Chapter II : Use of numbers, symbols, equations and process measurement

Dr.Abir Boucetta

University Mohamed Kheider of Biskra

Faculty of science and technology

Electrical engineering Faculty

Mail: abir.boucetta@univ-biskra.dz

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1. Math Numbers

$$7 + 5 = 12$$

$$44 - 10 = 34$$

$$5 \times 4 = 20$$

$$35 \div 7 = 5$$

*a/- Natural numbers:*[*] are those used for counting 1,2,3,4,5,........

b/- Integers numbers: is a number that can be written without fractional component, e.g 21, 4, 0 ,- 243

c/-Rational numbers: a rational number is any number that can be expressed as the quotient or fraction x/y of two integers ,with the denominator y not equal to zero2/3,-3,2.69

d/- Real numbers: the real numbers include all the rational numbers, such as the integer -4 and the fraction 3/2, and all the irrational numbers $\sqrt{2}$ (1.41421356...,the square root of two,an irrational algebraic number) and π (3.14159265...

e/- complex numbers: A complex number is a number that can be expressed in the forma+bi, where a and b are real numbers and i is the imaginary unit, which satisfies the equationi2=-1.In this expression,as the real part and b is the imaginary part of the complex number.

2. Math Symbols
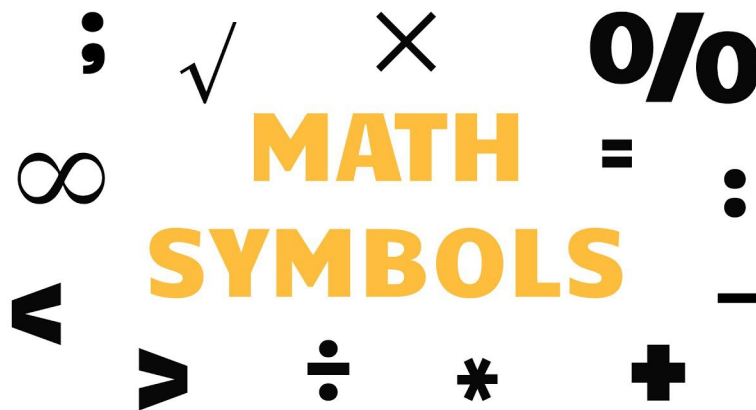
Math is all about numbers, symbols, and formulas. Math symbols[*] are used for different purposes from one mathematical field to another. Using symbols to represent mathematical information makes it easier to understand expressions as these symbols show the relationship between quantities. Let us look at the common ones that we use across different branches of mathematics.

2.1. Common Math Symbols

We have at least 10,000+ symbols and there are some that we rarely use. The most common symbols are listed in the following table:

Symbols	Meaning	Math Symbols Examples
+	Add	5 + 4 = 9
-	Subtract	5 - 4 = 1
=	Equal to	1+1 = 2
≡	Identically equal to	$(a+b)2 \equiv a2 + 2ab + b2$
≈	Approximately equal to	П ≈ 3.14
≠	Not equal to	5 + 4 ≠ 1
×	Multiply	5 × 4 = 20
÷	Divide	10 ÷ 2 = 5
x,y	Variables	x=5, y=2
√	Square root	√4=2
3√x	Cube root of x	3√27=3
n√x	nth root of x	4√16=2
()	Parentheses	2+(5-3)=2+2=4
∈	Belongs to	0 ∈ Whole number
∉	Does not belong to	1/2∉ Natural numbers
∴	Therefore	x+1=2∴ x=1
∵	Because	1/2÷0.5=1(∵1/2=0.5)
∞	Infinity	Infinity is countless, 1/3 when written in decimal form, is endless 0.333.....
!	Factorial	5! =5×4×3×2×1

2.2. Math Symbols Used in Logic

The following table shows the math symbols used in logic.

Symbols	Meaning	Math Symbols Examples
∃	There exists at least one	∃ x: P(x)∃ x: F(x) There exists at least one element of p(x), x, such that F(x) is True.
∃!	There exists one and only one	∃! x: F(x) means that there is exactly one x such that F(x) is true.
∀	For all	∀n>1; n2>1
¬	Logical Not	Statement A is true only if ¬ is false x≠y⟺¬(x=y)
∨	Logical OR	The statement A ∨ B is true if A or B is true; if both are false, the statement is false.
∧	Logical And	The statement A ∧B is true if A and B are both true; else it is false.
⟹	Implies	x = 2 ⟹ x2 = 4
⟺	If and only if	x +1 = y +1 ⟺ x = y

3. Math Equations
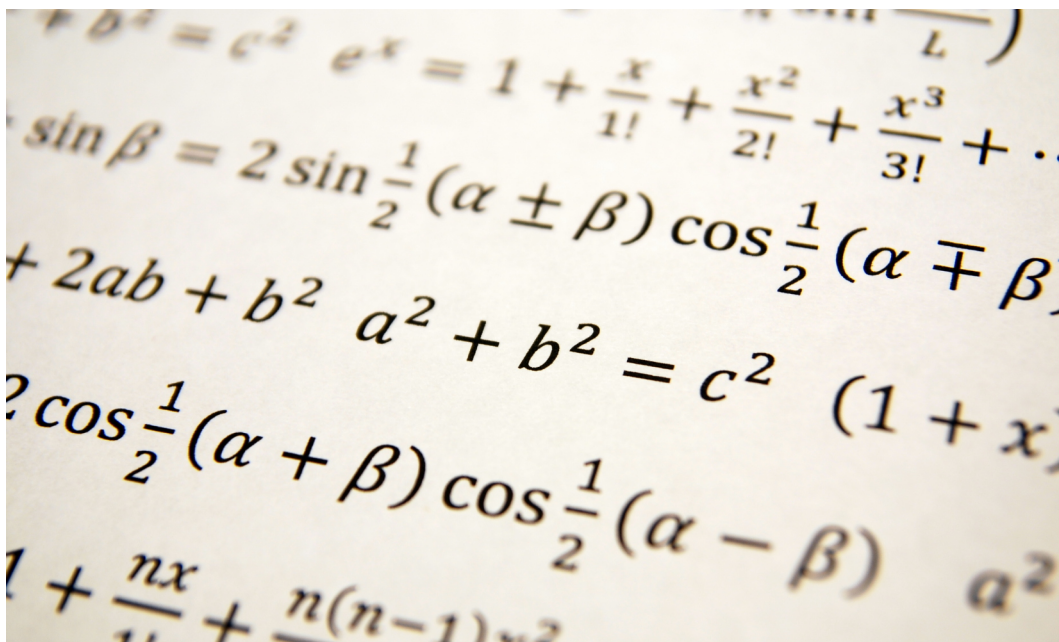
Mathematical equations can present difficult and costly problems of type composition.

Because equations often must be retyped and reformatted during composition, errors can be introduced. Keep in mind that typesetters will reproduce what they see rather than what the equation should look like. Therefore, preparation of the manuscript copy and all directions and

identification of letters and symbols must be clear, so that those lacking in mathematical expertise can follow the copy.

♀ Fundamental

An equation can use any combination of mathematical operations, including addition, subtraction, division, or multiplication.

3.1. Linear Equation

equation of line (slope and intercept form), is a straight line on the coordinate plane can be described by the equation $y = ax + b$

Where :a is the slope of the line and b is the intercept

3.2. Nonlinear equation

equation whose graph does not form a straight line (linear)

e.g :$6x^2 + 3y - 1 = 0$

3.3. Roots

As practical, use negative exponents or the solidus instead of display fractions and fractional powers instead of the radical sign .

For example:$\cos(1/x)/[a + (b/x)]^{(1/2)}$

3.4. Exponential Functions:

For lengthy or complex exponents,the symbol exp is preferred, particularly if such exponential appear in the body of the text. Thus, $\exp^{(}a^2 + b^2)^{1/2}$ is preferable to $e^{(}a^2 + b^2)^{1/2}$ .The larger size of symbols permitted by this usage also makes reading easier.

4. Measures

4.1. Measurement

is the process of attaching a numeric value to an aspect of natural phenomenon,such as the volume of the milk produced by a goat To begin the process of measurement, we need to recognize the type of phenomenon, called the physical dimension that we would like to measure. For example, the diameter of the front wheel of a bicycle is of type Length, how fast the bicycle is moving is described by Speed and the amount of air crammed inside the wheel is determined by Pressure (4)[*].

4.2. Standardization of measurement units

Measurements are most commonly made in the SI system, which contains seven fundamental units[*]: kilogram, meter, can deal, second, ampere, Kelvin, and mole.

These units are cited in the table below, which serves as a standard.

Base quantity	Base.unit	symbol	Current SI constants
Time	Second	S	Hyperfine splitting in Cesium-133
Length	Meter	M	Speed of light in vacuum, c
Mass	Kilogram	Kg	

			Mass of international prototype kilogram (IPK)
Electric current	Ampere	A	Permeability of free space, permittivity of free space
Temperature	Kelvin	K	Triple point of water, absolute zero
Amount substance	Mole	Mol	Molar mass of carbon -12
Luminous intensity	Candela	Cd	Luminous efficacy of 540 THz source

✎ Note

Other units can use in measurements such us:

a/- Length: the distance from one end of something to the other end: a measurement of how long something is.The units are: meter, centimeter, pond, inch......

b/- Surface: a surface is a set of points on which it is possible to identify locally using two real coordinates ,as in the plane (with x and y coordinates). Theunitism2orcm2......

c/- Volume: the volume, physical science or mathematics, is a quantity that measures the extension of an object or part of the space.The volume unit is M3,L

d/- Power: We can define power as the rate of doing work, it is the work done in unit time.The SI unit of power is Watt (W) which is joules per second (J/s). Sometimes the power of motor vehicles and other machines is given in terms of Horse power (hp),which is approximately equal to 745.7 watts .

5. Quiz: Test

give some devices and tools of each electrical engineering specialties:

- Power and energy

- Telecommunications

- Electronics

6. Exercice : Test

Read the question carefully and choose the right answer (s)

If a+b=3 and ab= 2, then what is the value of 2a3+2b3

○ 25

○ 27

○ 18

○ 20

7. Exercice : Test

Write down the symbols for basic arithmetic operations.

The symbols for basic arithmetic operations are

☐ addition (+)

☐ For all ($\forall$)

☐ subtraction (-)

☐ Implies ($\Rightarrow$)

8. Exercice : Test

fill in the gaps with the appropriate words from the list:

Measurements, length, distances, science

Geometry originated as a practical .... concerned with surveying,................., areas, and volumes. Among the notable accomplishments one finds formulas for............., areas, and volumes, such a Pythagorean theory and area of circle, area of a triangle, and volume of a cylinder, sphere, and a pyramid. A method of computing certain inaccessible heights and ....based on similarity of geometric figures is attributed to Thales.

Exercises solution

> **Solution** n°1

Read the question carefully and choose the right answer (s)

If a+b=3 and ab= 2, then what is the value of 2a3+2b3

○ 25

○ 27

◉ 18

○ 20

> **Solution** n°2

Write down the symbols for basic arithmetic operations.

The symbols for basic arithmetic operations are

☑ addition (+)

☐ For all ($\forall$)

☑ subtraction (-)

☐ Implies ($\Rightarrow$)

> **Solution** n°3

fill in the gaps with the appropriate words from the list:

Measurements, length, distances, science

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Glossary

Math numbers

In math, numbers can be even and odd numbers, prime and composite numbers, decimals, fractions, rational and irrational numbers,

Math symbols

Mathematical symbols are used to perform various operations. The symbols make it easier to refer Mathematical quantities.

seven fundamental units

A fundamental quantity is any physical quantity that cannot be represented in terms of any other physical quantity in a traditionally defined subset of physical values.

References

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4   https://www.cuemath.com/numbers/math-symbols/