EXPERIMENT 1

Demonstrate the use of data types, local variables and Random function. Tabulate the output for various inputs and verify against expected values. Analyze the efficiency of the algorithm. Describe your learning along with the limitations of overall approach if any. Suggest how these can be overcome in conclusion. Write a C program to illustrate random number generation. Modify the program to generate a random number between lower to upper limit. Your report should include:

1. Introduction and Purpose of Experiment

   The purpose the experiment is to demonstrate the use of data types, local variables and random numbers. Two random number generator is used which is rand () and srand().

   Srand() is called a pseudo random number generator, which is used generate different random numbers on every execution as oppose to rand() which generate the same random numbers after repeated execution.

2. Aim and Objectives

   The aim of the experiment is to generate random using rand(), srand() and to generate random numbers between limits.

   Rand() function is used to generate random numbers, but executed repeatedly it is noticed that it gives the same numbers on repeated execution.

   On the contrast, srand() function gives different numbers on each execution.

3. Design an algorithm for the given problem statement and develop a flowchart/pseudo-code

   Algorithm for rand() program:

   ```
   1. Start
   2. For i=1 to 5
   3. Display rand()
   4. Stop for
   5. End
   ```

   Algorithm for srand() program:

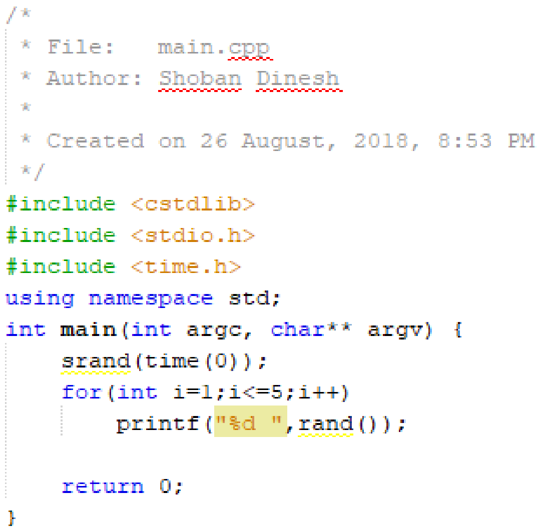
   ```
   1. Start
   2. Srand(time(0))
   3. For i=1 to 5
   ```

```
    4.  Display rand()
    5.  End for
    6.  End
```

Algorithm to generate random between 75 and 85:

```
1.  Start
2.  Initialize lower to 75 and upper to 85
3.  For i=1 to 5
4.  Display rand()%(upper-lower)+lower
5.  End for
6.  End
```

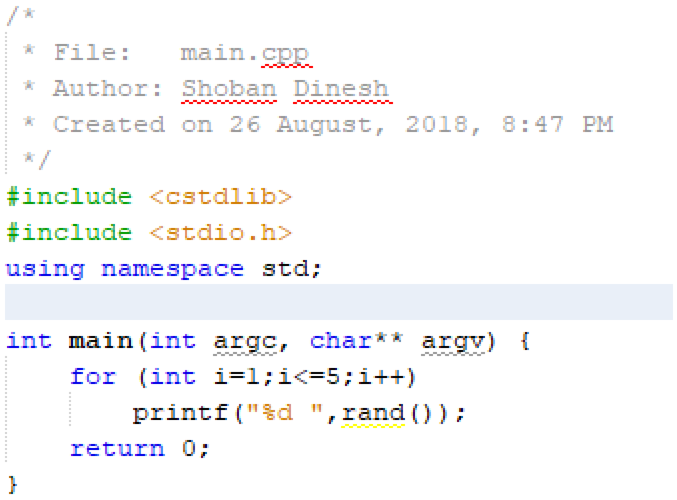
4. Implement C program



```
/*
 * File:   main.cpp
 * Author: Shoban Dinesh
 *
 * Created on 26 August, 2018, 8:53 PM
 */
#include <cstdlib>
#include <stdio.h>
#include <time.h>
using namespace std;
int main(int argc, char** argv) {
    srand(time(0));
    for(int i=1;i<=5;i++)
        printf("%d ",rand());

    return 0;
}
```

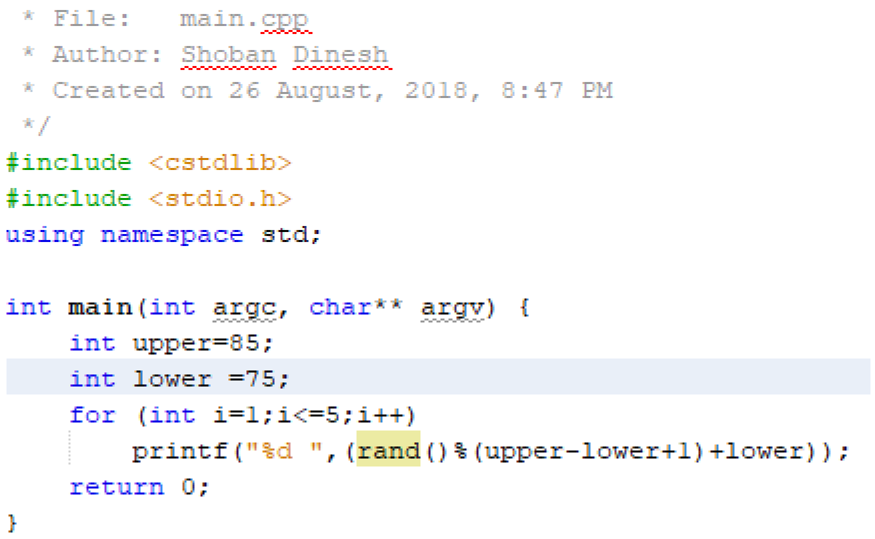
Figure 1Source code to generate numbers using srand()



```
/*
 * File:   main.cpp
 * Author: Shoban Dinesh
 * Created on 26 August, 2018, 8:47 PM
 */
#include <cstdlib>
#include <stdio.h>
using namespace std;

int main(int argc, char** argv) {
    for (int i=1;i<=5;i++)
        printf("%d ",rand());
    return 0;
}
```

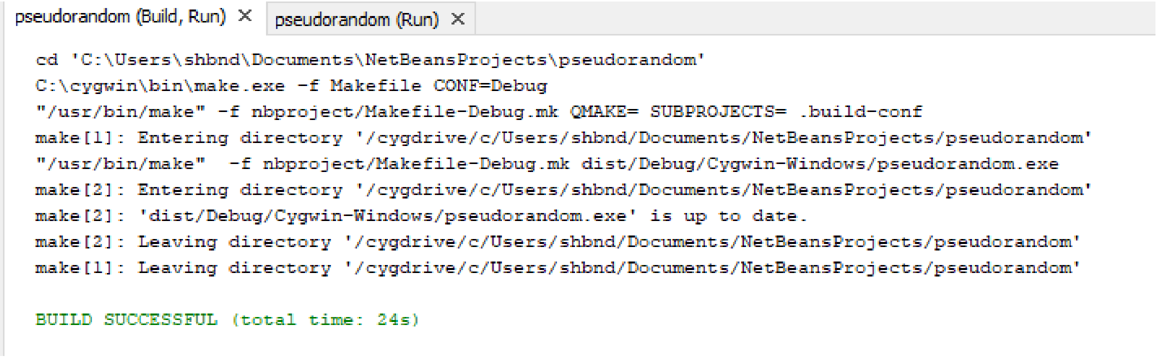
Figure 2Source code to generate random numbers using rand()



```
 * File:   main.cpp
 * Author: Shoban Dinesh
 * Created on 26 August, 2018, 8:47 PM
 */
#include <cstdlib>
#include <stdio.h>
using namespace std;

int main(int argc, char** argv) {
    int upper=85;
    int lower =75;
    for (int i=1;i<=5;i++)
        printf("%d ",(rand()%(upper-lower+1)+lower));
    return 0;
}
```

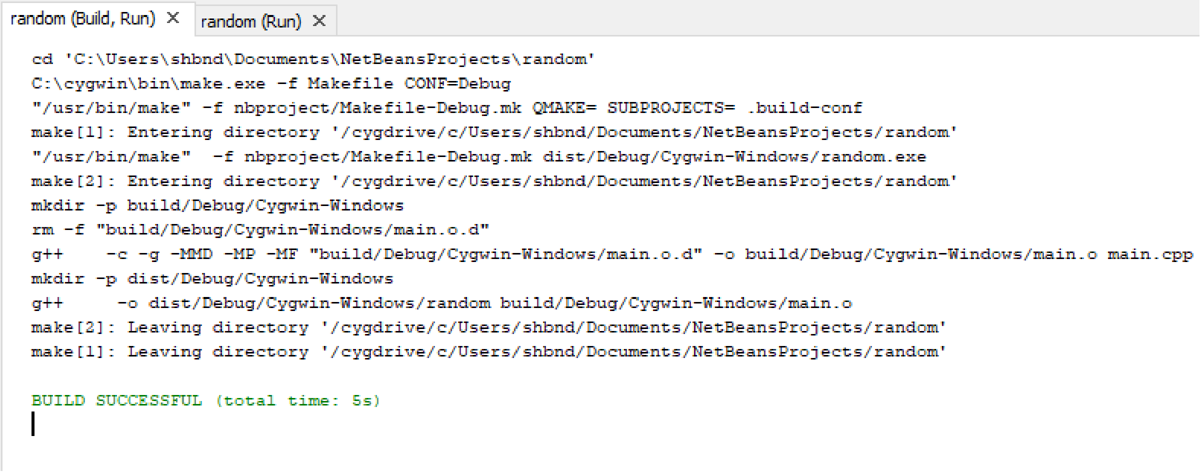
Figure 3source code to generate random numbers between 75 and 85



```
cd 'C:\Users\shbnd\Documents\NetBeansProjects\pseudorandom'
C:\cygwin\bin\make.exe -f Makefile CONF=Debug
"/usr/bin/make" -f nbproject/Makefile-Debug.mk QMAKE= SUBPROJECTS= .build-conf
make[1]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/pseudorandom'
"/usr/bin/make"  -f nbproject/Makefile-Debug.mk dist/Debug/Cygwin-Windows/pseudorandom.exe
make[2]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/pseudorandom'
make[2]: 'dist/Debug/Cygwin-Windows/pseudorandom.exe' is up to date.
make[2]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/pseudorandom'
make[1]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/pseudorandom'

BUILD SUCCESSFUL (total time: 24s)
```

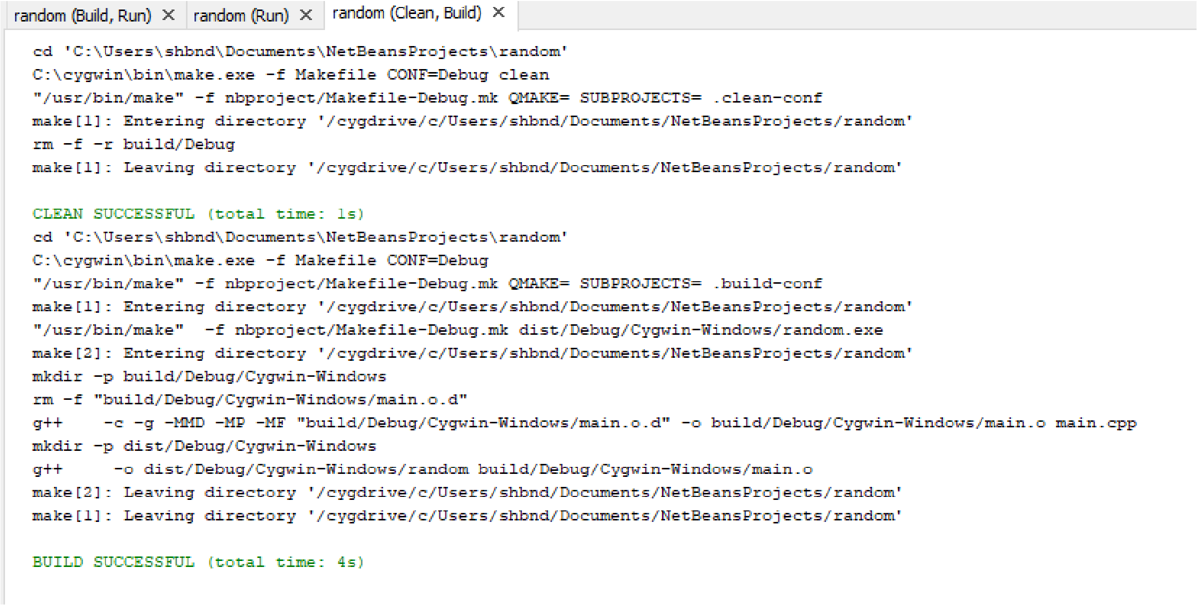
Figure 4clean and built for srand() program.



```
cd 'C:\Users\shbnd\Documents\NetBeansProjects\random'
C:\cygwin\bin\make.exe -f Makefile CONF=Debug
"/usr/bin/make" -f nbproject/Makefile-Debug.mk QMAKE= SUBPROJECTS= .build-conf
make[1]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
"/usr/bin/make"  -f nbproject/Makefile-Debug.mk dist/Debug/Cygwin-Windows/random.exe
make[2]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
mkdir -p build/Debug/Cygwin-Windows
rm -f "build/Debug/Cygwin-Windows/main.o.d"
g++    -c -g -MMD -MP -MF "build/Debug/Cygwin-Windows/main.o.d" -o build/Debug/Cygwin-Windows/main.o main.cpp
mkdir -p dist/Debug/Cygwin-Windows
g++     -o dist/Debug/Cygwin-Windows/random build/Debug/Cygwin-Windows/main.o
make[2]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
make[1]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'

BUILD SUCCESSFUL (total time: 5s)
```

Figure 5clean and built of rand() program



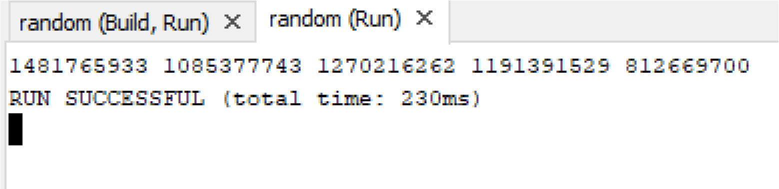
```
cd 'C:\Users\shbnd\Documents\NetBeansProjects\random'
C:\cygwin\bin\make.exe -f Makefile CONF=Debug clean
"/usr/bin/make" -f nbproject/Makefile-Debug.mk QMAKE= SUBPROJECTS= .clean-conf
make[1]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
rm -f -r build/Debug
make[1]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'

CLEAN SUCCESSFUL (total time: 1s)
cd 'C:\Users\shbnd\Documents\NetBeansProjects\random'
C:\cygwin\bin\make.exe -f Makefile CONF=Debug
"/usr/bin/make" -f nbproject/Makefile-Debug.mk QMAKE= SUBPROJECTS= .build-conf
make[1]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
"/usr/bin/make"  -f nbproject/Makefile-Debug.mk dist/Debug/Cygwin-Windows/random.exe
make[2]: Entering directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
mkdir -p build/Debug/Cygwin-Windows
rm -f "build/Debug/Cygwin-Windows/main.o.d"
g++    -c -g -MMD -MP -MF "build/Debug/Cygwin-Windows/main.o.d" -o build/Debug/Cygwin-Windows/main.o main.cpp
mkdir -p dist/Debug/Cygwin-Windows
g++     -o dist/Debug/Cygwin-Windows/random build/Debug/Cygwin-Windows/main.o
make[2]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'
make[1]: Leaving directory '/cygdrive/c/Users/shbnd/Documents/NetBeansProjects/random'

BUILD SUCCESSFUL (total time: 4s)
```

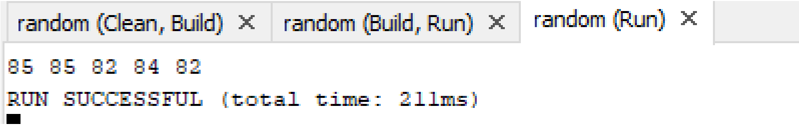
Figure 6clean and built of the random numbers between limits program

5. Presentation of Results



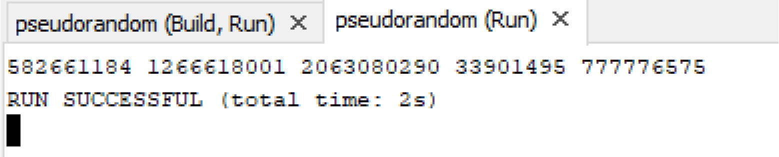
```
1481765933 1085377743 1270216262 1191391529 812669700
RUN SUCCESSFUL (total time: 230ms)
```

Figure 7output of the rand() program



```
85 85 82 84 82
RUN SUCCESSFUL (total time: 211ms)
```

Figure 8output:random numbers between 75 and 85



```
582661184 1266618001 2063080290 33901495 777776575
RUN SUCCESSFUL (total time: 2s)
```

Figure 9output of the srand() program

6. Conclusion

The program is coded according to the expected output. Better understanding of the rand(), srand() function is achieved, and also how to logic behind generating random numbers between any given limits.

Rand() and srand() fuctions are weak random number generators, and hence not used in program where security is a priority. A good alternative getrandom() function.