Object-Oriented Programming Language

09/19/2018

Homework Assignment No. 2

Due 09:00 pm, Tuesday September 25, 2018

Late submission within 24 hours: score*0.9;

Late submission before post of solution: score*0.8 (the solution will usually be posted within a week); no late submission after the post of solution)

1. (25%) For the sum $S(N) = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + ... + \frac{1}{N}$, write a C++ program to calculate the smallest integer N such that $S(N) > M$ where M is a user input. Below is a typical run:

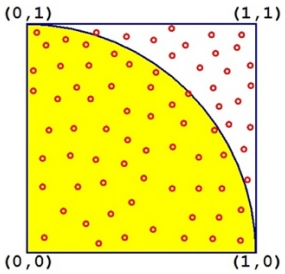
```
Please input M : 3.2
1/1+1/2+1/3+1/4+1/5+1/6+1/7+1/8+1/9+1/10+1/11+1/12+1/13+1/14=3.25156

The smallest integer N=14
```

2. (25%) 蒙地卡羅法(Monte Carlo Method)求圓周率

蒙地卡羅法(Monte Carlo Method)求圓周率的原理示意圖如下。正方形邊長為 1 單位長，面積為 1 平方單位；黃色扇形面積等於半徑為 1 單位長的 1/4 圓，面積為 PI/4。在正方形內均勻隨機丟石頭 (或隨機擲飛鏢)

落在扇型內的機率 = 扇型面積 ÷ 正方形面積 = PI/4。



Follow the note given above and write a Monte Carlo method to compute PI. You should ask the user to input the desirable number of random numbers and observe as the number gets bigger, your result should be closer to PI. Use a const double to prescribe the value PI=3.14159265 and report the error in % obtained from the Monte Carlo method. Below are sample runs:

```
Use a const double to prescribe the value PI=3.14159265
Enter the number of throw: 55
PI = 2.98181818   error%= 5.08577928
```

```
Use a const double to prescribe the value PI=3.14159265
Enter the number of throw: 100000
PI = 3.13932000   error%= 0.07234070
```

3. (20%) Please use the following `struct` to form your linked list with proper header guards in the .h file.

```
struct LElement {
    LElement * next = NULL;
    int val = -1;
};
```

Ask the user to input 5 positive integer numbers. You can assume the user behaves as what we ask. Based on the order of input, you will need to set the `next LElement` object for each of your `LElement` object.

Then use the following function to display your linked list by giving the function the head of the list. Be aware that you need to declare or define your function prior to the main function. So please copy the following function and paste it before your main function.

```
void printList(LElement head){
    cout<< "Showing integers: ";
    while(true){
        cout << head.val << " ";
        if(head.next != NULL) head = *(head.next);
        else break;
    }
    cout << endl;
}
```

The following is a sample output:

```
Please input 5 positive integers: 1 2 3 4 5
Showing integers: 1 2 3 4 5
```

4. (30%) Continuing on from the previous problem, please ask the user what integer she/he wishes to remove from the list. You will redirect the `next LElement` pointer in the list. The following are sample runs.

```
Please input 5 positive integers: 1 2 3 4 5
Showing integers: 1 2 3 4 5
What integer value do you wish to remove? 1
Showing integers: 2 3 4 5
```

```
Please input 5 positive integers: 1 2 3 4 5
Showing integers: 1 2 3 4 5
What integer value do you wish to remove? 5
Showing integers: 1 2 3 4
```

```
Please input 5 positive integers: 1 1 1 1 1
Showing integers: 1 1 1 1 1
What integer value do you wish to remove? 1
Showing integers: -1
```