C++ Programs – Practice Problems Set 1

1. Write a C++ program to calculate and display the coordinates of the midpoint of a line connecting two arbitrary points. Use the fact that the coordinates of the midpoint between two points having coordinates (x1, y1) and (x2, y2) are ((x1+x2)/2, (y1+y2)/2). Your program should produce the following display: The x midpoint coordinate is xxx. The y midpoint coordinate is xxx where the x's are replaced with the values calculated by your program. The test values are (2, 10) and (12, 6).

2. All years that are evenly divisible by 400 or are evenly divisible by four (4) and not evenly divisible by 100 are leap years. For example, since 1600 is evenly divisible by 400, the year 1600 was a leap year. Similarly, since 1988 is evenly divisible by four (4) and not 100, the year 1988 was also a leap year. Using this information, write a C++ program that accepts the year as user input, determines if the year is a leap year, and displays an appropriate message that tells the user if the entered year is or is not a leap year. The test years are 2011, 2000, and 1900.

3. Given a string, design a flowchart/algorithm and write the C++ program to check whether the given string is a palindrome. Palindrome is a sequence of characters which reads the same backward or forward. The comparison must be made case insensitive that is the input may be 'Madam' and the program should print Palindrome.

4. Given a square matrix of size N×N, devise an algorithm and write a c++ program to calculate the absolute difference of the sums across the two main diagonals. For example, given a 3 X 3 matrix as below:

   11 2 4
   4 5 6
   10 8 -12

   Sum across the first diagonal = 11+5-12= 4
   Sum across the second diagonal = 4+5+10 = 19
   Absolute Difference: |4-19| =15.

5. Write the pseudocode and a c++ program to check whether the given matrix is a sparse matrix or not by counting the number of zeros in the matrix and checking the same against the non-zero values. It is decided as “sparse matrix” if count of zero values is greater than or equal to non-zero values. Otherwise it’s “Not a sparse matrix”.

6. Two points in a plane are specified using the coordinates (x1, y1) and(x2, y2). Write a program that calculates the slope of a line through two (non-vertical) points entered by the user.
   Slope = (y2-y1) / (x2-x1)
   Input:
   Read the coordinates x1, x2, y1, y2 respectively
   Method:
   Slope = (y2-y1) / (x2-x1)
   Output:
   Display slope of a line.
   Write a c++ program to find the slope of the line.

7. Given six marks secured by a student, develop an algorithm, draw a flow chart and write a c++ program to compute the CGPA of the student. The maximum mark in each subject is 100. Use the following table for grading purpose. CGPA is calculated as the average of all the grade points in six subjects. Check boundary conditions and print 'Invalid input' for wrong output.
   Input Format:
   Marks secured
   Output Format:
   CGPA with grade

Total score (Range)	Grade	Points
91 – 100	S	10
81 – 90	A	9
71 – 80	B	8
61 – 70	C	7
51 – 60	D	6
< 50	F	5
ABSENT	ABSENT	0

8. Cost of a basketball is Rs. 4 more than four times the cost of a tennis ball. And he pays Rs. 'x' towards buying a basketball and two tennis balls. Write an algorithm and a c++ program to determine the cost of tennis ball, cost of basket ball and the number of basket ball that can be bought for amount Rs. 'a'. For example, if 'x' is 28 and 'a' is 210 then cost of one tennis ball is Rs.4, cost of basket ball is Rs. 20 and 10 basket ball's can be bought for Rs 210. Display only two decimal places for floating point values.

   Input for the Problem

   'x' – money paid for buting one basketball and two tennis ball

   'a' – query amount

   Output of the Problem

   cost of tennis ball

   cost of basket ball

   number of basket ball purchased for amount 'a'