ES 106: Introduction to Computer Science Programming Assignment - 1

Problem Set 1

1. **Write a program that asks the user for a number *n* and prints the sum of the numbers 1 to *n***

   INPUT: 4
   OUTPUT: 10

   INPUT: 122
   OUTPUT: 7503

2. **Given an input character, print whether it is a NUMBER or an ALPHABET or a SYMBOL.**

   INPUT: a
   OUTPUT: ALPHABET

   INPUT: 4
   OUTPUT: NUMBER

   INPUT: $
   OUTPUT: SYMBOL

3. **John is a jolly guy who lives on an island called "Oh! so confusing.". He is incapable of sensing temperature and thus, ends up wearing the weather inappropriate clothes. Write a program to help John in selecting clothes category such as 'breezy casuals', ' summery stuff ' or 'woolly woolens'.**

   Data Points: The temperature between 20C to 35C (both included) with humidity 20-75% is considered "Breezy". However, if the humidity is more than 75%, then summer clothes are recommended. If the temperature is below 20C, it is considered "cold", and hence "woolly woolens" is recommended (independent of humidity). The temperature above 35C is considered hot, and "summery stuff" is recommended (independent of humidity).

   Temperature Range should be between: 0-45C
   Humidity Range should be between: 20-95%

The input is temperature in Celsius scale and humidity.

INPUT: 24 65
OUTPUT: breezy casuals

INPUT: 36 67
OUTPUT: summery stuff

INPUT: 19 35
OUTPUT: woolly woolens

4. **Write a program that takes three integers a, b, and c from the user and**

   if $a^2 = b^2 + c^2$ print a, b, c in that order
   else if $b^2 = a^2 + c^2$ print b, a, c in that order
   else if $c^2 = a^2 + b^2$ print c, a, b in that order
   else print FAIL!

   INPUT: 5,3,4
   OUTPUT: 5,3,4

   INPUT: 8,10,6
   OUTPUT: 10,8,6

   INPUT: 1,2,3
   OUTPUT: FAIL

5. **Write a program to calculate X^N (X to the power of N) using pow function.**

   INPUT: 5, 3
   OUTPUT: 125

   INPUT: 15, 2
   OUTPUT: 225

Problem Set 2

1. **Given two integers as input, print YES if the first integer is a divisor of the second, else print NO.**

   INPUT: 5, 25

OUTPUT: YES

INPUT: 4, 17
OUTPUT: NO

2. **While writing a computer program, we use different data types. Each data type has its own specific purpose and thus, varying memory assignment. A novice computer user wants to know which one to use. Write a program which prints the size (in bytes) of different data types available. (Hint: sizeof() function). Further, C language provides the option to use different modifiers with these data types which may further increase or decrease their data range.**

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Available Data types: int (0), char (1), float (2), double (3)
Size modifier: none (-1), long (0), short (1), unsigned (2), signed (3)

The size of the datatype "char" when applied "none" modifier is 1 byte.

Input format: Datatype, Modifier
Output format: Size of datatype, **in bytes**, when the modifier is applied to it

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INPUT: 0, -1
OUTPUT: 4

INPUT: 0, 0
OUTPUT: 8

INPUT: 3, 3
OUTPUT: ERROR

INPUT: 2, 0
OUTPUT: ERROR

How do these keywords affect the data ranges for in built data types? *(Just food for thought, not part of the assignment submission.)*

3. **Write a program to swap the values of two integers without using a third variable.**

INPUT: 3,7
OUTPUT: 7,3

INPUT: 13,17
OUTPUT: 17,13

4. **Write a program to get ASCII value of character.**

    INPUT: a
    OUTPUT: 97

    INPUT: A
    OUTPUT: 65

5. **Given a user entered decimal number, write a program to find the minimum number of bits required to represent it in Binary representation.**

    INPUT: 32
    OUTPUT: 6

    INPUT: 31
    OUTPUT: 5

Problem Set 3

1. **Write a program that asks the user for a number *n* and prints its positive square root, upto 6 decimal places.**

    INPUT: 4
    OUTPUT: 2.000000

INPUT: 26
OUTPUT: 5.099020

2. **A mathematician has approached you for help with "roots". Write a program to solve the following queries.**
   - Verify that -29 and 31 are roots of the polynomial $x^3 + x^2 - 905 * x - 2697$. What is its third root?

   OUTPUT: (third root)

   - Verify that -2931 is a root of the polynomial $x^3 + 2871 * x^2 - 174961 * x + 2634969$.

   OUTPUT: YES (if it satisfies the equation) or NO (if it does not satisfy)

3. **A large Indian petroleum company decided to paint its tanks. The tanks are in cylindrical shape with the top covered. Radius and height of each cylinder, and number of cylinders are taken from the user (in the mentioned order). If the cost of painting is Rs.100 per square feet than how much will it cost to paint all the tanks.**

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   Input format: radius, height, number of cylinders
   Output format: cost (as a number)
   Take the value of *pi* to be 3.14.

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   INPUT: 2, 3, 10
   OUTPUT: 50240

   INPUT: 5, 6, 20
   OUTPUT: 533800

4. **Write a program to take two numbers as input and to find the quotient and remainder when the first number is divided by the second.**

   INPUT: 15,4
   OUTPUT: 3,3

   INPUT: 103,25
   OUTPUT: 4,3

5. **You are given a line segment with terminal points x1, y1, x2, y2 in X-Y axes. Write a program to find the slope of the line.**

   INPUT: 5, 4, 10, 14
   OUTPUT: 2

   INPUT: 5, 12, 5, 48
   OUTPUT: UNDEFINED