

1. Write a recursive function that will generate and print the first n fibonacci numbers
2. Using pointers, write a function that receives a character string and a character as argument and deletes all occurrences of this character in the string. The function should return the corrected string with no holes
3. Given an array of sorted list of integer numbers, write a function to search for a particular item using the method of binary search. And also show how this function may be used in a program. Use pointers and pointer arithmetic
4. Write a program to extract a portion of a character string and print the extracted string. Assume that m characters are extracted, starting with nth character
5. Write a program to print the Pascal triangle for 10 rows
6. Write a program that will read a positive integer and print its binary equivalent
7. Develop a program to add and multiply two matrices
8. Develop a program to sort n strings. Use array of pointers.
9. Develop a program to read lines and print only those containing a certain word
10. Write a program to sort all the elements of 4 by 4 matrix. A magic square is a square array of positive integers such that the sum of each row, column, and diagonal is the same constant.

For Example:

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1



Given above is a magic square whose constant is 34. Write a program to determine whether or not the given square is a magic square.

11. Write a function to get the transpose of a matrix.
12. Write a program to reverse a string using pointers
13. Develop a program to calculate nPr and nCr given n and r
14. Write a program that will open a file and report on the number of lines, characters, and words in a file. Have the name of the file to be opened appear as a command line argument.
15. Write a program to swap contents of two variables without using third variable.
16. Write a program, which will delete only odd numbers from a linked list of integers.
17. Write a program to remove trailing blanks and tabs from each line of input, and to delete entirely blank lines.
18. Write a function `smallest` that takes three integers, x , y , z and returns an integer smallest among them.
19. An integer is said to be prime if it is divisible only by 1 and itself. For example 2, 3, 5 and 7 are prime, but 4, 6, 8, and 9 are not.
20. Write a function that determines if a number is prime.
21. Use this function in a program that determines and prints all the prime numbers between 1 and 100.
22. Write the versions of the library functions `strncpy`, `strncat`, and `strncmp`, which operate on at most the first n characters of their argument strings. For example, `strncpy(s,t,n)` copies at most n characters of t to s .



23. Write a program that reads three nonzero float values representing the sides of a triangle. Calculate the area of the triangle
24. Write a program to encrypt / decrypt a file using bit wise operator XOR (^).
25. Create a database management system for managing student's information. Add the features like, add, delete, modify, search, sort etc. The program should also have the feature for generating reports in the text file format. The text file should contain titles under which all the information is listed in a tabular form.
26. Write a program to remove all the comments from a 'C' program.
27. Develop a program that reads a file containing a list of numbers, and then writes two files, one with all numbers divisible by three and another containing all the other numbers
28. Take one of your previous programs and run it using the interactive debugger to examine several intermediate values
29. Develop a program that counts the number of bits in a character array. Optimize it through the use of register integer variables. Time it on several different arrays of different sizes. How much time does you save?
30. Try examples by embedding assembly code in C and observe the performance
31. Develop a program that reads a linked list of numbers, and then writes two linked lists, one with all numbers divisible by three and another containing all the other numbers
32. Create a program with functions for creation, insertion, deletion & searching in a linked list. The main should interactively read a command and invoke above functions.
33. Write a recursive function for printing the elements of a linked list in the reverse order.
34. Write a function to reverse a linked list.



35. Write a program to add two polynomials. Use linked list representation for polynomials.
36. Implement a doubly linked list with functions to add or delete from head or tail of the list.
37. Create a program for Stack with needed functions, using array implementation and solve the following
- i. Evaluation of postfix expression
 - ii. Converting Infix to postfix
38. Implement a program for Queue with necessary functions using linked list implementation
39. Implement a program for Deque with functions to add or delete from either end.
40. Implement C program to sort N number of student records using
1. Bubble sort
 2. Insertion Sort
 3. Heap Sort
 4. Quick sort
 5. Merge Sort
41. Search for a particular student details from the sorted student list using Bubble Sort
42. Given a postfix expression, construct an expression tree and include the following functions
- Inorder traversal
 - Height of the tree
 - Mirror Image
 - No of nodes



Preorder traversal

Postorder traversal

43. Create Binary Search Tree ADT with the following functions

Insertion

Deletion

Find

Find_Min

Find_Max

44. Given Inorder and Preorder traversals of a binary tree, construct the binary tree.

45. Write a non recursive routine to traverse the binary tree in inorder

46. Create an AVL tree by including functionality for inserting, singlerotationleft, singlerotationright, doublerotationleft & doublerotationright



Additional Exercises

1. Develop a C program to perform operations (+, *, -, / and %) on two whole numbers. Identify suitable data types to represent the numbers and resultant values
2. Develop a C program to add two operands and store the result in one of the operand using addition assignment operator
3. Develop a C program to calculate simple interest using the formula $I = PTR/100$. Display Interest with two digit precision after decimal point
4. Develop a C program having following logic. If i is 20 or j is 20, display as "Atleast one variable is having 20" otherwise display "Both variables are not having 20". If i is less than or equal to 40 and j is less than or equal to 40, It should display "Both are less than or equal to 40" otherwise, it should display as "Both are not less than or equal to 40". Implement this using if-else statement as well as with conditional operator.
5. Develop a C program which accepts character type data item from user. In case if user Typed
 - 'A' or 'a', it should display A for Apple
 - 'B' or 'b', it should display B for Bat
 - 'D' or 'd', it should display D for Dog
 - 'F' or 'f', it should display F for FanInstead of the above 4 characters, if user types any other character, it should display "Character is not in the range". Implement this using if-else statement and switch statement
6. Develop a C program which adds all numbers from 1 to N, except those which are divisible by 5. Implement this using for loop and continue statement



7. Develop a C program to find factorial of a number N using for loop
8. Develop a C program to find sum of all odd numbers upto N using while loop
9. Write a program to print ASCII values of upper case and lower case alphabets and digits (A-Z, a-z and 0-9)
10. Write a program to calculate $n!/(n-r)!$ using functions
11. Write a Program to find if a given number is armstrong number. ($153 = 1^3 + 5^3 + 3^3$)
12. Write a program to display all the vowels in a given line of text.
13. Write a menu based C program to perform operations (+, - and *) on matrices.
14. Write a program to read your name into a character array. Print the name along with the length of your name and sizeof the array in which name is stored.
15. Use scanf function to read a string of characters (into character type array called text) including alphabets, digits, blanks, tabs etc except new line character. Write a loop that will examine each character in a character-type array and determine how many of the characters are letters, how many are digits, how many are blanks and how many are tabs. Assume that text contains 80 characters.
16. Generate the following pyramid of numbers using nested loops



212
32123
4321234
543212345

17. Write a program to reverse a string using recursive functions
18. Write a recursive function to find factorial of a number
19. Write a function to swap contents of two variables using functions and pointer variables
20. Write a program to search for an element in a given list of elements. Use break statement
21. Develop multi file program to understand static, auto, register, global, static global variables. What is the scope and lifetime of each of these types of variables?
22. Write a program to represent time of the day in hrs, mins and secs. Use structures
23. Write a program to perform operations on complex numbers.
24. Define structure with two members (one int and other char). Also define a union with two members (one int and other char). Print the sizes of structure and union in number of bytes
25. A C program contains the following declaration

```
int x[8]= {10,20,30,40,50,60,70,80};
```



- a)What is the meaning of x?
- b)What is the meaning of (x+2)?
- c)What is the value of *x?
- d)What is the value of (*x+2)?
- e)What is the value of *(x+2)?

26.A C program contains the following declaration

```
float table[2][3] = { { 1.1,1.2,1.3},{2.1,2.2,2.3}};
```

- a)What is the meaning of a table?
- b)What is the meaning of (table+1)?
- c)What is the meaning of *(table+1)?
- d)What is the meaning of (*(table+1)+1)?
- e)What is the meaning of *(table)+1)?
- f)What is the value of (*(table+1) +1)?
- g)What is the value of *(*table)+1)?
- h)What is the value of *(*table+1)?
- i)What is the value of *(*table) + 1)+1?

27.A C program contains the following declaration

```
char *color[6] = {"red", "green", "blue", "white", "black", "yellow"};
```

- a)What is the meaning of color?
- b)What is the meaning of (color+2);
- c)What is the value of *color?
- d)What is the value of *(color+2)?
- e)How do color[5] and *(color + 5) differ?

28.Write a program to read n number of strings using two-dimensional character array, sort them and display the sorted list of strings on the screen.



29. Write a program to read n number of strings and display them on the screen. Use array of pointers and dynamic memory allocation techniques
30. Write a C program with a function any (s1, s2). This function returns the first location (index of location) in the string s1 which matches with any string in s2 otherwise
31. Write a C program with a function delete (s1, c). This function deletes each character in s1 which matches character c
32. Write a C program with a function deletes2 (s1, s2). This function deletes each character in string s1 which matches any character in string s2
33. Write a C program with a function rotate_right (n, b). This function rotates integer n towards right by b positions
34. Write a C program with a function invertpowards (n, p, b). This function inverts b bits of integer n, that begin at position p, leaving the others unchanged
35. Write a C program with a function tolower, which converts upper case letters to lower case. Use conditional expression
36. Experiment to find out what happens when printf argument string contains \x, where x is some character (a, b, c, \, ^ etc). What are your observations
37. Write a function expand (s, t) which converts characters like newline and tab into visible escape sequences like \n and \t as it copies the string s to t. Use switch statement and also display both s and t at the end



38. Write a function `expand (s1, s2)` which expands shorthand notations of `s1` like `a-d` into `abcd` and `0-9` to `0123456789` in `s2`. For example if the string in `s1` is `0123a-e1-4` then `s1` is expanded in `s2` to `0123abcde1234`
39. Write a C program with two functions `itob (n, s)` and `itoh (n, s)`. `itob` converts integer into binary character representation in `s`. Similarly `itoh` converts integer into hexadecimal character representation in `s`.
40. Write a C program with a function `indexr(s,t)`, which returns the index of right most occurrence of `t` in `s` otherwise `-1`
41. Write a C program with a recursive function `reverse(s)`, which reverses the string `s`
42. Write a C program with a recursive function `itoa`, which converts integer into a string
43. Write a Program to implement `strtok` library function.
44. Write a program to add first seven terms of the following series:

$$1 / 1! + 2 / 2! - 3 / 3! + 4 / 4! \dots$$

45. Write a program that will concatenate two files, that is append the contents of one file at the end of another file and write the results into a third file. You must be able to execute command at DOS prompt as follows:

C > CONCAT Source 1.txt source 2.txt Target.txt

46. Write a program to print out all rotations of a string typed in. For eg: if the input is "Space", the output should be: space paces acesp cespa espac



47. Implement string library functions. `strrev`, `strcpy`, `strcat`, `strcmp` with same return values and all error handling features using pointers

48. Write a program to compute factorial and GCD using recursion.

49. Write a menu driven application that performs the functions of a calculator. The inputs from the user should be validated and error messages in case, inputs are not valid, should be displayed of multiplication, division, factorials (use recursion) and squares. Modularize the code wherever possible.

50. Write a program to find out difference in days between any two dates. It must work regardless of the year, month and day. Consider Leap years while calculating the difference.

51. Write a program to count the number of 'e' in the following array of pointer to the string.

```
char * s [ ] = {  
    "we will teach you how to " ;  
    "Move a mountain " ;  
    "Level a building " ;  
    "Erase the past " ;  
    "Make a million " ;  
}
```

52. Write a program in which define `a` as an unsigned integer whose value is (hexadecimal) `0xa2c3`. Write the corresponding bit pattern for this value. Then evaluate each of the following bitwise expressions, first showing the resulting bit pattern and then the equivalent hexadecimal value. Utilize the original value of `a` in each expression. Assume that `a` is stored in a 16-bit word

a) $\sim a$

b) $a \wedge 0x3f06$

c) $a \mid 0x3f06$



- d) $a \mid \sim 0x3f06$
- e) $a \gg 3$
- f) $a \ll 5$
- g) $a \wedge \sim a$
- h) $a \mid \sim a$
- i) $(a \& \sim 0x3f06) \ll 8$
- j) $a \& \sim (0x3f06 \gg 8)$

53. Define a structure declaration for each of the following situations. Assume a 16-bit integer word

- a) Define three bit fields, called a, b and c, whose widths are 6-bits, 4-bits and 6-bits, respectively
- b) Declare a structure-type variable v having the composition defined in part (a) above. Assign initial values 3, 5 and 7 respectively, to the three bit fields. Are the bit fields large enough to accommodate these values?
- c) What are the largest values that can be assigned to each of the bit fields defined in part (a) above?
- d) Define three bit fields, called a, b and c, whose widths are 8 bits, 6 bits and 5 bits, respectively. How will these fields be stored within the computer's memory?
- e) Define three bit fields, called a, b and c, whose widths are 8 bits, 6 bits and 5-bits respectively. Separate a and b with 2 vacant bits

54. Write a C program that will accept a hexadecimal number as input, and then display a menu that will permit any of the following operations to be carried out

- a) Display the hexadecimal equivalent of the one's complement



- b) Carry out a masking operation and then display the hexadecimal equivalent of the result
- c) Carry out a bit shifting operation and then display the hexadecimal equivalent of the result
- d) Exit

55. Write a C program that will illustrate the equivalence between

- a) Shifting a binary number to the left n bits and multiplying the binary number by 2^n
- b) Shifting a binary number to the right n bits and dividing the binary number by 2^n .

Choose the initial binary number carefully, so that bits will not be lost as a result of the shifting operation

56. Define a character array of size 35 (35 bytes) to store 40 characters. To do so use the bitwise shift operators in such a manner that a group of eight characters is stored in seven consecutive array elements. Each array element will contain one complete character, plus one bit from another character. Include a provision to display the contents of the 35 byte array in compressed form and in the equivalent form

57. Write a program to display a number in different number systems. Begin by displaying a menu that allows the user to specify that type of number (i.e. the desired number system) before entering the actual value. Then display the input in the other two number systems and in terms of its equivalent binary bit pattern

58. Write a C program to calculate factorial of a number. Factorial function has to be written as a multiline macro



59. Write a program to search for a given element in a list of elements using Linear Search. Use flag to represent the status of search. Define flag as an enumeration variable whose value is either true or false
60. Write a menu driven C program to perform operations on Complex numbers. Use enumeration data type to identify the different operations on Complex numbers
61. Write a C program to open a file and store text (character type data) in one's complement form. Read the contents from the file and display as it is as well in one's complement form. Use command line arguments to pass file name to your C program
62. Write a program to embed assembly language code in C program
63. Develop sample programs using preprocessor operators #, ## and also conditional compilation
64. Develop a program to generate marks sheet of C-DAC Students (DSSD, DESD and DAC courses). Modules are different for each course. Implement this using structures, unions, arrays, loops and variables
65. Write a program which reads a line of characters. Each character entered from the keyboard is tested to determine its case, and is then written to the data file in opposite case. Display the contents of the file. Also use ftell and fseek to determine the current file position and to change the file position
66. Write an interactive, file-oriented C program that will maintain a list of names, addresses and telephone numbers in alphabetical order (by last names). Process the information associated with each name as a separate



record, represent each record as a structure. Include a menu that will allow the user to select any of the following features:

- a)Add a new record
- b)Delete a record
- c)Modify an existing record
- d)Retrieve and display an entire record for a given name
- e)Generate a complete list of all names, addresses and telephone numbers
- f)End the computation

Be sure to rearrange the records whenever a new record is added or a record is deleted, so that the records are always maintained in alphabetical order. Utilize a linear linked list. Also use ftell and fseek wherever required

67. Write a program that will generate a data file containing a list of countries and their corresponding capitals. Write interactive code which will access the above created data file to perform the following operations

- a)Determine the capital of a specified country
- b)Determine the country whose capital is specified
- c)Terminate the programme

