Practical Workbook

CT-175
PROGRAMMING FUNDAMENTALS

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EXERCISE Q# 01

Write a function that prints all the unique values from an array and the number of times each value occurred. The main function takes a size of array as input and generates a random integer array with name "array1". Random number limit must be between 0 and 10. The 'main' function calls a function with the name as "CountFrequency( )" that will find the occurrence of each value in array.

```c
#include <stdio.h>
#include <stdlib.h>
#include <time.h>
void CountFrequency(int arr[], int size) {
    int freq[11] = {0};
    for (int i = 0; i < size; i++) {
        freq[arr[i]]++;
    }
    printf("\nRandom values and their frequencies:\n");
    for (int i = 0; i <= 10; i++) {
        if (freq[i] > 0) {
            printf("Value %d occurred %d frequently\n", i, freq[i]);
        }
    }
}

int main() {
    int size;
    printf("Enter the size of the array: ");
    scanf("%d", &size);

    if (size <= 0) {
        printf("Invalid. Enter positive values.\n");
        return 1;
    }

    int array1[size];
    srand(time(0));
    printf("\nArray is:\n");
    for (int i = 0; i < size; i++) {
        array1[i] = rand() % 11;
        printf("%d ", array1[i]);
    }
    CountFrequency(array1, size);

    return 0;
}
```

OUTPUT:

```
Enter the size of the array: 6

Array is:
5 0 7 3 4 8
Random values and their frequencies:
Value 0 occurred 1 frequently
Value 3 occurred 1 frequently
Value 4 occurred 1 frequently
Value 5 occurred 1 frequently
Value 7 occurred 1 frequently
Value 8 occurred 1 frequently

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Enter the size of the array: 7

Array is:
6 1 1 8 4 7 7
Random values and their frequencies:
Value 1 occurred 2 frequently
Value 4 occurred 1 frequently
Value 6 occurred 1 frequently
Value 7 occurred 2 frequently
Value 8 occurred 1 frequently
```

EXERCISE Q# 02

Salesflow is one of leading software house they are starting their recruitment process for three different following positions: Associate Developer, Assistant Developer, Trainee Engineer. There is a defined criterion for recruitment process: if candidate clears the test with 50 marks, he will be selected for the post of trainee engineer; experience is not the required for this post. If candidate secures 60 marks with at least one year of experience and 70 marks with at least 2 years of experience, then he/she will be selected as an assistant and associate developer, respectively. Write a function that takes the test marks from user and ask for experience (if the entered marks are x >=60). After that, function shows the assigned position.

```c
#include <stdio.h>

void REC_PROCESS() {
    int marks, experience;
    printf("Enter the test marks(MUST BE <=100): ");
    scanf("%d", &marks);

    if (marks >= 70) {
        printf("Enter your experience in years: ");
```

```
        scanf("%d", &experience);

        if (experience >= 2) {
            printf("You are selected as an Associate Developer.\n");
        } else {
            printf("Experience insufficient for Associate Developer.\n");
        }
    } else if (marks >= 60) {
        printf("Enter your experience in years: ");
        scanf("%d", &experience);

        if (experience >= 1) {
            printf("You are selected as an Assistant Developer.\n");
        } else {
            printf("Experience insufficient for Assistant Developer.\n");
        }
    } else if (marks >= 50) {
        printf("You are selected as a Trainee Engineer.\n");
    } else {
        printf("You did not qualify for any position.\n");
    }
}

int main() {

    REC_PROCESS();

    return 0;
}
```

OUTPUT:

```
Enter the test marks(MUST BE <=100): 40
You did not qualify for any position.

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Enter the test marks(MUST BE <=100): 50
You are selected as a Trainee Engineer.

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Enter the test marks(MUST BE <=100): 70
Enter your experience in years: 5
You are selected as an Associate Developer.
```
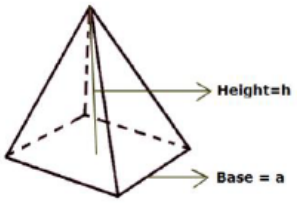

```
Enter the test marks(MUST BE <=100): 90
Enter your experience in years: 2
You are selected as an Associate Developer.
```

EXERCISE Q# 03

Write the program that calculate the volume by using following formula

$$V = a\ 2 * 1\ /3\ h,$$



by creating two separate functions. One of the functions with prototype "getData(int h, int a)", takes two inputs from user. The other function with prototype "volumeCal( )" calculates the volume, and this function must be called from the first function "getData ( )". The first function must be called from the main function.

```c
#include <stdio.h>

float volumeCal(int h, int a) {
    return (a*a*(1.0/3)*h);
}
void getData() {
    int h, a;

    printf("Enter the height (h): ");
    scanf("%d", &h);
    printf("Enter the side length (a): ");
    scanf("%d", &a);

    float volume = volumeCal(h, a);

    printf("The calculated volume is: %.2f\n", volume);
}

int main() {
    getData();
    return 0;
}
```

OUTPUT:

```
Enter the height (h): 3
Enter the side length (a): 6
The calculated volume is: 36.00
```

EXERCISE Q# 04

Write a program that takes a positive number with a fractional part and rounds it to two decimal places. For example, 32.4851 would round to 32.49, and 32.4431 would round to 32.44.

```c
#include <stdio.h>
#include <math.h>

int main() {
    double number, rounded_number;

    printf("Enter a positive number with a fractional part: ");
    scanf("%lf", &number);

    if (number < 0) {
        printf("The number must be positive.\n");
        return 1;
    }

    rounded_number = round(number * 100) / 100;
    printf("The rounded number is: %.2f\n", rounded_number);

    return 0;
}
```

OUTPUT:

```
Enter a positive number with a fractional part: 33.5455
The rounded number is: 33.55

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Enter a positive number with a fractional part: 5.22
The rounded number is: 5.22
```

EXERCISE Q# 05

In shopping for a new house, you must consider several factors. In this problem the initial cost of the house, the estimated annual fuel costs, and the annual tax rate are available. Write a program that will determine the total cost of a house after a five-year period and run the program for each of the following sets of data.

Initial House Cost	Annual Fuel Cost	Tax Rate
67,000	2,300	0.025
62,000	2,500	0.025
75,000	1,850	0.020

To calculate the house cost, add the initial cost to the fuel cost for five years, then add the taxes for five years. Taxes for one year are computed by multiplying the tax rate by the initial cost. Write and call a function that displays instructions to the program user.

```c
#include <stdio.h>
void display_instructions() {
    printf("\n.....................INSTRUCTIONS..................... \n");
    printf("This program calculates the total cost of a house over a five-year period.\n");
    printf("The total cost includes the initial house cost, the fuel cost for 5 years, and the taxes for 5 years.\n");
    printf("The tax rate is applied to the initial house cost for each year.\n");
}

int main() {
    double initial_cost, annual_fuel_cost, tax_rate;
    double total_cost, annual_tax, total_fuel_cost, total_tax;

    display_instructions();

    initial_cost = 67000;
    annual_fuel_cost = 2300;
    tax_rate = 0.025;

    total_fuel_cost = annual_fuel_cost * 5;
    annual_tax = initial_cost * tax_rate;
    total_tax = annual_tax * 5;
    total_cost = initial_cost + total_fuel_cost + total_tax;

    printf("\nHouse 1:\n");
    printf("Initial House Cost: %.2f\n", initial_cost);
    printf("Annual Fuel Cost: %.2f\n", annual_fuel_cost);
```

```
    printf("Tax Rate: %.3f\n", tax_rate);
    printf("Total Fuel Cost for 5 years: %.2f\n", total_fuel_cost);
    printf("Total Tax for 5 years: %.2f\n", total_tax);
    printf("Total Cost of House after 5 years: %.2f\n", total_cost);

    initial_cost = 62000;
    annual_fuel_cost = 2500;
    tax_rate = 0.025;

    total_fuel_cost = annual_fuel_cost * 5;
    annual_tax = initial_cost * tax_rate;
    total_tax = annual_tax * 5;
    total_cost = initial_cost + total_fuel_cost + total_tax;
  printf("\nHouse 2:\n");
    printf("Initial House Cost: %.2f\n", initial_cost);
    printf("Annual Fuel Cost: %.2f\n", annual_fuel_cost);
    printf("Tax Rate: %.3f\n", tax_rate);
    printf("Total Fuel Cost for 5 years: %.2f\n", total_fuel_cost);
    printf("Total Tax for 5 years: %.2f\n", total_tax);
    printf("Total Cost of House after 5 years: %.2f\n", total_cost);

    initial_cost = 75000;
    annual_fuel_cost = 1850;
    tax_rate = 0.020;

    total_fuel_cost = annual_fuel_cost * 5;
    annual_tax = initial_cost * tax_rate;
    total_tax = annual_tax * 5;
    total_cost = initial_cost + total_fuel_cost + total_tax;

printf("\nHouse 3:\n");
    printf("Initial House Cost: %.2f\n", initial_cost);
    printf("Annual Fuel Cost: %.2f\n", annual_fuel_cost);
    printf("Tax Rate: %.3f\n", tax_rate);
    printf("Total Fuel Cost for 5 years: %.2f\n", total_fuel_cost);
    printf("Total Tax for 5 years: %.2f\n", total_tax);
    printf("Total Cost of House after 5 years: %.2f\n", total_cost);

    return 0;
}
```

OUTPUT:

```
..................INSTRUCTIONS...................
This program calculates the total cost of a house over a five-year period.
The total cost includes the initial house cost, the fuel cost for 5 years, and the taxes for 5 years.
The tax rate is applied to the initial house cost for each year.

House 1:
Initial House Cost: 67000.00
Annual Fuel Cost: 2300.00
Tax Rate: 0.025
Total Fuel Cost for 5 years: 11500.00
Total Tax for 5 years: 8375.00
Total Cost of House after 5 years: 86875.00

House 2:
Initial House Cost: 62000.00
Annual Fuel Cost: 2500.00
Tax Rate: 0.025
Total Fuel Cost for 5 years: 12500.00
Total Tax for 5 years: 7750.00
Total Cost of House after 5 years: 82250.00

House 3:
Initial House Cost: 75000.00
Annual Fuel Cost: 1850.00
Tax Rate: 0.020
Total Fuel Cost for 5 years: 9250.00
Total Tax for 5 years: 7500.00
Total Cost of House after 5 years: 91750.00
```