## hw10程式碼的思維與過程

以下是我的作業思路 我先將第一段要求先宣告出來

1. Assume there is a function declared as **(1) double power(double, int)** that calculates x n if we call power(x, n), a function declared as **(2) double multiply(double, int)** that calculate x\*n if we call multiply(x, n), and a function declared as **(3) double divide(double, int)** that calculate x/n if we call divide(x, n), where x must be double and n be integer.

## 程式碼如下

```
1
     #include<stdio.h>
2
     #include<stdlib.h>
3
     #include<string.h>
     #include<math.h>
4
5
6
     * 函式power回傳x^n
7
      * 首先處理n為負數的情況,將x替換成倒數,n轉正再傳入power()
8
      * 再來考慮到n=0的情況,直接回傳1
9
      * 再來考慮到n=1的情況,直接回傳x本身
10
      * 接下來使用遞迴計算x的n次方
11
12
      */
     double power(double x, int n){
13
         if(n<0) return power((double)(1/x),-n);</pre>
14
15
         if(n == 0) return 1.0;
16
         if(n == 1) return x;
         return (double)x*power(x,n-1);
17
18
     }
19
     // 函式multiply回傳x*n
20
     double multiply(double x, int n){
21
22
         return (double)x*n;
23
     }
24
     // 函式divide回傳x/n
25
     double divide(double x, int n){
26
27
         return (double)x/n;
     }
28
```

接著按照第二三四段要求寫出powerpower()

- 2. Write a function **double powerpower(...)** that can compute  $(x^n)^m$ ,  $(x^n)^m$ ,  $(x^n)^m$ , where powerpower() must use four parameters: a pointer to function, one double and two integers.
- 3. Also remember to write functions divide(), multiply() and power()
- 4. use **typedef to define a new type F** which is a pointer to function

## 程式碼如下

```
1
 2
    // 首先依照要求定義好函式指標F
 3
    typedef double (*F)(double,int);
4
5
    /*
     * 函式powerpower()回傳所選的func(x,n)^m
6
7
     * 接下來依照第二點宣告powerpower()
     * 首先處理m為負數的情況,將x替換成倒數,m轉正再傳入函式中
8
     * 再來考慮到m=0的情況,直接回傳1
9
     * 計算func(x,n),可能是power,multiply或divide x與n
10
     * 再使用迴圈的方式計算func(x,n)^m
11
     */
12
    double powerpower(F func,double x,int n,int m){
13
14
            return powerpower(func, (double)(1/x), n, -m);
15
        if(m == 0)
16
            return 1.0;
17
        double result = func(x,n);
18
        for(int i = 1;i<m;i++){
19
            result *= func(x,n);
20
21
22
        return result;
23
    }
```

接著按照第五段要求寫main函式

When executing your program, you can choose the values for x, n, and m by using argorand argv.

程式碼如下

```
1
2
     /*
3
      * 使用argc, argv · 所需參數存在argv字串陣列中
4
      * 其中我另argv[1] = x
5
              argv[2] = n
6
              argv[3] = m
      * 因為其為字串,在傳參時我使用atoi轉為整數、atof轉為浮點數
7
      * 然後題目並無提到func的選擇方式,所以我將三種結果全部打印
8
9
      */
10
     int main(int argc, char *argv[]){
        printf("----- powerpower(power,x,n,m) -----\n");
11
12
        printf("%lf\n",powerpower(power,atof(argv[1]),atoi(argv[2]),atoi(argv[3])));
        printf("----- powerpower(multiply,x,n,m) -----\n");
13
        printf("%lf\n",powerpower(multiply,atof(argv[1]),atoi(argv[2]),atoi(argv[3])
14
15
        printf("----- powerpower(divide,x,n,m) -----\n");
        printf("%lf\n",powerpower(divide,atof(argv[1]),atoi(argv[2]),atoi(argv[3])))
16
17
     }
```

以下是完整程式碼

```
#include<stdio.h>
 1
 2
     #include<stdlib.h>
 3
     #include<string.h>
 4
     #include<math.h>
 5
     typedef double (*F)(double,int);
 6
 7
 8
     double power(double x, int n){
 9
         if(n<0) return power((double)(1/x),-n);</pre>
10
         if(n == 0) return 1.0;
         if(n == 1) return x;
11
         return (double)x*power(x,n-1);
12
13
     }
14
15
     double multiply(double x, int n){
         return (double)x*n;
16
17
     }
18
     double divide(double x, int n){
19
20
         return (double)x/n;
21
     }
22
     double powerpower(F func,double x,int n,int m){
23
         if(m < 0) return powerpower(func, (double)(1/x), n, -m);</pre>
24
25
         if(m == 0) return 1.0;
         double result = func(x,n);
26
         for(int i = 1; i < m; i++){}
27
28
              result *= func(x,n);
29
         }
30
         return result;
31
32
     }
33
34
     int main(int argc, char *argv[]){
35
         printf("----- powerpower(power,x,n,m) -----\n");
         printf("%lf\n",powerpower(power,atof(argv[1]),atoi(argv[2]),atoi(argv[3])));
36
37
         printf("----- powerpower(multiply,x,n,m) -----\n");
         printf("%lf\n",powerpower(multiply,atof(argv[1]),atoi(argv[2]),atoi(argv[3])
38
         printf("----- powerpower(divide,x,n,m) -----\n");
39
40
         printf("%lf\n",powerpower(divide,atof(argv[1]),atoi(argv[2]),atoi(argv[3])))
41
     }
```