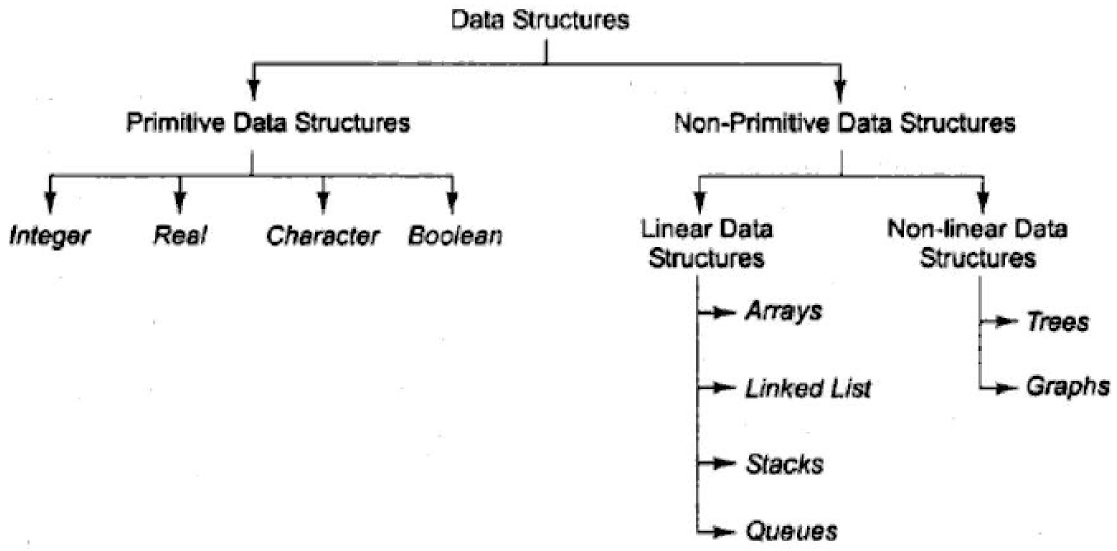
CSE-2104
INTRODUCTION TO DATA STRUCTURE

WHAT IS DATA STRUCTURE

“A data structure can be defined normally as an organized collection of values and a set of operations on them.” – Reingold

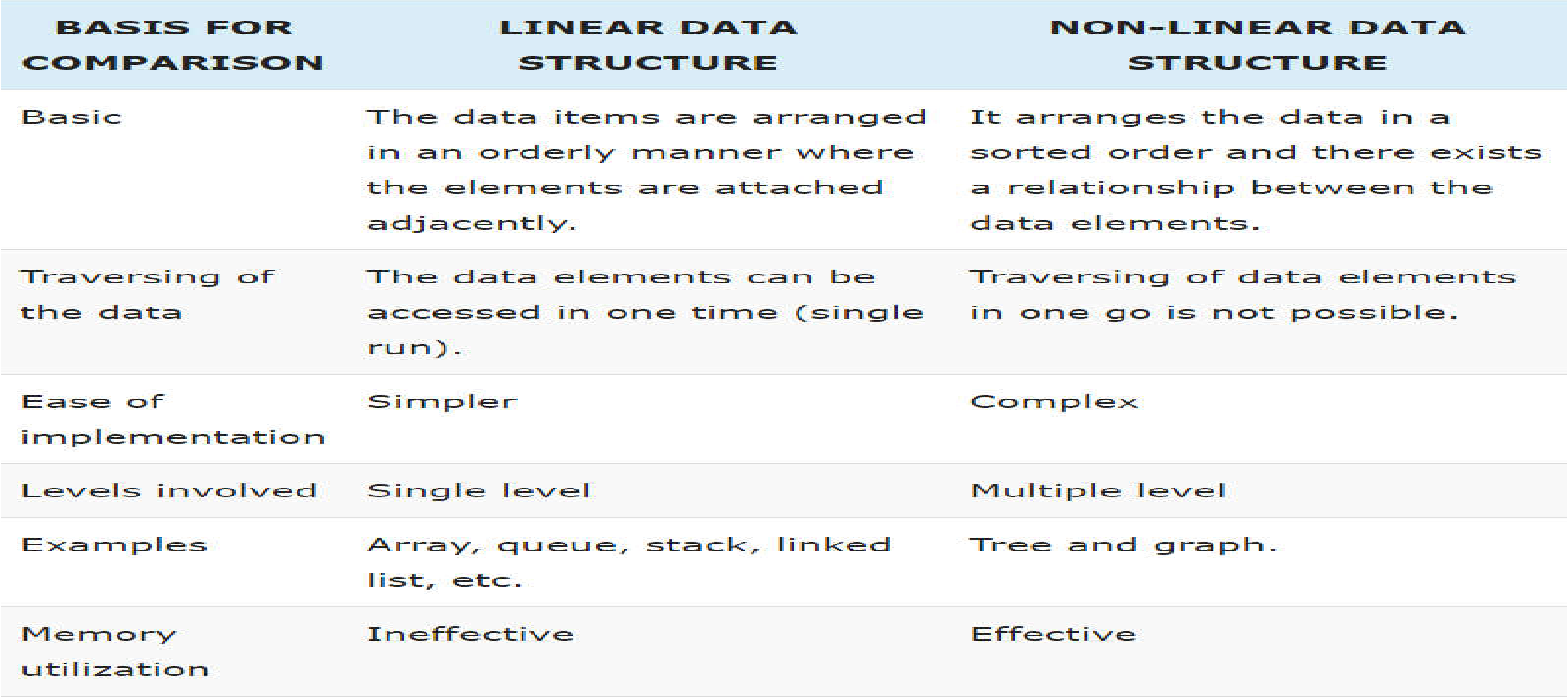
“A **data structure** is a particular way of organizing data in a computer so that it can be used effectively.” - GeeksforGeeks

TYPES OF DATA STRUCTURES



https://www.quora.com/What-is-the-data-structure-What-are-the-different-types-of-data-structures-and-their-explanation

DIFFERENCE BETWEEN LINEAR AND NON-LINEAR DATA STRUCTURE



BASIS FOR COMPARISON	LINEAR DATA STRUCTURE	NON-LINEAR DATA STRUCTURE
Basic	The data items are arranged in an orderly manner where the elements are attached adjacently.	It arranges the data in a sorted order and there exists a relationship between the data elements.
Traversing of the data	The data elements can be accessed in one time (single run).	Traversing of data elements in one go is not possible.
Ease of implementation	Simpler	Complex
Levels involved	Single level	Multiple level
Examples	Array, queue, stack, linked list, etc.	Tree and graph.
Memory utilization	Ineffective	Effective

https://techdifferences.com/difference-between-linear-and-non-linear-data-structure.html

USE OF DATA STRUCTURES

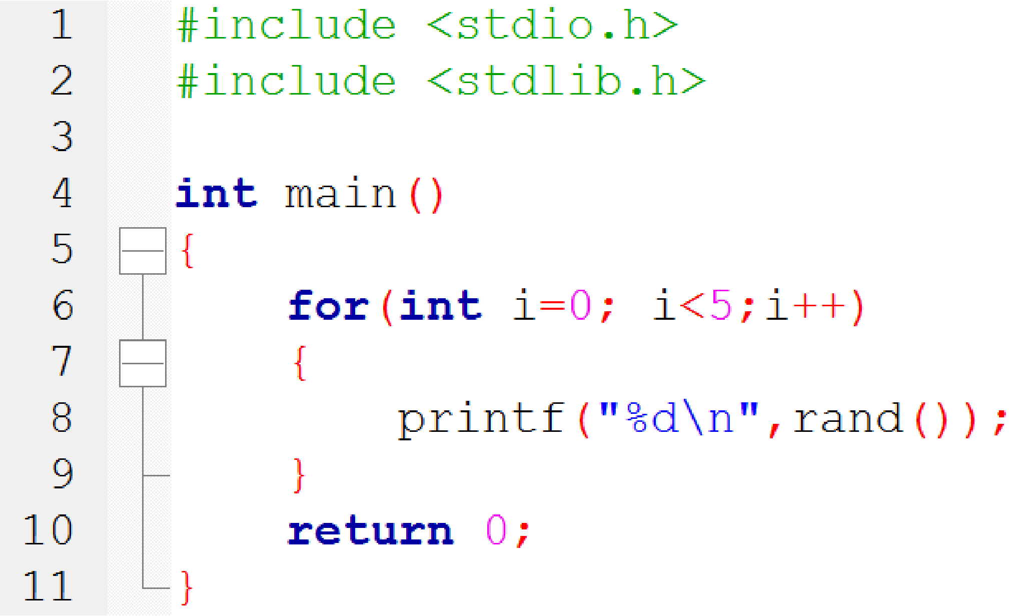
1. Stacks - expression evaluation, UNDO/REDO operations in word processors, sub-routine calls, static memory allocation
2. Queues - queues are used mostly in operating systems in order to execute process scheduling
3. Arrays - are generally used for implementation of Stacks, Queues, Priority Queues, Adjacency Matrix, Heaps, Trees, etc when the allocation size is predetermined.
4. Linked Lists - these are advantageous over arrays as they can be appended ON-THE-GO and do not need any predetermined size.

https://www.quora.com/How-are-data-structures-and-algorithms-applied-to-solve-real-world-problems

TIME

- include<time.h>
- Take two “**clock_t**” to track start time and end time
- Take a **double** variable to calculate the time
- Ex, time = (double)(end_t - start_t)/CLOCKS_PER_SEC

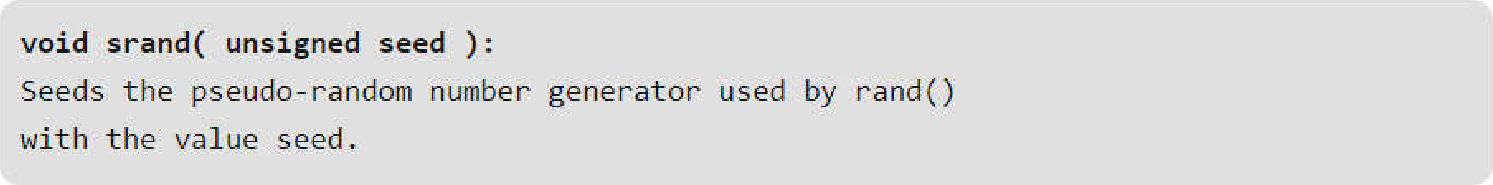
RANDOM NUMBER



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

int main()
{
    for(int i=0; i<5;i++)
    {
        printf("%d\n",rand());
    }
    return 0;
}
```

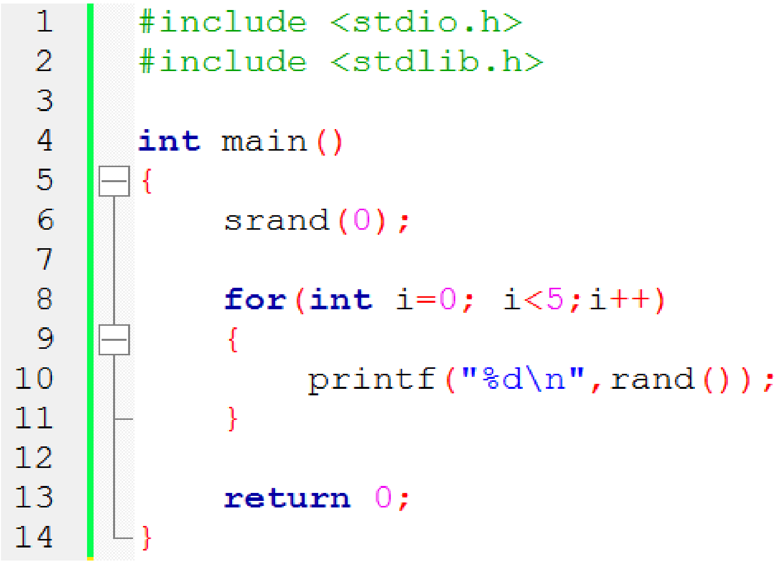
Run multiple times and you will get the same answer.

SRAND()



void srand(unsigned seed):

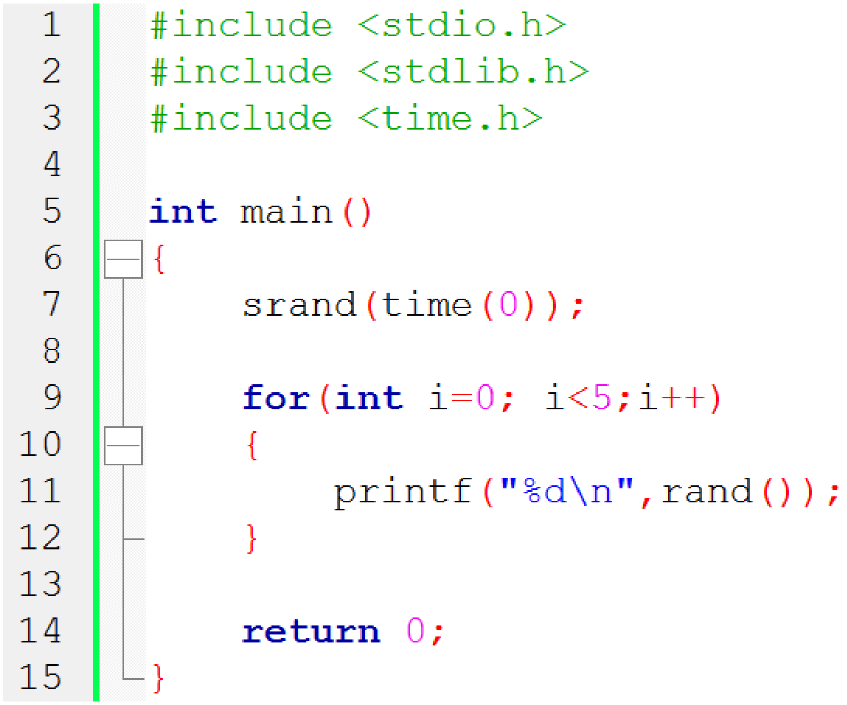
```
Seeds the pseudo-random number generator used by rand()
with the value seed.
```



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

int main()
{
    srand(0);

    for(int i=0; i<5;i++)
    {
        printf("%d\n",rand());
    }

    return 0;
}
```

This code also shows the same problem

PROBLEM SOLVED…

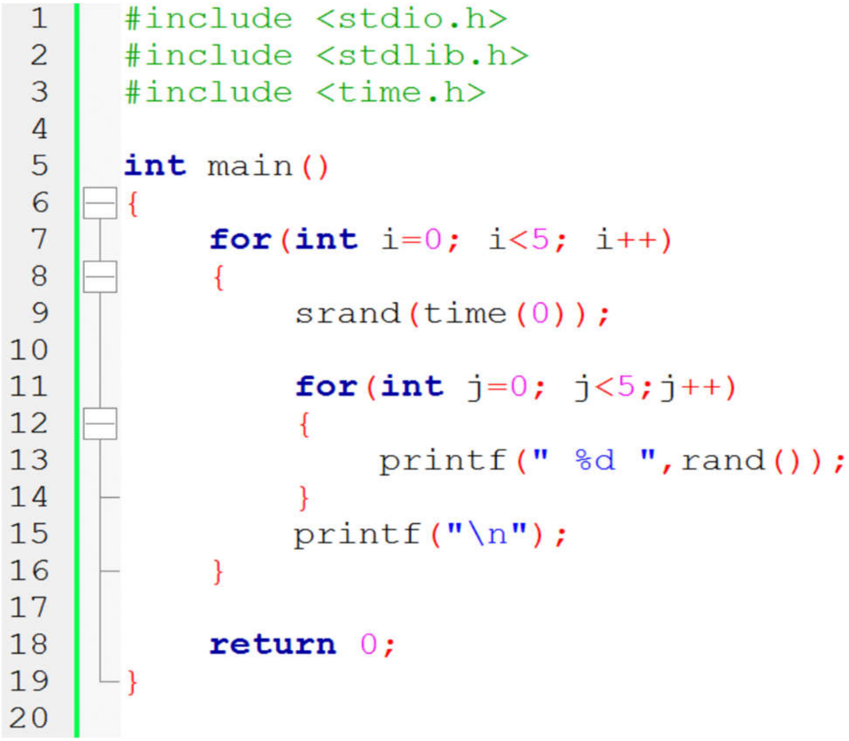


```c
#include <stdio.h>
#include <stdlib.h>
#include <time.h>

int main()
{
    srand(time(0));

    for(int i=0; i<5;i++)
    {
        printf("%d\n",rand());
    }

    return 0;
}
```

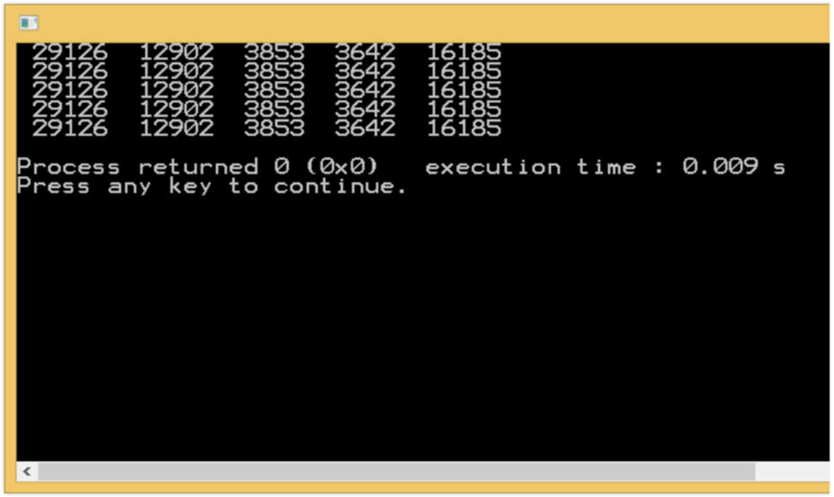
ONLINE ZERO

Could you please generate the random numbers between 1 to 10?

CAN YOU HELP ME?



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

int main()
{
    for(int i=0; i<5; i++)
    {
        srand(time(0));

        for(int j=0; j<5;j++)
        {
            printf(" %d ",rand());
        }
        printf("\n");
    }

    return 0;
}
```



```
 29126  12902  3853  3642  16185
 29126  12902  3853  3642  16185
 29126  12902  3853  3642  16185
 29126  12902  3853  3642  16185
 29126  12902  3853  3642  16185

Process returned 0 (0x0)   execution time : 0.009 s
Press any key to continue.
```

Source: “Computer Programming 2nd Part” written by “Tamim Shahriar Subeen”. Publisher: Dimik Prokashoni, 2016.

LINEAR SEARCH

BUBBLE SORT

THANK YOU