🧑‍💻 C++ 101 – Session 6 Notes

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1. Multi-Dimensional Arrays in C++

A **multi-dimensional array** is an array of arrays. The most common example is a **2D array**, but you can go further and create 3D, 4D, and more (though complexity increases).

🔷 1.1 Declaring a 2D Array

```
string letters[2][4];
```

Creates:

- 2 rows
- 4 columns in each row

🔷 1.2 Initializing a 2D Array

```
string letters[2][4] = {
  { "A", "B", "C", "D" },
  { "E", "F", "G", "H" }
};
```

🔷 1.3 Accessing Elements

```
cout << letters[0][2];  // Outputs: C
```

➡️ Index `[0][2]` accesses row 0, column 2.

🔷 1.4 Modifying Elements

```
letters[0][0] = "Z";
cout << letters[0][0];  // Outputs: Z
```

◆ 1.5 Looping Through a 2D Array

```
for (int i = 0; i < 2; i++) {
  for (int j = 0; j < 4; j++) {
    cout << letters[i][j] << "\n";
  }
}
```

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2. 3D Arrays in C++

A **3D array** is like a cube: it has rows, columns, and depth.

◆ Declaration + Initialization:

```
string letters[2][2][2] = {
  {
    { "A", "B" },
    { "C", "D" }
  },
  {
    { "E", "F" },
    { "G", "H" }
  }
};
```

◆ Accessing an Element:

```
cout << letters[1][0][1];  // Outputs: F
```

→ This means:

- Outer block 1 (second group)
- Inner row 0 (first row)
- Column 1 (second item)

☑ 3. Random Number Generation in C++

Random numbers are useful in games, simulations, and more.

◆ Basic Usage:

```
#include <cstdlib>
```

```
cout << rand();   // Random number between 0 and a very large value
```

◆ Limit the Range:

```
int randomNum = rand() % 101;   // 0 to 100
```

◆ Different Results Each Time:

```
#include <cstdlib>
#include <ctime>

srand(time(0));                   // Seed the generator
int randomNum = rand() % 101;   // Random number from 0 to 100
cout << randomNum;
```

🧠 **Why seed it?** Without `srand(time(0))`, you'll get the same "random" number every time.

🛠 Task

☑ Assignment:

Write a C++ program that:

1. Declares and initializes a **3D array** (minimum 2×2×2).
2. Uses **nested for loops** to print every element in the array.

📌 Bonus:

- Include meaningful or random values in the array.
- Add comments to explain your logic.