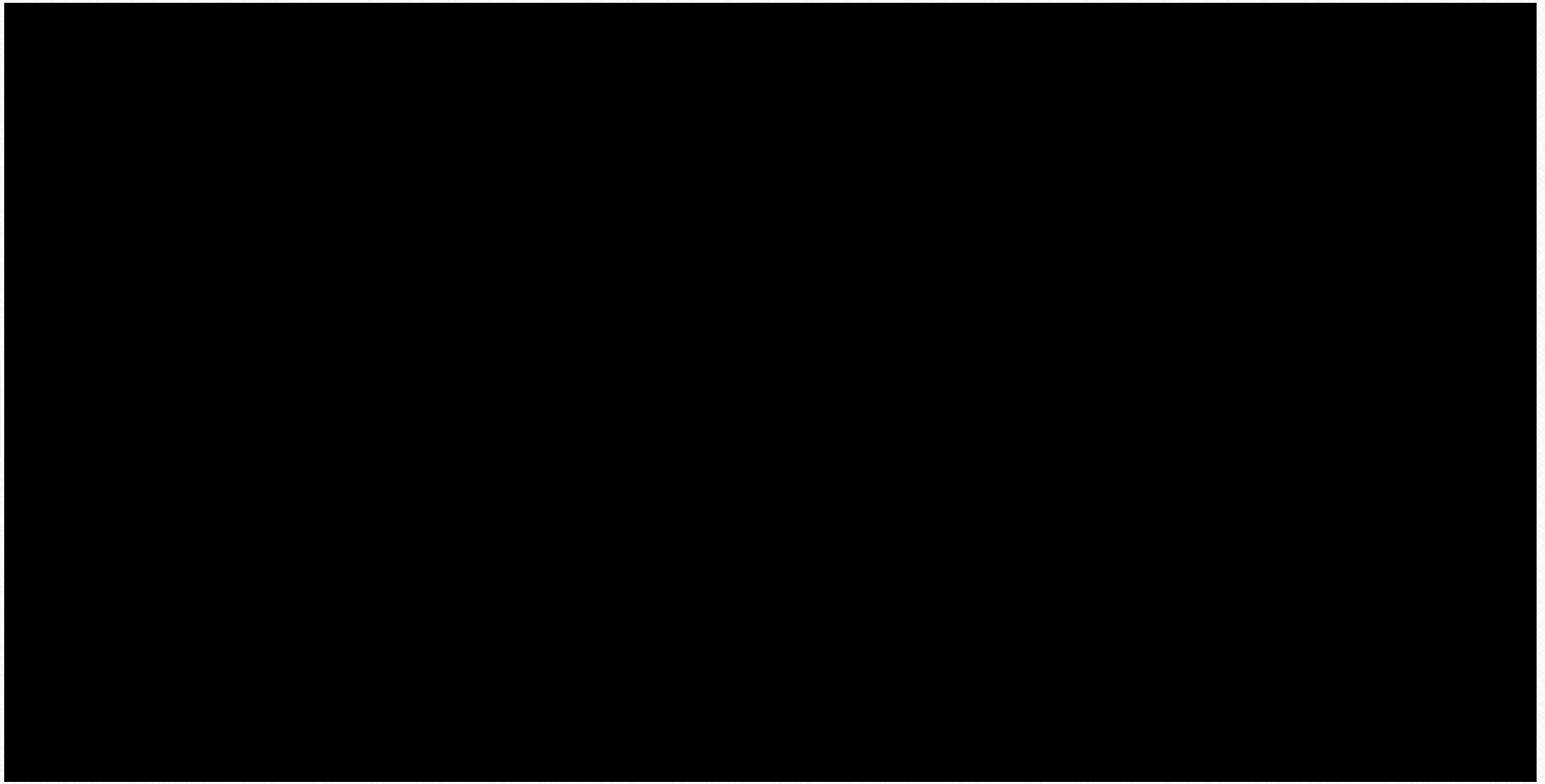
MATHEMATICAL LANGUAGE AND SYMBOLS

question

- **Is Mathematics a language?**
- **Is Mathematics a universal language?**

TRUE?

“If Mathematics is a universal language, then Mathematics is the language of the universe”



MATHEMATICAL LANGUAGE AND SYMBOLS

LANGUAGE

– systematic means of communicating ideas or feelings by the use of conventionalized signs, sounds, gestures or marks having understood meanings (Merriam-Webster, 2017).

Importance of Language

Language was invented to communicate ideas to others.

The language of mathematics was designed:

- **numbers**
- **sets**
- **functions**
- **perform operations**

Know the Convention

ORDER OF OPERATIONS

The order of operations tells you the sequence to follow when you are performing operations in a mathematical expression.

P	E	M D	A S
1	2	3	4
Parentheses	Exponents	Multiply or Divide	Add or Subtract
( )	a^2	X or ÷	+ or −

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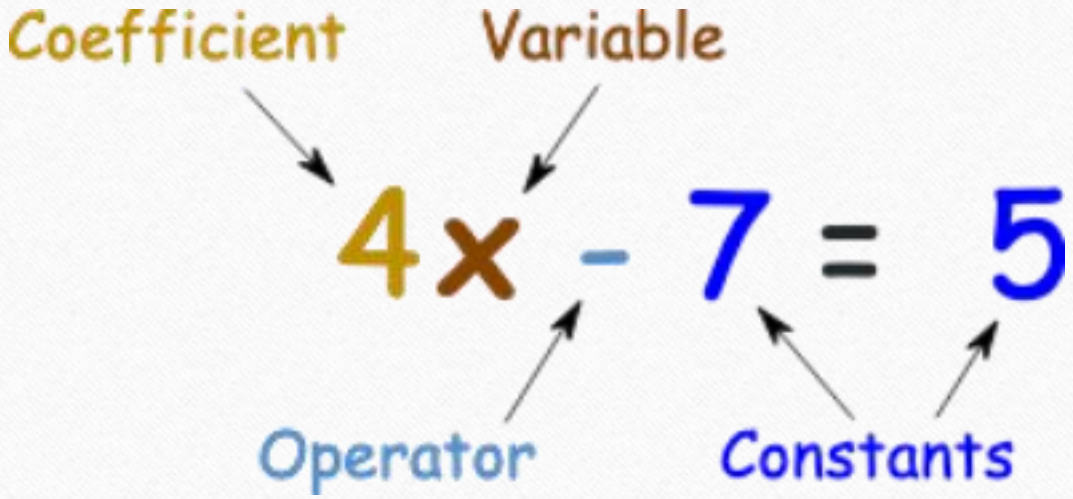
Greek Letters

VARIABLE

A letter that represents an unknown number.

e.g. *x* *y* *n*



Mathematical language

- system used to communicate mathematical ideas

- it has its own grammar, syntax, vocabulary, word order, synonyms, negations, conventions, idioms, abbreviations, sentence structure and paragraph structure

CHARACTERISTICS OF MATHEMATICAL LANGUAGE

CHARACTERISTICS OF MATHEMATICAL LANGUAGE

Able to make very fine distinctions.

e.g.

A square is different to a circle based on definition.

CHARACTERISTICS OF MATHEMATICAL LANGUAGE

CONCISE

Able to say things briefly.

e.g.

Twice the number eight is sixteen.

$2 \times 8 = 16$

Mathematical language is CONCISE

ADDITION	SUBTRACTION	MULTIPLICATION	DIVISION
[+]	[−]	[× ( ), *]	[, /]
Plus, the sum of, increased by, total, added to, more than, greater than	Minus, the difference of, decreased by, subtracted from, less, less than	Multiplied by, the product of , times, of, twice, thrice	Divided by, the quotient of, per, ratio of

OPERATIONAL TERMS AND SYMBOLS

Literal coefficient **the unknown quantity in a term (variable)**

Numerical coefficient – **the constant which determines the number of times a variable is to be multiplied.**

e.g. $2\pi r + 1$

2π – numerical coefficient

r – literal coefficient (variable)

1 – constant

OPERATIONAL TERMS AND SYMBOLS

e.g. $3x,\ 3x + 2y,\ 3x + 2y - 5$

- $3x,\ \pi r^2$ – one term (monomial)
- $3x + 2y,\ a^2 + b^2$ – two terms (binomial)
- $3x + 2y - 5$ – three terms (trinomial)
- $5x + 6y - 4z + 1$ – polynomial

Examples: Represent the given words or phrases in symbols.

1. The sum of two numbers is 5.

Let x be the first number, then

$x - 5 =$ the second number

2. Two more than thrice a certain number

Let x be the certain number, then

$3x + 2 =$ the required number

Examples: Represent the given words or phrases in symbols.

3. Ten less than twice a certain number

Let x be the certain number, then

$2x - 10 =$ the required number

4. The difference of two numbers is five.

Let x be the first number(larger), then

$x - 5 =$ the second number(smaller)

Examples: Represent the given words or phrases in symbols.

5. Three consecutive integers

Let x be the first integer, then

$x + 1$ = the second integer

$x + 2$ = the third integer

6. Three consecutive even integers

Let x be the first even integer, then

$x + 2$ = the second even integer

$x + 4$ = the third even integer

Examples: Represent the given words or phrases in symbols.

7. Three consecutive odd integers

Let x be the first odd integer, then

$x + 2 =$ the second odd integer

$x + 4 =$ the third odd integer

8. Ten exceeds a given number

Let x be the number

$10 - x =$ the excess of a number

Examples: Represent the given words or phrases in symbols.

9. The square of the sum of a and b

$a + b$ =the sum of a and b

$(a + b)^2$ = the square of the sum of a and b

10. The sum of the squares of a and b

a^2 = square of a

b^2 = square of b

$a^2 + b^2$ = the sum of the squares of a and b

Examples: Represent the given words or phrases in symbols.

11. Mark is twice as old as Ken, and Ken is three times as old as Ian. Express each of the ages in terms of x.

Let x be Ian's age, then

$3x$ = Ken's age

$2(3x) = 6x$ =Mark's age

12. The sum of x and y subtracted from the sum of a and b.

$a + b$ =the sum of a and b

$x + y$ =the sum of x and y

$(a + b) - (x + y)$ = the sum of x and y subtracted from the sum of a and b

Examples: Represent the given words or phrases in symbols.

13. The perimeter of the isosceles triangle if the base is two centimeters less than the two equal sides.

Let x be the length of one side, then

$x - 2 =$ the length of the base

$x + x + (x - 2) =$the perimeter of the isosceles triangle

14. Jet is 4 years younger than his brother Jef. Find the difference of the squares of their ages.

Let x be the age of Jef, then

$x - 4 =$ the age of Jet

$x^2 =$the square of Jef's age

$(x - 4)^2 =$ the square of Jet's age

$x^2 - (x - 4)^2 =$ the difference of the squares of their ages

Examples: Represent the given words or phrases in symbols.

15. The difference between the squares of two consecutive odd integers

Let x be the first odd integer, then

$x + 2 =$ the second odd integer

$x^2 =$ square of the first odd integer

$(x + 2)^2 =$ the square of the second odd integer

$x^2 - (x + 2)^2 =$ difference between the squares of two consecutive odd integers

16. Carl has two times as many 10-peso coins than 5-peso coins.

Let x be the number of 5-peso coins, then

$2x =$ the number of 10-peso coins

CHARACTERISTICS OF MATHEMATICAL LANGUAGE

Able to express complex thoughts with relative ease.

e.g.

$2 + 4$ means we need to add 2 and 4 to get 6.

MATHEMATICAL SENTENCE

Is the mathematical analogue of an English sentence. That is, it is a correct arrangement of mathematical symbols that state a complete thought.

MATHEMATICAL EXPRESSION

Is the mathematical analogue of an English noun. That is, it is a correct arrangement of a mathematical symbols used to represent a mathematical object of interest.

Open Mathematical Sentence

A sentence which could be true or false depending on the value or values of unknown variables.

Closed Mathematical Sentence

A sentence that is known to be true or knwon to be false.

English Language vs. Mathematical Language

Noun/Phrase

e.g.

Jarwin

Nestor's dog

Small eyes

Mathematical Expression

e.g.

2×8

$4 + 8$

$2x - 5y$

English Language vs. Mathematical Language

Sentence

e.g.

Lyka is beautiful.

Heaven has a dog named Happy.

Peter is handsome.

Mathematical Sentence

e.g.

$2x8=16$

$4+8=12$

$2x-5y=0$

Convention in Mathematical Language

Convention

is a general agreement about basic principle accepted as true.

Merriam Webster Dictionary

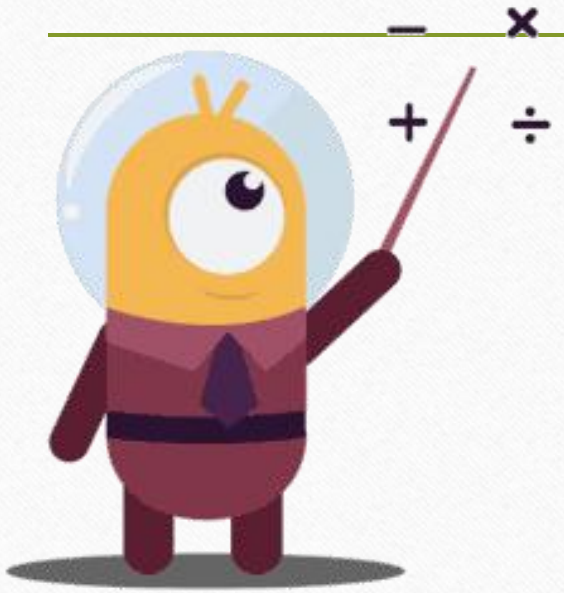
Mathematical Expression

A correct arrangement of mathematical symbols used to represent a mathematical object of interest and it does not state a complete thought.

Mathematical sentence.

A correct arrangement of mathematical symbols that state a complete thought.

The Grammar of Mathematics



The mathematical notation used for formulas has its own grammar, not dependent on a specific natural language, but shared internationally by mathematicians regardless of their mother tongues.

Grammar in Mathematics Language

1. The word "is" could mean *equality*, *inequality*, or *membership* in a set depending on how they are used in a sentence.

Equality — **A mathematical statement is which two expressions are equal.**

Inequality — **A mathematical sentence indicating that two expressions are not equal.**

Membership

Grammar in Mathematics Language

1. The word “is” could mean *equality*, *inequality*, or *membership* in a set depending on how they are used in a sentence.

e.g.

10 *is* 2 *times* 5. — *Equality*

10 *is greater than* 3. — *Inequality*

10 *is a natural number*. — *Membership*

Grammar in Mathematics Language

2. A number in a sentence may be of *cardinal*, *ordinal*, or *nominal* type.

Ordinal indicate the rank or order of items in a set.

Nominal name or identify something.

Cardinal known as the ‘counting numbers’, represent a quantity in reality.

Grammar in Mathematics Language

2. A number in a sentence may be of *cardinal*, *ordinal*, or *nominal* type.

e.g.

My phone number is 09975801002. — *Nominal*

I have 5 sets of pair of Budgies. — *Cardinal*

Choleen is 1st Place in the Singing Contest. — *Ordinal*

Grammar in Mathematics Language

3. The words “and” and “or” mean differently in mathematics from its English use.

4. Mathematical objects may be represented in many ways such as sets and functions.


THANK YOU


THANK YOU!