Problem Set

Problem 01

A program that will take a floating-point number **(x)** as input from the keyboard and perform the followings:

a. Print the number right-justified within ten columns up to three decimal places.
b. Print the number to be right-justified to 2 columns (Assuming the input has more than two digits)
c. Print the number rounded to two decimal places.
d. Print the number rounded to integer (without using conversion or type casting)
e. Prints the number in exponential notation/scientific notation

Sample Input	Sample Output
123.098	(a) Val: 123.098 (b) Val:123.098000 (c) Val:123.10 (d) Val:123 (e) Val: 1.230980e+02

Problem 02

A program that will calculate the roots of a quadratic equation, where the constant **a**, **b**, and **c** will be given.

$$ax^2 + bx + c = 0$$

Sample Input	Sample Output
2 4 -16	2.00 -4.00
1 2 3	Imaginary

Problem 03

A program that reads 3 numbers **a**, **b** and **c** from user and computes **minimum**, **median** and **maximum** of the numbers. [Array or Loop is not allowed.]

Sample Input	Sample Output
2 5 3	minimum = 2 maximum = 5 median = 3
2 2 3	minimum = 2 maximum = 3 median = 2

Problem 04

A program that reads a point **(x, y)** from user and prints its region

Sample Input	Sample Output
3 -1	This point is in Region 4
-1 -5	This point is in Region 3

Problem 05

A program that reads a number between 1 and 999 from user and spells out it in English.

[Pre-calculation is not allowed.]

Sample Input	Sample Output
453	Four hundred fifty three
37	Thirty seven
204	Two hundred four

Problem 06

A program that reads a number **N** and print "PRIME" if it is a prime number, otherwise "COMPOSITE".

Sample Input	Sample Output
13	PRIME
55	COMPOSITE
191	PRIME

Problem 07

A program for the described scenario:

1. Player-1 picks a number **X**, Player-2 has to guess it within **N = 3** tries.
2. For each wrong guess, the program prints "*Wrong, N-1 Chance(s) Left!*".
3. For any successful guess, the program prints "*Right, Player-2 wins!*" and stops allowing further tries (if any left).
4. Otherwise, after completing **N = 3** wrong tries, the program prints "*Player-1 wins!*" and halts.

Sample Input (X, n1, n2, n3)	Sample Output
5 12 8 5	Wrong, 2 Chance(s) Left! Wrong, 1 Chance(s) Left! Right, Player-2 wins!
100 50 100	Wrong, 2 Chance(s) Left! Right, Player-2 wins!
20 12 8 5	Wrong, 2 Chance(s) Left! Wrong, 1 Chance(s) Left! Wrong, 0 Chance(s) Left! Player-1 wins!

Problem 08

A program for the described scenario:

1. Player-1 picks a number **X**, and Player-2 has to guess it within **N** tries.
2. For each wrong guess, the program prints " *Wrong, N-1 Choice(s) Left!*"
3. For any successful guess, the program prints " *Right, Player-2 wins!*"
4. Otherwise, after **N** wrong tries, the program prints " *Player-1 wins!*" and halts.
5. Winning declaration should be the last possible printing.

[Array is not allowed.]

Sample Input (X, N, n1, n2...nN)	Sample Output
5 3 12 8 5	Wrong, 2 Chance(s) Left! Wrong, 1 Chance(s) Left! Right, Player-2 wins!
100 5 50 100 10 20 30	Wrong, 4 Chance(s) Left! Right, Player-2 wins!
20 3 12 8 5	Wrong, 2 Chance(s) Left! Wrong, 1 Chance(s) Left! Wrong, 0 Chance(s) Left! Player-1 wins!

Problem 09

A program that will take three numbers, **X**, **Y** and **K** as inputs.

1. If **X<Y**, it will print the square of **X** and increment by **K**
2. If **X>Y**, it will print the square of **X** and decrement by **K**
3. When **X** is equal to **Y**, the program prints "Reached!" and exited.
4. Print "ERROR" if **X** will never be equal to **Y**.

Sample Input	Sample Output
10 5 1	100, 81, 64, 49, 36, Reached!
5 10 1	25, 36, 49, 64, 81, Reached!
10 10 5	Reached!

Problem 10

A program that will find the grade of **N** students. For each student, it will take the marks of his/her **attendance (a)** (on 5 marks), **assignment (as)** (on 10 marks), **class test (ct)** (on 15 marks), **midterm (m)** (on 50 marks), **final (f)** (on 100 marks). Then based on the tables shown below, the program will output the grade.

Attendance (A)	5%
Assignments (AS)	10%
Class Tests (CT)	15%
Midterm (M)	30%
Final (F)	40%

Marks	Letter Grade	Marks	Letter Grade	Marks	Letter Grade
[90,100]	A	[70,74)	C+	[0,55)	F
[86,90)	A-	[66,70)	C		
[82,86)	B+	[62,66)	C-		
[78,82)	B	[58,62)	D+		
[74,78)	B-	[55,58)	D		

Sample Input	Sample Output
2 5 10 15 44.5 92.5 0 7.5 5 20 55.5	Student 1 : A Student 2 : F

Problem 11

A program that will print the factorial (**N!**) of a given number **N**.

Sample Input	Sample Output
1	1! = 1 = 1
2	2! = 2 x 1 = 2
3	3! = 3 x 2 x 1 = 6
4	4! = 4 x 3 x 2 x 1 = 24

Problem 12

A program that will calculate the sum of the following mathematical series upto **nth** term.

$$Sum = 9 + 15 + 21 + 27 + \ldots$$

Sample Input	Sample Output
1	9
2	24
3	45

Problem 13

A program that will calculate the **nth** fibonacci, where fib(n)=fib(n-1)+fib(n-2), fib(0) = 0 and fib(1) = 1.

Sample Input	Sample Output
1	1
2	1
3	2
4	3
5	5

Problem 14

A program that will calculate the following mathematical function for the input of **x** and **n**. Find the value considering that there is **n** term in the series.

$$Sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$$

Sample Input	Sample Output
1 3	0.842
2 5	0.909
3 3	0.525

Problem 15

A program that will calculate the following mathematical function for the input of **x and m**. Use only the series to solve the problem.

$$\sum_{i=0}^{m} x^i = x^0 + x^1 + x^2 + x^3 + x^4 + \cdots + x^m$$

Sample Input	Sample Output
2 3	15
3 2	13
5 3	156

Problem 16

A program that will calculate the following mathematical function for the input of **x and n**. Use only the series to solve the problem.

$$e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots + + \frac{x^n}{n!}$$

Sample Input	Sample Output
1 2	2.50
3 2	8.50
3 3	13.00

Problem 17

A program that will calculate the following mathematical function for the input of **n**. Use only the series to solve the problem.

$$ln2 = \frac{1}{1} - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots \pm \frac{1}{n}$$

Sample Input	Sample Output
1	1.00
2	0.50
3	0.83

Problem 18

A program that will find the **GCD** (greatest common divisor) and **LCM** (least common multiple) of two integers.

Sample Input	Sample Output
5 7	GCD: 1 LCM: 35
12 12	GCD: 12 LCM: 12
12 32	GCD: 4 LCM: 96

Problem 19

A program that will take **N** integers into an array and then search a number **(x)** into that array. If found, then print all of its **index**. If not found, then print "*NOT FOUND.*"

Sample Input	Sample Output
8 7 8 1 3 2 6 4 3 3	FOUND at index position: 3, 7
8 7 8 1 3 2 6 4 3 5	NOT FOUND

Problem 20

A program that will take **N** integers into an array **A**. Now remove all duplicates elements from that array. Finally, print all elements from that array according to the given sequence.

Sample Input	Sample Output
8 2 8 1 3 2 6 4 3	2 8 1 3 6 4
3 3 3 3	3
4 6 7 8 9	6 7 8 9

Problem 21

A program that will take **N** integers into array **A** and **M** integers into array **B**. Now find the **intersection**, **union**, and **difference** (set operation) of array **A** and **B**.

Sample Input	Sample Output
8 7 8 1 5 2 6 4 3 6 1 3 6 0 9 2	I: 1 2 6 3 U: 7 8 1 5 2 6 4 3 0 9 D: 7 8 5 4
3 1 2 3 2 4 5	I: Empty set U: 1 2 3 4 5 D: 1 2 3

Thank You