Programming Lab Report

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Lab Week 3

Condition, If-else and Switch statement

Topic

- Arithmetic and Logical comparision
- Condition and operation
- If-else statement
- Switch statement

Experiment I

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1 Problem description

- Write a program that gets value of x and displays the value of function f.

$$Given\ f(x) = \begin{cases} x^2 + 5, & when\ x < -2 \\ \frac{2.5}{x^3}, & when\ x \geq -2 \end{cases}$$

Also, verify your program with hand calculation.

2 Program design

- The function have 2 case when x in different value.
- Use math.h to use pow for power equation.
- For coding, we have to use if-else to split in 2 case. One is $x < -2$ and other is $x \geq 2$
- For verify program. We will set $x = 3$ and $x = -3$, and compare to answer from hand solve.

3 Equation solve

- Case [1] $x = 3$:
  insert $x = 3$ in $f(x)$

$$f(3) = \frac{2.5}{(3)^3}$$

Then, solve equation:

$$f(3) = \frac{2.5}{27}$$
$$f(3) \approx 0.09259259259$$

- Case [2] $x = -3$:
  insert $x = -3$ in $f(x)$

$$f(-3) = (-3)^2 + 5$$

Then, solve equation:

$$f(3) = 9 + 5$$
$$f(3) \approx 14$$

Part 3: Program text is on the next page.

4 Program text

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

int main() {
    float x;
    printf("Insert value x: ");
    scanf("%f", &x);
    if (x < -2)
    {
        printf("%f",pow(x,2)+5);
    } else if (x >= -2)
    {
        printf("%f",2.5/pow(x,3));
    }
    return 0;
}
```

5 Terminal output

- Case 1

```
Insert value x: 3
0.092593
```

- Case 2

```
Insert value x: -3
14.000000
```

Experiment II

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1 Problem description

- Write a program that gets age of visitor and displays zoo entrance fee. The fee is free for person who is 65 years or older and is 100 Baht for person who is younger than 65. The screen should show message as shown below.

  First run:

```
Enter age: 65
Entrance fee: 0 Baht
```

  Second run:

```
Enter age: 30
Entrance fee: 100 Baht
```

2 Program design

- There are 2 event. when age are ≥ 65 and < 65.
- So, if we set in function, it will be $f(x_{age}) = \begin{cases} Free, & when\ x_{age} \geq 65 \\ 100, & when\ x_{age} < 65 \end{cases}$
- We use if-else for split case.

3 Program text

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

int main() {
    int x;
    printf("Enter age: ");
    scanf("%d", &x);
    if (x >= 65)
    {
        printf("Entrance fee: 0 Baht");
    } else {
        printf("Entrance fee: 100 Baht");
    }
    return 0;
}
```

Experiment III

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1 Problem description

- By using **if-else if condition**, write a program that gets score from user and displays grade. If score is greater than 100 or less than 0, grade is invalid.

Score	Grade
>100	Invalid
85-100	A
70-84	B
55-69	C
0-54	F
<0	Invalid

- Also, verify your program.

2 Program design

- The function will be:

$$f(x_{score}) = \begin{cases} Invalid, & when\ x_{score} > 100\ or\ x_{score} < 0 \\ A, & when\ 85 \leq x_{score} \leq 100 \\ B, & when\ 70 \leq x_{score} \leq 84 \\ C, & when\ 55 \leq x_{score} \leq 69 \\ F, & when\ x_{score} < 54 \end{cases}$$

- In this case we have to use if condition to split case.
- For coding. We will get score from user input.
- For testing and evaluate, We will make 2 function: ScoreCal function and Test function
- We include stdlib.h for use rand() to random number.
- For random in range, We have to % The range of number and + the min.

Part 3: Program text is on the next page.

3 Program text

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

int main() {
    int x;
    printf("Score: ");
    scanf("%d", &x);
    if (x > 100 || x < 0) {
        printf("Invalid");
    } else if (x >= 85) {
        printf("A");
    } else if (x >= 70) {
        printf("B");
    } else if (x >= 55) {
        printf("C");
    } else {
        printf("F");
    }
    return 0;
}
```

Main Program

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

//score cal function
const char* ScoreCal(int score){
    if (score > 100 || score < 0) {
        return "Invalid";
    } else if (score >= 85) {
        return "A";
    } else if (score >= 70) {
        return "B";
    } else if (score >= 55) {
        return "C";
    } else {
        return "F";
    }
}

//test function
void Test(){
    printf("%d",ScoreCal(101)=="Invalid")
        ;
    printf("%d",ScoreCal(rand() % 16 +
        85)=="A");
    printf("%d",ScoreCal(rand() % 15 +
        70)=="B");
    printf("%d",ScoreCal(rand() % 10 +
        55)=="C");
    printf("%d",ScoreCal(rand() % 55)=="F
        ");
    printf("%d",ScoreCal(-1)=="Invalid");
}

int main() {
    Test();
}
```

Test Program

Experiment IV

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1 Problem description

- By using **switch statement**, write a program that gets weight of an orange and shows orange size.

Weight (g)	Size
401-500	Extra large
301-400	Large
201-300	Medium
101-200	Small
0-100	Tiny

- Also, verify your program.

2 Program design

- The function will be:

$$f(x_{weght}) = \begin{cases} Extra\ large, & x_{weight} \in \{401 \leq x_{weight} \leq 500\} \\ Large, & x_{weight} \in \{301 \leq x_{weight} \leq 400\} \\ Medium, & x_{weight} \in \{201 \leq x_{weight} \leq 300\} \\ Small, & x_{weight} \in \{101 \leq x_{weight} \leq 200\} \\ Tiny, & x_{weight} \in \{0 \leq x_{weight} \leq 100\} \end{cases}$$

- In this case we have to use switch condition to split case.
- For coding. We will get weight from user input.
- For testing and evaluate, We will make 2 function: Cal function and Test function
- We include stdlib.h for use rand() to random number.
- For random in range, We have to % The range of number and + the min.
- In this Experiment, The range length are the same. So, We can make fix function.

Part 3: Program text is on the next page.

3 Program text

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

int main() {
    int x;
    printf("Weight: ");
    scanf("%d", &x);
    switch (x){
    case 0 ... 100:
        printf("Tiny");
        break;
    case 101 ... 200:
        printf("Small");
        break;
    case 201 ... 300:
        printf("Medium");
        break;
    case 301 ... 400:
        printf("Large");
        break;
    case 401 ... 500:
        printf("Extra large");
        break;
    }
    return 0;
}
```

Main Program

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

const char* Cal(int x){
    switch (x){
    case 0 ... 100:
        return "Tiny";
        break;
    case 101 ... 200:
        return "Small";
        break;
    case 201 ... 300:
        return "Medium";
        break;
    case 301 ... 400:
        return "Large";
        break;
    case 401 ... 500:
        return "Extra large";
        break;
    }
    return 0;
}

int random(int min, int max){
    int result =  rand() % (max - min +
        1) + min;
    return result;
}

void Test(){
    printf("%d",Cal(random(0,100))=="Tiny
        ");
    printf("%d",Cal(random(101,200))=="
        Small");
    printf("%d",Cal(random(201,300))=="
        Medium");
    printf("%d",Cal(random(301,400))=="
        Large");
    printf("%d",Cal(random(401,500))=="
        Extra large");
}

int main() {
    Test();
}
```

Test Program

End of Lab Experiment Week 3