

Programming for Big Data

Question 1 – Characters for the ASCII Codes

Write a program that uses a loop to display the characters for each ASCII code 32 through 127. *Display 16 characters on each line with one space between characters.*

Question 2 – Sum of Numbers

Write a program that asks the user for a positive integer value. The program should use a loop to get the sum of all the integers from 1 up to the number entered. For example, if the user enters 50, the loop will find the sum of 1, 2, 3, 4, ... 50.

Input Validation: Do not accept an input that is less than 1.

Question 3 – Distance Traveled

The distance a vehicle travels can be calculated as follows:

$$\text{distance} = \text{speed} * \text{time}$$

For example, if a train travels 40 miles per hour for 3 hours, the distance traveled is 120 miles.

Write a program that asks the user for the speed of a vehicle (in miles per hour) and how many hours it has traveled. It should then use a loop to display the total distance traveled at the end of each hour of that time period. Here is an example of the output:

What is the speed of the vehicle in mph? 40

How many hours has it traveled? 3

Hour Distance Traveled	
1	40
2	80
3	120

Input Validation: Do not accept a negative number for speed and do not accept any value less than one for time traveled

Question 4 – Celsius to Fahrenheit Table

You were asked to write a program that converts a Celsius temperature to Fahrenheit and Kelvin . Modify that program so it uses a loop to display a table of the Celsius temperatures from 0 to 20 and their Kelvin and Fahrenheit equivalents.

Output should be like the following:

Question 5 – Speed Conversion Chart

Write a program that displays a table of speeds in kilometers per hour with their values converted to miles per hour. The table should display the speeds from 60 kilometers per hour through 130 kilometers per hour, in increments of 5 kilometers per hour. (In other words, it should display **60 kph**, **65 kph**, **70 kph** and so forth, up through **330 kph**.)

$$\text{MPH} = \text{KPH} * 0.6214$$

Celsius	Fahrenheit	Kelvin
0	32	273.15
1	33.8	274.15
2	35.6	275.15
.	.	.
.	.	.
.	.	.
.	.	.
.	.	.
N	N	N

Question 6 – Pennies for Pay

Write a program that calculates how much a person earns in a month if the salary is one penny the first day, two pennies the second day, four pennies the third day, and so on with the daily pay doubling each day the employee works. The program should ask the user for the number of days the employee worked during the month and should display a table showing how much the salary was for each day worked, as well as the total pay earned for the month. The output should be displayed in dollars with two decimal points, not in pennies.

Celsius	Fahrenheit	Kelvin
0	32	273.15
1	33.8	274.15
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Input Validation: Do not accept a number less than 1 or more than 31 for the number of days worked.

Question 7 – Hotel Suites Occupancy

Write a program that calculates the occupancy rate of the 120 suites (20 per floor) located on the top 6 floors of a 15-story luxury hotel. These are floors 10 – 12 and 14 – 16 because, like many hotels, there is no 13th floor. Solve the problem by using a single loop that loops once for each floor between 10 and 16 and, on each iteration, asks the user to input the number of suites occupied on that floor. After all the iterations, the program should display how many suites the hotel has, how many of them are occupied, and what percentage of them are occupied.

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Input Validation: Do not accept a value less than 0 or more than 20 for the number of suites occupied on a given floor.

Question 8 – Rectangle Display

Write a program that asks the user for two positive integers between 2 and 10 to use for the length and width of a rectangle. If the numbers are different, the larger of the two numbers should be used for the length and the smaller for the width. The program should then display a rectangle of this size on the screen using the character "X". For example, if the user enters either 2, 5 or 5, 2, the program should display the following:

XXXXX
XXXXX

Question 9 – Arrowhead Display

Write a program that uses nested loops to display the arrowhead pattern shown below:

Question 10 – Payroll Report

Write a program that displays a weekly payroll report. A loop in the program should ask the user for the employee number, gross pay, state tax, federal tax, and FICA withholdings. The loop will terminate when 0 is entered for the employee number. After the data is entered, the program should display totals for gross pay, state tax, federal tax, FICA withholdings, and net pay.

Input Validation: Do not accept negative numbers for any of the items entered. If the state tax + federal tax + FICA withholdings for any employee is greater than gross pay, print an error message and ask the user to reenter the data for that employee.

Question 11 –

Write a C++ program to print the following pattern :

```

1  1
2  121
3  12321
4  1234321
5  123454321
6  123454321
7  1234321
8  12321
9  121
10 1

```

Question 12 –

Write a program that calculates how much money you'll end up with if you invest an amount of money at a fixed interest rate, compounded yearly. Have the user furnish the initial amount, the number of years, and the yearly interest rate in percent. Some interaction with the program might look like this:

```

Enter initial amount:          3000
Enter number of years:         10
Enter interest rate (percent per year): 5.5
At the end of 10 years, you will have: 5124.43 dollars.

```

At the end of the first year you have $3000 + (3000 * 0.055)$, which is 3165. At the end of the second year you have $3165 + (3165 * 0.055)$, which is 3339.08. Do this as many times as there are years. A for loop makes the calculation easy.

Question 13 –

Write a program that repeatedly asks the user to enter two money amounts expressed in old-style British currency: pounds, shillings, and pence. The program should then add the two amounts and display the answer, again in pounds, shillings, and pence. Use a do loop that asks the user if the program should be terminated. Typical interaction might be

```

Enter first amount:    £5, 10, 6
Enter second amount:   £3, 2, 6
Total is:              £8, 13, 0

```

Do you wish to continue (y/n)?

To add the two amounts, you'll need to carry 1 shilling when the pence value is greater than 11, and carry 1 pound when there are more than 19 shillings.

Question 14

Suppose you give a dinner party for six guests, but your table seats only four. In how many ways can four of the six guests arrange themselves at the table? Any of the six guests can sit in the first chair. Any of the remaining five can sit in the second chair. Any of the remaining four can sit in the third chair, and any of the remaining three can sit in the fourth chair. (The last two will have to stand.)

So the number of possible arrangements of six guests in four chairs is $6*5*4*3$, which is **360**. Write a C++ program that calculates the number of possible arrangements for any number of guests and any number of chairs. (Assume there will never be fewer guests than chairs.) Don't let this get too complicated. A simple for loop should do it.