Unit 3

Practice II

Algorithms

**Goal of the practice**

Become familiar with the writing of algorithms in pseudo code, expressions, operands, operators, assignments, conditionals and the elementary logic required to program.

1. What is the difference between the contents of a variable and its name?

The content of a variable is its value, the data which contains. The name of a variable is the way how to reference that data.

1. What is the difference between a variable, a constant and a literal? What do they have in common?

Variable could change its value, a constant can't change its value once it is assigned, a literal is a value. All of them are data.

1. What is an expression?

Operation which returns a value

1. What are the elements in an assignment?

Variable and Expression

1. Debug the following assignments, writing the value that the variable gets in each assignment.

X = 0 (X = 0)

X = X + 4 (X = 4)

X = X + X – X \* X (X = -8)

X = X mod 4 (X = 0)

X = (x + 4) div 2 (X = 2)

1. Determine the operands (specifying which type of operand is), and operators (specifying their name) of the following expressions. Group with parentheses to clarify which operations are performed first.

var Number: x,y,a,n (Operands variables)

const Number: PI = 3,1416 (Operand constant)

const Number: COFACTOR = 1 (Operand constant)

PI + (x / 2) (operators +,/) (8.1416)

Y (10)

(x + y) – a (operators +,-) (19)

(n mod 2) == 0 (operators mod, ==) (TRUE)

(COFACTOR \* x) > 20 (operators \*, >) (FALSO)

COFACTOR (1)

Assuming that x = 10, y = 10, n = 4 and a = 1

Calculate the expressions and write the results.

"/ , %, \* are evaluated before than +, -,=="

<http://en.cppreference.com/w/c/language/operator_precedence>

<https://docs.oracle.com/javase/tutorial/java/nutsandbolts/operators.html>

<https://msdn.microsoft.com/en-us/library/2bxt6kc4.aspx>

1. Write an algorithm to read a number by keyboard and say if it is positive or negative.

Var number : a

Read(a)

IF (a == 0)

Print ("The number is zero")

ELSE IF (a > 0)

Print ("The number is positive")

ELSE

Print ("The number is negative")

ENDIF

1. Perform an algorithm to read a number and report if it is greater, equal or less than zero.

Var number : a

Read(a)

IF (a == 0)

Print ("The number is equal zero")

ELSE IF (a > 0)

Print ("The number is greater than zero")

ELSE

Print ("The number is less than zero")

ENDIF

1. Write an algorithm that determines if a number is even.

Var number : a

Read(a)

IF (a == 0)

Print ("The number is zero")

ELSE IF (a MOD 2 == 0)

Print ("The number is even")

ELSE

Print ("The number is odd")

ENDIF

1. Make an algorithm to read two real numbers and print the largest of them.

Var number : a , b

Read(a)

Read(b)

IF (a == b)

Print ("These numbers are equal")

ELSE IF (a > b)

Print ("The number a is the largest")

ELSE

Print ("The number b is the largest")

ENDIF

1. Given the radius of a circle, make an algorithm to calculate the value of the area.

Var number : radius , area

Const number : PI = 3,1416

Read(radius)

area = PI \* (radius \* radius)

Print ("the area is " + area)

1. Write an algorithm that determines if an "N" number is divisible by another "M".

Var number : n, m

Read(n)

Read(m)

IF (M == 0)

Print ("Error. M cannot be zero")

ELSE IF (N MOD M == 0)

Print ("The number N is divisible by M")

ELSE

Print ("The number N is not divisible by M")

ENDIF

1. Write an algorithm to translate a time expressed in days, hours, minutes and seconds to time expressed in seconds.

Var number : days, hours, minutes, seconds

Var number : time

Read(days)

Read(hours)

Read(minutes)

Read(seconds)

time = seconds

time = time + (minutes \* 60)

time = time + ((hours \* 60) \* 60)

time = time + (((days\* 60) \* 60) \* 24)

Print ("The time expressed in seconds is " + time)

1. We are being informed of three environmental temperature values, and we are asked to develop an algorithm to calculate and report the sum and average of these values.

Var number : temp1, temp2, temp3,

Var number : sum, avg

Read(temp1)

Read(temp2)

Read(temp3)

sum = temp1 + temp2 + temp3

avg = sum / 3

Print ("The sum of the three environmental temperature values is " + sum)

Print ("The average of the three environmental temperature values is " + avg)

1. For our brave ones: translate a time expressed in seconds to a time expressed in days, hours, minutes and seconds.

Var number : days, hours, minutes, seconds, value

Const number : MIN = (60)

Const number : HOURS = (60 \* MIN)

Const number : DAYS = (24 \* HOURS)

Read(value)

Print ("The time expressed in seconds is " + value)

days = value / DAYS

value = value MOD DAYS

hours = value / HOURS

value = value MOD HOURS

minutes = value / MIN

seconds = value MOD MIN

Print ("Days" + days)

Print ("Hours " + hours)

Print ("Minutes " + minutes)

Print ("Seconds " + seconds)