LAB 11/12

In this experiment, we suppose rand() can generate data with uniform distribution from 0 to RAND_MAX

1. **Generate 1000 random numbers with uniform distribution in the range of integer (-2147483678~2147483647). Also print out the max and min number in the 1000 numbers generated.**

   Hint1: the range of integer is from -2^{31} to 2^{31}-1, and rand() generate random numbers from 0 to 32767 (2^{15}-1)

   Hint2: try and understand rand() * (RAND_MAX + 1) + rand()

```
-987832437      -2116883427       61291531      1134798920      -1239014560
 509389797       481918245      590020678       -603592168      -1123282575
 151168258      -1475139574     -1747584743      -987739719       1241128666
1617390688      1685016437      1043326646     -1681277735        943229904
2112881837       370343111       124643231        2106828       -418595047
1154883234      -913764159      -637262625       14660538       1844030384
-1866979902      214568403      -272314882      -1037749403       318232084
1957294382      1487717845     -1381499722     -1304186237      -1658395068
 184204943      -1647393511     -1055750255       162991426        520831176
-626218970       553643043       817976012      2078660184      -2093860814
-831171350      1553400483      -531627611        449712554       -423965949
-922146385       128957732       715416984      -1409619666      1992177819
 407710802       951954690      -415365838      -132961678        -84773564
-1520999057     -1099970666      -866167409      -2023279738      -387234347
1940415583      1209537996      1018374885      1305411834       -123723944
1085400939      -574960792      -1606933867     -1882057851      -770469974
-693394794      -1460422434     -1688712274     -1566970581       688361076
1321914121      -109404646       -31314545      -2007315985      -458403661
-1251748913     -1529963508      -311646168      1913805649       1625548650

-2134557607 2146246694
--------------------------------
Process exited after 0.1655 seconds with return value 0
請按任意鍵繼續 . . .
```

2. **Understand the following method for generating random numbers**

```
#include<stdio.h>
#include<stdlib.h>
#include<time.h>
int main()
{
    srand(time(NULL));
    int range=10000, x;
    int bound=(RAND_MAX+1)/range;
    do{
        x=rand();
    }while(x>=bound*range);
    printf("%d\n",x%range);
    return 0;
}
```

Using similar concept, Please generate 100 random numbers in the range from 0 to 10, the numbers should be accurate to 3 digits after decimal point, and they must be uniformly distributed. For example, 1.000 and 8.777 each is generated in the same probability.

```
2.118   8.675   9.366   7.338   3.927   7.499   4.112   0.697   8.335   6.856
4.253   3.076   3.013   3.305   4.588   1.550   1.037   7.286   4.988   5.577
9.751   2.316   1.907   2.135   0.168   5.950   7.254   0.603   0.419   4.033
2.338   6.167   9.291   5.065   2.820   7.879   5.785   3.550   6.812   0.077
6.986   5.601   4.870   1.866   4.117   2.779   8.759   7.751   4.478   7.789
1.232   8.357   1.008   1.378   6.022   6.905   2.738   1.469   4.228   0.179
0.097   2.230   3.346   4.285   9.634   8.998   8.977   6.587   5.399   7.164
3.838   4.399   4.915   7.676   9.458   9.223   1.654   7.154   1.317   6.732
5.657   4.889   4.528   2.721   0.393   4.561   5.080   9.871   4.251   1.257
9.307   7.139   9.028   8.006   8.454   8.498   3.403   2.716   1.033   9.703
```

3. Using the concepts of problem 1 and 2, please design a program which lets user input an integer x (any integer) and generates a random number y. If x is positive, y ranges from 0 to x-1, otherwise y ranges from 0 to x+1.
   The distribution of y must be uniform.
   Let user continuously inputs until the program receives Ctrl+D or Ctrl+Z.

```
0
range cannot be zero
1
---->0
50000
---->31965
50000
---->20173
-50000
---->-42120
-50000
---->-4035
-1
---->0
-2
---->-1
-2
---->0
^Z

--------------------------------
Process exited after 21.58 seconds with return value 0
```

```
40000
---->38094
40000
---->11958
40000
---->33925
40000
---->9274
-40000
---->-35325
-40000
---->-20132
-40000
---->-2465
-40000
---->-25008
-1
---->0
1
---->0
^Z

--------------------------------
Process exited after 14.75 seconds with return value 0
```