Programming Lab Report

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[010243107] C Programming 2023

Lab Week 10

Function[II]: Array & Pointer

Experiment I

1 Problem description

- Write a function that shows a message if the temperature is higher than 30.0 degrees or not. The function gets a temperature value of an array {29.5, 30.7, 30.1, 29.2, 30.9} in function main.

- void IsTempHigh(float temperature)

- **Note**: Pass a cell of array into the function.

2 Program design

- For this experiment, we have to create function called "IsTempHigh()" and get cell value from array.

- For the function, we use if statement to split between more or equal to 30 and lower than 30

- The function will be:

$$IsTempHigh(x_{temp}) = \begin{cases} x_{temp} >= 30 & High \\ x_{temp} < 30 & NotHigh \end{cases}$$

3 Program text

```c
#include <stdio.h>
float Temp[] = {29.5, 30.7, 30.1, 29.2, 30.9};
int lenght = sizeof(Temp)/sizeof(Temp[0]);
int i;

void IsTempHigh(float temperature){
    if (temperature >= 30){
        printf("Temp: %.1f is High\n",temperature);
    } else {
        printf("Temp: %.1f is not High\n",temperature);
    }
}

int main(){
    for (i = 0; i < lenght; i++){
        IsTempHigh(Temp[i]);
    }
}
```

4 Terminal output

```
Temp: 29.5 is not High
Temp: 30.7 is High
Temp: 30.1 is High
Temp: 29.2 is not High
Temp: 30.9 is High
```

Experiment II

1 Problem description

- Write a function that gets an array {29.5, 30.7, 30.1, 29.2, 30.9} as input and returns average temperature. In function main, call the function and verify the function.

- float calAverageTemp(float t[])

- **Note**: Pass the whole array into the function.

2 Program design

- For this experiment, we have to create function called "calAverageTemp()" and get cell value from array by insert whole array.

- The function will sum all value of the array and calculate the average.

- For calculate the average, we can calculate by:

$$\bar{x} = \frac{\sum_{n=1}^{n} x_n}{n}$$

3 Program text

```c
#include <stdio.h>
float Temp[] = {29.5, 30.7, 30.1, 29.2, 30.9};
int lenght = sizeof(Temp)/sizeof(Temp[0]);
int i;

float calAverageTemp(float t[]){
    float SumFunction = 0, Avge;
    for (i = 0; i < lenght; i++){
        SumFunction = SumFunction + t[i];
    }
    Avge = SumFunction/lenght;
    return Avge;
}

int main(){
    printf("lenght: %d\nAverage temp: %f",lenght,calAverageTemp(Temp));
}
```

4 Terminal output

```
lenght: 5
Average temp: 30.079998
```

Experiment III

1   Problem description

- Write a function that increments value of a variable (declared in function main) by one every time that the function is called. In function main, call the function 10 times and verify the function.

- void count(int *p)

- **Note**: Pass address of a variable into the function.

2   Program design

- For this experiment, we have to create the function called "count" that get address from pointer and add the value of that variable of the address.

- In this case, we can not have the return value because when we add the value of the pointer, the variable of that address will add too.

- For calling function 10 times, we use the loop of easy to do the same pattern.

3   Program text

```c
#include <stdio.h>

void count(int *p){
    (*p)++;
}

int main(){
    int var = 0, i;
    printf("Var: %d\n",var);
    for(i = 0; i < 10 ; i++){
        count(&var);
    }
    printf("Var: %d", var);
}
```

4   Terminal output

```
Var: 0
Var: 10
```

Experiment IV

1 Problem description

- Write a function that calculate volume of cylinder.

- void calCylinderVol(float r, float h, float *v)

- In function main, call the function and verify the function.

2 Program design

- For this experiment, we have to return the value after calculation but the problem fix the function to void. So, we have to use pointer to transfer the value.

- For calculate the area of cylinder (A), we can calculate by:

$$A = \Pi r^2 h$$

- For testing and compare to hand calculation, we set r and h equal to 1.

3 Equation solve

First:
$$Let\ r\ and\ h = 1$$

Then insert into equation:

$$A = \Pi r^2 h$$
$$= \Pi \times 1^2 \times 1$$
$$A = \Pi \approx 3.141593$$

4 Program text

```c
#include <stdio.h>
#define M_PI (3.141592653589793)

void calCylinderVol(float r, float h, float *v){
    *v = M_PI * r * r * h ;
}

int main(){
    float Radiun = 1, Heigh = 1, Volumn;
    calCylinderVol(Radiun,Heigh,&Volumn);
    printf("Volumn of Cylender (R: %f, D: %f): %f",Radiun,Heigh,Volumn);
}
```

Part 5: Terminal output is on the next page.

5 Terminal output

```
Volumn of Cylender (R: 1.000000, D: 1.000000): 3.141593
```

End of Lab Experiment Week 10