3. BASIC PROCEDURES PERFORMED WITH COMPUTER PROGRAMS

Operations performed with computer programs are generally divided into three categories:

1. Mathematical Operations
2. Decision Operations
3. Logical Operations

3.1. Mathematical (arithmetic) operations

When performing mathematical operations on the computer, it must be written in an appropriate language. These statements should be as follows.

Operation	In Mathematics	In Computer
Addition	$a + b$	$a + b$
Substraction	$a - b$	$a - b$
Multiplication	$a.b$	$a * b$
Division	$a \div b$	$a \: / \: b$
Exponentiate	a^b	$a \wedge b$

The order of priority is very important. The computer performs operations in the order specified in the following table. That is, in a mathematical expression, the computer first performs pharanteses, then exponential expression, then multiplication and division, and finally addition and subtraction. Failure to observe this sequence while performing operations will result in incorrect results.

Operation Priority Order		
Order	Process	In Computer
1	Paranthesis	((………))
2	Exponentiate	$a \wedge b$
3	Multiplication and Division	$a * b$ and $a \: / \: b$
4	Addition and Substaction	$a + b$ and $a - b$

For equal priority operations, the order is from left to right. Therefore, it is very important to pay attention to this when writing.

For example, in A * B / C operation, the computer will first multiply A and B, then divide the output by C.

Examples:

Matematiksel yazılım	Bilgisayara kodlanması
$a+b-c+2abc-7$	a+b-c+2*a*b*c-7
$a+b^2-c^3$	a+b^2-c^3
$a-\dfrac{b}{c}+2ac-\dfrac{2}{a+b}$	a-b/c+2*a*c-2/(a+b)
$\sqrt{a+b}-\dfrac{2ab}{b^2-4ac}$	(a+b)^(1/2)-2*a*b/(b^2-4*a*c)
$\dfrac{a+b-c}{\sqrt{a^2+b^3}}-\dfrac{2(ab+ac+bc)}{9}$	(a+b-c)/((a^2+b^3)^(1/2))-2*(a*b+a*c+b*c)/9
$\dfrac{a^2+b^2}{2ab}$	(a^2+b^2)/(2*a*b)
$A+\dfrac{B.C}{D}-E.F$	A+B*C/D-E*F
$a+\sqrt[7]{abc}-\cfrac{1}{1+\cfrac{1}{a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{abc}}}}}$	a+(a*b*c)^(1/7)-1/(1+1/(a+1/(b+1/(c+1/(a*b*c)))))
$\sqrt[3]{\dfrac{\sqrt[5]{a-b}}{\sqrt[4]{a+b-\dfrac{c}{ab}}}+\dfrac{1}{\sqrt{1+\cfrac{1}{\sqrt{1+\dfrac{1}{abc}}}}}}$	((a-b)^(1/5)/(a+b-c/(a*b))^(1/4))^(1/3)+1/((1+1/((1+1/(a*b*c))^(1/2)))^(1/2))

If the parentheses are not taken into consideration when writing mathematical expressions, the results will be incorrect. It can be seen in below how the same expressions with different parentheses change the result.

$$c*d/(a*d)+b+c*d/a \Rightarrow \frac{cd}{ad}+b+\frac{cd}{a}=\frac{c}{a}+b+\frac{cd}{a}$$

$$c*d/a*d+b+c*d/a \Rightarrow c\frac{d}{a}d+b+\frac{cd}{a}=\frac{cd^2}{a}+b+\frac{cd}{a}$$

$$c*d/a*d+(b+c)*d/a \Rightarrow c\frac{d}{a}d+\frac{(b+c)d}{a}=\frac{cd^2+(b+c)d}{a}$$

3.2. Comparison (decision) operations

Equivalents of mathematical expression symbols in computer-language are different. It is very important to pay attention to these expressions when writing programs on the computer. These are as follows.

Operation Symbol	Description
=	Equal
< >	Not equal
>	Greater than
<	Less than
>= or =>	Greater or equal
<= or =<	Less or equal

3.3. Logical Operations

The logical operations are described by AND, OR, and NOT statements. Their usages are similar to our daily use.

Logical Operation	As a Command
AND	AND
OR	OR
NOT	NOT

Example:

if a > 10 and b > 10, BINGO!

If a > 10 or b > 10, YESS!

If not a > 10, HEYY!

Accordingly, the results to be obtained for the following values of a and b:

For a = 12, b = 15 BINGO! YESS!

For a = 8, b = 15, YESS! HEYY!

For a = 13, b = 8, YESS!