

# Lab Assignment 2

## Conditionals and Loops

COL 100

15 March 2021

### 1 Operator Precedence

The following program snippets are executed. Without writing a program, write the output at each line of execution(after the line is executed ) as asked accordingly:

```
a int i = 1, j = 1, k, l;  
   k = i + --j; //what's k here?  
   l = i-- + --j; //what's l here?
```

```
b int x, y, z;  
   x=y=1;  
   z = x++ -1; //what's x and z?  
   z+= -x ++ + ++ y; //what's x and z?  
   z=x/++x; // what's z?
```

```
c int x;  
   x = -3*4 + -6/5; //what's x?
```

```
d int x;  
   x = (7+6)-5/2; //what's x?
```

```
e int u, v, w, z;  
   u=v=w=1;  
   z=++u + ++v - ++w; //what's u,v,w and z?  
   z=++u - ++v + ++w; //what's u,v,w and z?  
   z=++u - ++v - ++w; //what's u,v,w and z?
```

```
f int u, v, w, z;  
   u=v=w=-1;  
   z=++u + ++v - ++w; //what's u,v,w and z?  
   z=++u - ++v + ++w; //what's u,v,w and z?  
   z=++u + ++v + ++w; //what's u,v,w and z?
```

## 2 Number System Conversions

For each of the subparts do the following conversions in number systems and show the appropriate calculations:

a  $(1001101010)_{10}$  to Decimal

b  $(490)_{10}$  to Octal

c  $(576)_8$  to Hexadecimal

d  $(B9C0)_{16}$  to Binary

e  $(6537)_8$  to Binary

f  $(445)_{10}$  to Octal

g  $(11001)_2$  to Decimal

h  $(4AD)_{16}$  to Decimal

## 3 Check for Primes

Write a program to take an integer as input and output whether it is a prime number or not. If the number is a prime number then output “Is a Prime Number” otherwise output “Not a Prime Number”.

### Example

1)

Input:

5

Output:

Is a Prime Number

2)

Input:

8

Output:

Not a Prime Number

## 4 Power of a Number

Write a program to take two integers  $x$  and  $n$  as input and output the value  $x^n$ , i.e, the nth power of x.

### Example

1)

Input:

2 3

Output:

```
8
```

2)

Input:

```
2 10
```

Output:

```
1024
```

## 5 Area of Shapes

Write a program to calculate the area of circle, rectangle or triangle based on user input choice where the choice is a character C,R,T for circle, rectangle and triangle respectively.

**Warning:** Beware of integer arithmetic while writing your formula for area and considering appropriate data types, e.g.  $(\frac{1}{2}) * 5$  will give 0 instead of 2.5 )

Input:

- The user enters C for a circle. Then the input is the radius for a circle.
- The user enters R for a rectangle. Then the input is the length and width for a rectangle.
- The user enters T for a triangle. Then the input is the base and height for a triangle.

Output: Print the area of the specified shape.

**Restrict** the output to 2 decimal places and take  $\pi = 3.14159265$

### Example

1)

Input:

```
C
6
```

Output:

```
The area is 113.04
```

2)

Input:

```
R
4 6
```

Output:

```
The area is 24.00
```

3)

Input:

```
T
4 3
```

Output:

```
The area is 6.00
```

## 6 Fibonacci Numbers

Write a program that takes as input an integer  $n$ . The program should print the  $n^{th}$  Fibonacci number. The  $n^{th}$  Fibonacci number is given by:

$$F(n) = F(n-1) + F(n-2)$$

Consider  $F(0) = 0$  and  $F(1) = 1$

### Example

1)

Input:

4

Output:

3

2)

Input:

10

Output:

55

## 7 Factorial of a Number

Write a program that takes as input an integer  $n$ . The program prints the value of the factorial of  $n$  i.e,  $n!$ .

The factorial of a number  $n$  is given by:

$$n! = n * (n-1) * (n-2) \dots * 1$$

Assume the input  $n$  to be  $\geq 1$ .

### Example

1)

Input:

5

Output:

120

2)

Input:

9

Output:

362880

## 8 Leap Year

Write a program which takes an integer  $n$  as input denoting a year and outputs whether the year is a leap year or not. The program should print “Leap year” if it is a leap year and “Not a leap year” otherwise.

(Remember that a leap year is exactly divisible by 4. However if it is a century year then the year must be divisible by 400 to be a leap year)

### Example

1)

Input:

```
2100
```

Output:

```
Not a leap year
```

2)

Input:

```
2020
```

Output:

```
Leap year
```

## 9 Multiplication Table

Write a program to display the multiplication table of an integer. The program should take as input an integer and output a properly formatted multiplication table of that integer.

### Example

Input:

```
17
```

Output:

```
17 x 1 = 17
17 x 2 = 34
17 x 3 = 51
17 x 4 = 68
17 x 5 = 85
17 x 6 = 102
17 x 7 = 119
17 x 8 = 136
17 x 9 = 153
17 x 10 = 170
```

## Submission and other logistics

Question 1 and 2 are compulsory. Additionally submit answers to any 3 questions from question 3 - 9. Question 1 and 2 are theoretical questions and they need to be submitted as handwritten answers. Scan your answers for these two questions and convert them into PDF format. Your submission must be a zip

file containing your pdf file with answers to question 1 and 2, your .c code solutions for at least 3 questions and corresponding screenshots showing the execution of your code on your terminal with outputs for the given inputs. You can also submit all 9 questions to increase your chances of full/5 marks.

**Example:** To zip folder 'a2' as 'a2.zip':

```
zip -r a2.zip a2
```

It is highly **recommended** that you name the code files and variables in those code files with proper names as per the question to easily identify them. Comments in your codes are also highly **encouraged** and makes life easier for everyone.

You can check **2nd Chapter** in NASA's [C style guide](#) for styling recommendations

You can work either individually or with another student of your group for the assignment.

**only one** submission on gradescope is enough for a team but you need to **add your teammate** on gradescope after submission.

Follow [these steps](#) for adding your team member

Note: you can change your team for future assignments