Part II: Structured Programs

1.- Drivers are concerned with the mileage obtained by their automobiles. One driver has kept track of several tankfuls of gasoline by recording miles driven and gallons used for each tankful. Develop a program that will input the miles driven and gallons used for each thankful. The program should calculate and display the miles per gallon obtained for each tankful. After processing all input information, the program should calculate and print the combined miles per gallon obtained for all tankfuls. Here is a sample input/output dialog.

```
Enter the gallons used (-1 to end): 12.8
Enter the miles driven: 287
The miles / gallon for this tank was 22.421875

Enter the gallons used (-1 to end): 10.3
Enter the miles driven: 200
The miles / gallon for this tank was 19.417475

Enter the gallons used (-1 to end): 5
Enter the miles driven: 120
The miles / gallon for this tank was 24.000000

Enter the gallons used (-1 to end): -1
The overall average miles/gallon was 21.601423
```

2.- Develop a C program that will determine if a department store customer has exceeded the credit limit on a charge account. For each customer, the following facts are available:

- a) Account number
- b) Balance at the beginning of the month
- c) Total of all items charged by this customer this month
- d) Total of all credits applied to this customer's account this month
- e) Allowed credit limit

3.- The program should input each of these facts, calculate the new balance (= beginning balance + charges – credits), and determine if the new balance exceeds the customer's credit limit. For those
customers whose credit limit is exceeded, the program should display the customer's account number, credit limit, new balance and the message “Credit limit exceeded.” Here is a sample input/out-
put dialog:

```
Enter account number (-1 to end): 100
Enter beginning balance: 5394.78
Enter total charges: 1000.00
Enter total credits: 500.00
Enter credit limit: 5500.00
Account: 100
Credit limit: 5500.00
Balance: 5894.78
Credit Limit Exceeded.

Enter account number (-1 to end): 200
Enter beginning balance: 1000.00
Enter total charges: 123.45
Enter total credits: 321.00
```

```
Enter credit limit: 1500.00

Enter account number (-1 to end): 300
Enter beginning balance: 500.00
Enter total charges: 274.73
Enter total credits: 100.00
Enter credit limit: 800.00

Enter account number (-1 to end): -1
```

4.- One large chemical company pays its salespeople on a commission basis. The salespeople receive $200 per week plus 9% of their gross sales for that week. For example, a salesperson who sells $5000 worth of chemicals in a week receives $200 plus 9% of $5000, or a total of $650. Develop a program that will input each salesperson's gross sales for the last week and will calculate and display that salesperson's earnings. Process one salesperson's figures at a time. Here is a sample input/output dialog:

```
Enter sales in dollars (-1 to end): 5000.00
Salary is: $650.00

Enter sales in dollars (-1 to end): 1234.56
Salary is: $311.11

Enter sales in dollars (-1 to end): 1088.89
Salary is: $298.00

Enter sales in dollars (-1 to end): -1
```

5.- The simple interest on a loan is calculated by the formula `interest = principal * rate * days / 365;` The preceding formula assumes that `rate` is the annual interest rate, and therefore includes the division by 365 (days). Develop a program that will input `principal`, `rate` and `days` for several loans, and will calculate and display the simple interest for each loan, using the preceding formula. Here is a sample input/output dialog:

```
Enter loan principal (-1 to end): 1000.00
Enter interest rate: .1
Enter term of the loan in days: 365
The interest charge is $100.00

Enter loan principal (-1 to end): 1000.00
Enter interest rate: .08375
Enter term of the loan in days: 224
The interest charge is $51.40

Enter loan principal (-1 to end): 10000.00
Enter interest rate: .09
Enter term of the loan in days: 1460
The interest charge is $3600.00

Enter loan principal (-1 to end): -1
```

6.- Write a program that demonstrates the difference between predecrementing and postdecrementing using the decrement operator `--`.

7.- Write a program that utilizes looping to print the numbers from 1 to 10 side by side on the same line with three spaces between number

8.- Write a program that uses looping to print the following table of values. Use the tab escape sequence, `\t`, in the `printf` statement to separate the columns with tabs

```
N   10*N    100*N     1000*N
1   10      100       1000
2   20      200       2000
3   30      300       3000
4   40      400       4000
5   50      500       5000
6   60      600       6000
7   70      700       7000
8   80      800       8000
9   90      900       9000
10  100     1000      10000
```

9.- A palindrome is a number or a text phrase that reads the same backward as forward. For example, each of the following five-digit integers is a palindrome: 12321, 55555, 45554 and 11611. Write a program that reads in a five-digit integer and determines whether or not it's a palindrome. [Hint: Use the division and remainder operators to separate the number into its individual digits.]

10.- Input an integer containing only 0s and 1s (i.e., a "binary" integer) and print its decimal equivalent. [Hint: Use the remainder and division operators to pick off the "binary" number's digits one at a time from right to left. Just as in the decimal number system, in which the rightmost digit has a positional value of 1, and the next digit left has a positional value of 10, then 100, then 1000, and so on, in the binary number system the rightmost digit has a positional value of 1, the next digit left has a positional value of 2, then 4, then 8, and so on. Thus the decimal number 234 can be interpreted as 4 * 1 + 3 * 10 + 2 * 100. The decimal equivalent of binary 1101 is 1 * 1 + 0 * 2 + 1 * 4 + 1 * 8 or 1 + 0 + 4 + 8 or 13.]

11.- Write a program that prints 100 asterisks, one at a time. After every tenth asterisk, your program should print a newline character. [Hint: Count from 1 to 100. Use the remainder operator to
recognize each time the counter reaches a multiple of 10.]

12.- Write a program that reads an integer and determines and prints how many digits in the integer are 7s.

13.- Write a program that reads in the side of a square and then prints that square out of asterisks. Your program should work for squares of all side sizes between 1 and 20. For example, if your program reads a size of 4, it should print

```
****
****
****
****
```