Submission Guidelines – Please carefully read the following instructions for submission of the assignment.

- ✓ Please submit the assignment before the deadline. It should be clear that submission after due date would not be considered.
- ✓ In case plagiarism strict actions will be taken. You are advised to not copied solution from any other student.
- ✓ If you find any confusion in assignment (Question statement), please consult with the course teacher before the deadline. After the deadline no queries will be entertained in this regard.
- ✓ **Submission:** Submission will only be accepted through GOOGLE CLASSROOM. If you are asked to write programs, then submit the source files. If you are asked to draw flow chart or write pseudo codes, then scan or take pictures of all your paper work and sub- mit a single pdf file of the paper work. Before submission, rename your pdf file with your roll number.

1. Ali is playing a game of cards. This is a special type of card in which a card is a 3 digit number (i.e. 100 - 999). He has to sort the cards in ascending order. However, sorting will be done on the sum of the digits. Make a c program to sort his cards, take user input for number of cards. Taking input of cards number should be a function named **get_data(…)**. Sorting should be another function **sort(…)** and displaying the final result should be another function **display(…)**.

Expected Input:		**Expected Output:**
How many cards do you have? 5		Sorted card 1 : 124
Enter number of card 1:	291	Sorted card 1 : 371
Enter number of card 2:	124	Sorted card 1 : 291
Enter number of card 3:	371	Sorted card 1 : 574
Enter number of card 4:	574	Sorted card 1 :189
Enter number of card 5:	189	

2. Suppose that you are asked to store the data given in the following Table by using three arrays, one for each column, where the index number is mapped for the record reference. For example the Roll number in index 0 of the first array corresponds to the name in index 0 of the second array and the student marks are placed in third array on the same index.

Roll No	**Name**	**Marks**
1001	Salman	75.5
1002	Zubair	80
1004	Ahsan	64
1005	Farah	78
1007	Hassan	65
1008	Kamran	54
1009	Mariyum	60

   a. Write a function that will sort the data according to the marks obtained.
   b. Write a function to search and print the data based on a roll number.
   c. Write a function to search and print the data based on name.

3. The Physics teacher at your university needs help in grading a True/False test. The students' IDs and test answers are entered by the user. First input must be the answers to the test in the form: **TFFTFFTTTTFFTFTFTFTT** Every other input is in the form: student ID, followed by a blank, followed by the student's responses. For example, the entry: **ABC54301 TFTFTFTT TFTFTFFTTFT** indicates that the student ID is ABC54301 and the answer to question 1 is True, the answer to question 2 is False, and so on. This student did not answer question 9. Each correct answer is awarded two points, each wrong answer gets one point deducted, and no answer gets zero points. Write a program that processes the test data. The output should display the list containing student's ID, followed by the answers, followed by the test score, followed by the test grade.
   Sample Output: **ABC54301 TFTFTFTT TFTFTFFTTFT 11 F**
   Take the number of questions and number of students as input from the user and dynamically allocate memory to the appropriate arrays. Assume the following grade scale: 90%–100%, A; 80%–89.99%, B; 70%–79.99%, C; 60%–69.99%, D; and 0%–59.99%, F.

4. You are required to print Pascal's triangle. Pascal's triangle is a triangular array of the binomial coefficients. Take number of rows(n) as input from user and print pattern similar to the one shown for n=6:

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

5. Someone has asked you to design a special purpose calculator with the following two options.
   a) Solve an equation involving combination of four (+, -, *, /) operators and maximum 100 operands. Assume that all the operators have same precedence and equation is supposed to be solved from left to right. For example, 3+34.5/2*60-22 is an equation, and it consists of six operands and five operators. In order to store all the operands and operators of the equation, define an array of type "**struct data**" having three members; two for operands and one for operator. At the first index of the array store the first two operands (3), (34.5) and the first operator (+). At the next index of the array, store the result of the last operation (37.5), the next operator (/), and the next operand (2). Call a user-defined function **basic( )** in order to perform a given arithmetic operation on two operands. Continue this until all the operands and operators of the equation are entered and you get the final result.
   b) Obtain the dot product of two vectors of same size. Note that if A=[1,2,5,2,1] and B=[4,5,6,3,10], then the dot product can be obtained as A . B = 1*4 + 2*5 + 5*6 + 2*3 + 1*10 = 60.

In main (), ask the user whether she wants to solve an equation or dot product. The user should press **a** for choosing equation and **b** for choosing dot product. If the user enters any character other than **a or b** the program should terminate after printing an invalid input message.
If the user chooses **a**, then ask how many operands are there in the equation. Store the operands and operators entered by the user in an array of type **struct data.** In case the user enters an invalid operator or operands, print the message of invalid input. Otherwise, call a user defined function **basic( )** to get the required result. Print the result by calling display( ) function from main( ). The program ends only if the user wants to terminate it.
If the user chooses dot product by pressing **b**, then ask her to enter the elements of two arrays. Call **dot( )** function in order to calculate the dot product of two arrays. Print the result in main(). The program ends only if the user wants to terminate it.
For defining basic( ), display( ), and dot( ) functions, please follow the following details.

1) float basic(float, float, char op);
   - It takes two operands and one operator as input.
   - It returns the result of applying the given operation on the operands.
2) void display(const struct data [ ], int);
   - It receives an array of struct data and its size as input.
   - It prints the information stored in the array.
3) double dot(const double [ ], const double [ ], int);
   - It receives two arrays of type double and size of the array as input.
   - It calculates the dot product of two arrays and returns the result**.**

```
Do you want to solve an equation (press a) or a dot product (press b)? a

How many operands are there in the equation: 5
Enter operand 1: 3
Choose operator(+,-,*,/): +
Enter operand 2: 34.5
Choose operator(+,-,*,/): /
Enter operand 3: 2
Choose operator(+,-,*,/): *
Enter operand 4: 60
Choose operator(+,-,*,/): -
Enter operand 5: 22
Call to display function: You have solved the following equation.
3.00 + 34.50 / 2.00 * 60.00 - 22.00 = 1103.00
Do you want to solve another equation? Press y for yes!y
How many operands are there in the equation: 3
Enter operand 1: 78
Choose operator(+,-,*,/): /
Enter operand 2: 0
Invalid. Any number divided by zero is infinity.
Do you want to solve another equation? Press y for yes!n
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Process exited after 44.46 seconds with return value 0
Press any key to continue . . .
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```
Do you want to solve an equation (press a) or a dot product (press b)? b

Enter the value for A[0] and B[0]: 1 4
Enter the value for A[1] and B[1]: 2 5
Enter the value for A[2] and B[2]: 5 6
Enter the value for A[3] and B[3]: 2 3
Enter the value for A[4] and B[4]: 1 10
A . B = 60.000000
Do you want to perform another dot product? Press y for yes!y
Enter the value for A[0] and B[0]: 12.5 6
Enter the value for A[1] and B[1]: 45 3.2
Enter the value for A[2] and B[2]: 0 59
Enter the value for A[3] and B[3]: 52 3.6
Enter the value for A[4] and B[4]: 32 54
A . B = 2134.200000
Do you want to perform another dot product? Press y for yes!n
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Process exited after 75.27 seconds with return value 0
Press any key to continue . . .
```