BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI (RAJ.)

Second Semester 2019-20 CS F111 Computer Programming

LABORATORY SESSION #4

(Data representation and data types)

In the last week's lectures you have learned about number systems. In this week's lab, you will do some study and solve some exercises to solidify your understanding.

1. Compute the binary equivalent using specified representation and number of bits for the following decimal numbers:

Decimal Value	**Minimum number of bits**		**16 bit representation**	
	1's Complement	2's Complement	1's Complement	2's Complement
10				
-250				
-64				

You can check your answers by using these web-based calculators: https://ncalculators.com/digital-computation/1s-2s-complement-calculator.htm

Now try converting to sign magnitude form. Just notice how different the representations can be!

2. Write a C program to calculate the total distance travelled by a vehicle in "t" seconds, given by: $d = ut + ½ at^2$. Get user input for u, a and t. Output the value of d. Assume all values are integers.

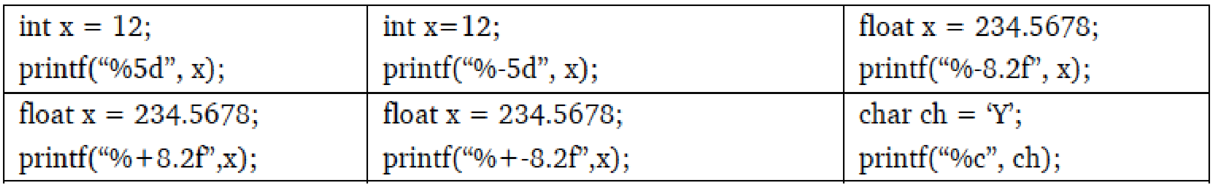
3. In C, expression a/b and a%b gives the quotient and remainder values we get on dividing a with b, respectively. Write a C program that reads in an integer denoting number of days. It prints the number of years, number of months and the number of days that constitute the input number of days. For example, if the input number is 403, it should print 1(year), 1(month), 13(days). For simplicity: there is no need to consider leap years and assume all months have 30 days.

4. Write an algorithm to convert and print a decimal number N (base 10 number, taken as user input) to a given radix (base) r (also input by user, 0< r<10). Write in steps.

5. Take the above C program, and copy it without the .c extension (Hint: use the `cp` command on Linux). Now try compiling this copy. Some C compilers will complain; others will not. On Unix systems, the complaint may be quite cryptic, with words such as bad magic number or unable to process using elf libraries. What happens on your system?

Additional Exercises

6. This exercise is meant for you to explore and learn more about `printf()` format specifiers. Try each of these and infer what is the meaning:



int x = 12;
printf(“%5d”, x);
	int x=12;
	printf(“%-5d”, x);
		float x = 234.5678;
		printf(“%-8.2f”, x);

float x = 234.5678;
printf(“%+8.2f”,x);
	float x = 234.5678;
	printf(“%+-8.2f”,x);
		char ch = ‘Y’;
		printf(“%c”, ch);

7. Every language has *keywords* and *identifiers*, which are only understood by its compiler. Keywords are predefined reserved words, which possess special meaning, e.g., int, return. An identifier is a unique name given to a particular variable, function or label in the program. Which of the following are not valid C identifiers and why?

3idyes o_no_o_no 00_goint

star*it _i_am_gr8 one_i_aren”t me_to

xYshouldI ThisIsAReallyVeryVeryLongVariableName

You will declare variables of each of these names and compile your program to check which of these are valid. Also find out the list of 32 keywords that are used in C.

8. Write a C program that evaluates and prints the values of the following arithmetic expressions. Here *x* and *y* are floating point numbers to be taken as input from the user. The value of *pi* is 3.142. The functions *e, sin, cos* and *tan* are defined in **math.h** header file. [Note: use of math library requires –lm option to be used while compiling]

$$\text{expr1}=\frac{e^{x}\sin 60^{\circ}+5.6\times 10^{-5}}{3\cos 30^{\circ}}$$

$$\text{expr2}=\sin\left(\frac{\tan^{-1}0.33+\pi}{2y}\right)$$