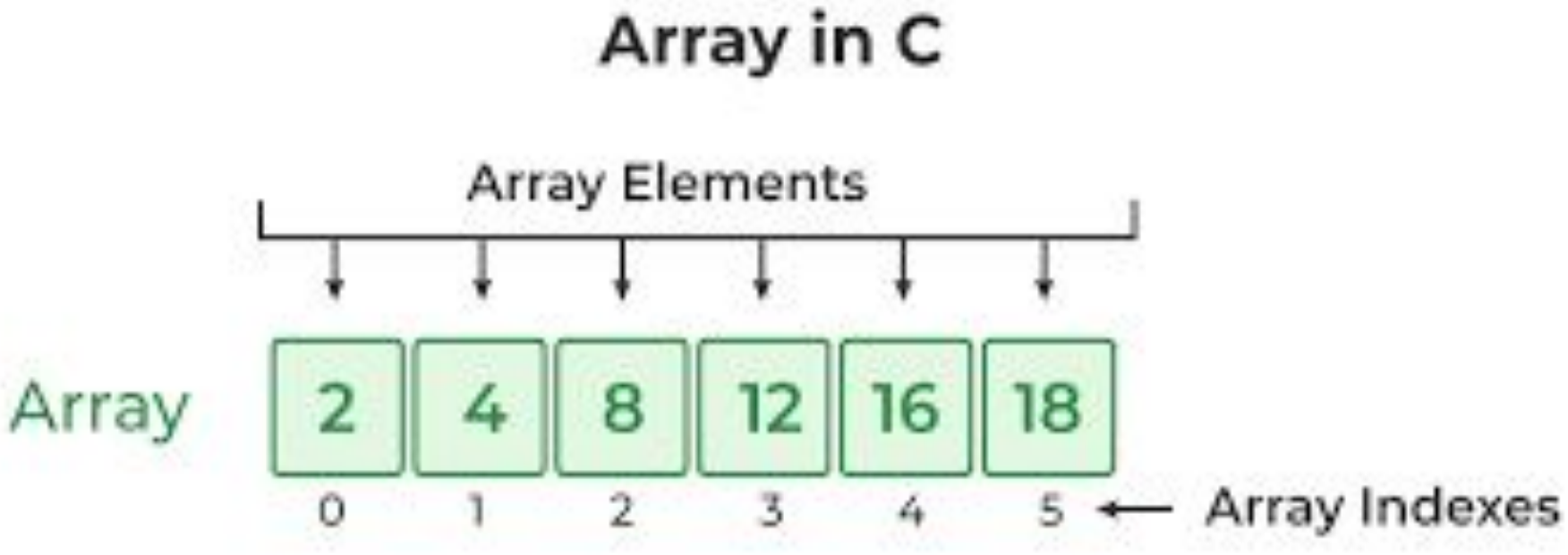
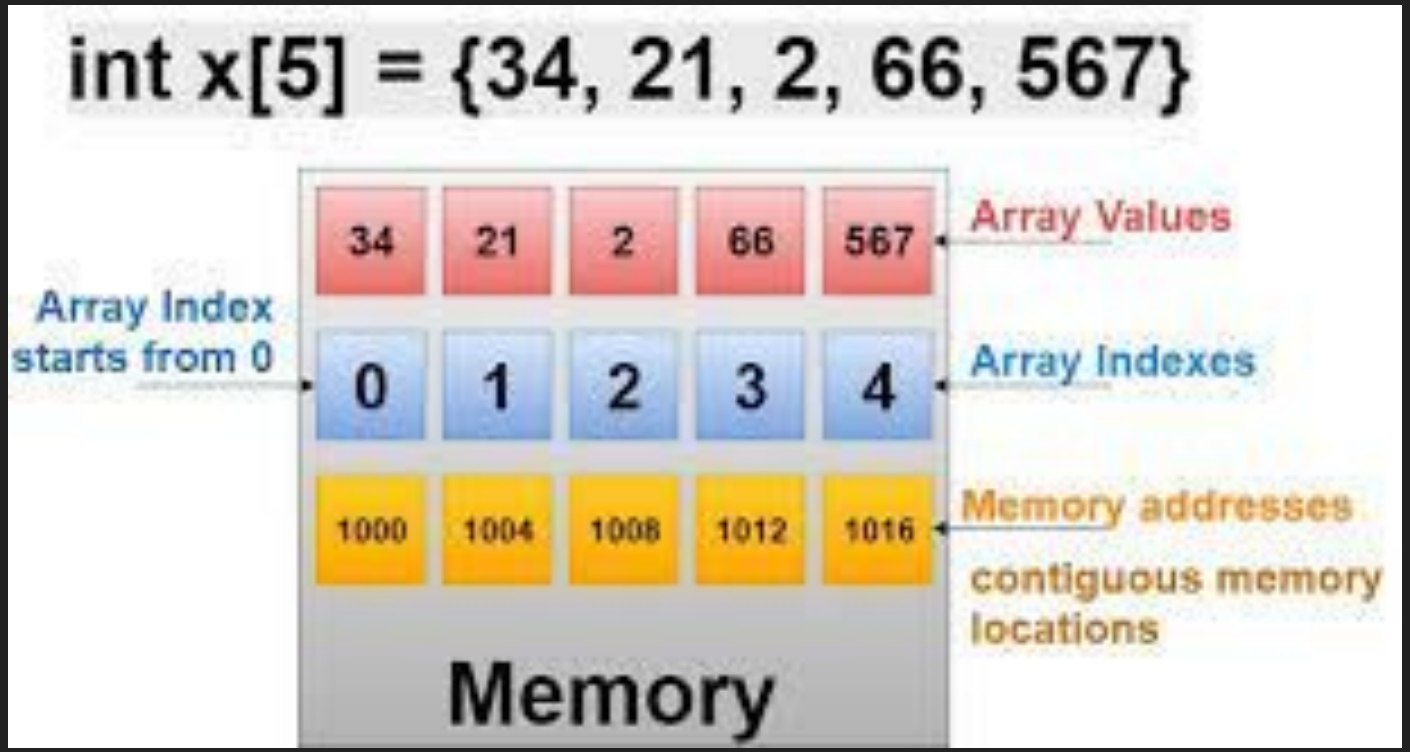
Arduino C++ Programming

Advanced Concepts

Arrays in C\C++


Array in C
Array Elements
Array
2
4
8
12
16
18
0
1
2
3
4
5
Array Indexes

Arrays in C++


int x[5] = {34, 21, 2, 66, 567}
34
21
2
66
567
Array Values
Array Index starts from 0
0
1
2
3
4
Array Indexes
1000
1004
1008
1012
1016
Memory addresses
contiguous memory locations
Memory

Arrays

Creating/Declaring an Array

```
int myInts[6];
int myPins[] = {2, 4, 8, 3, 6};
int mySensVals[5] = {2, 4, -8, 3, 2};
char message[6] = "hello";
```

Needs space for an extra empty byte(5 characters but 6 elements/indexes)

Accessing an Array

```
int myArray[10]={9, 3, 2, 4, 3, 2, 7, 8, 9, 11};
// myArray[9]    contains 11
// myArray[10]   is invalid and contains random information (other memory address)
```

Assigning a Value

```
mySensVals[0] = 10;
```

Retrieving a Value

```
x = mySensVals[4];
```

Arrays and For Loops

```
for (byte i = 0; i < 5; i = i + 1) {
  Serial.println(myPins[i]);
}
```

Questions and Exercises

1. Create an array with 5 numbers. Print out all 5 numbers using the array.
2. Create an array with 5 random numbers. Print out all 5 random numbers using the array.
3. Create a char array with a string message. Print out each character one line at a time from the array.
4. Create an array with 100 random numbers. Find the average of all those numbers.
5. Create an array with 5 names. Create another array with 5 numbers. Assume each name matches up with each number. Ask someone to enter a name and then find the number that matches up with it.

6. Randomly fill a 1000 element array with random numbers between 1 and 100. Use the array to calculate the average of all those numbers.

7. Fill an array with 100 random numbers between 1 and 100. Ask a user for any number between 1 and 100. Find out if and where the number first appears in the array.

8. Do the same as #7 but this time display how many instances of the number appears in the array.

9. Create a program to ask a user for 5 numbers and fills an array with these numbers. Next ask them for the first, middle and last numbers. Finally tell them how many they got right.

1. Create an array with 5 numbers. Print out all 5 numbers using the array.

```
Serial.begin(9600);

  // Declare and initialize an array with 5 numbers
 int numbers[] = {10, 20, 30, 40, 50};

 // Print all 5 numbers
 Serial.println("The numbers in the array are:");
 for (int i = 0; i < 5; i++) {
   Serial.println(numbers[i]);
 }
```

2. Create an array with 5 random numbers. Print out all 5 random numbers using the array.

```
Serial.begin(9600);
randomSeed(analogRead(A0));   // Seed the random number generator

int numbers[5];               // Declare an array of 5 integers

// Fill the array with random numbers between 1 and 100
for (int i = 0; i < 5; i++) {
  numbers[i] = random(1, 101);  // random number between 1 and 100
}

// Print the numbers
Serial.println("Random numbers in the array:");
for (int i = 0; i < 5; i++) {
  Serial.println(numbers[i]);
}
```

3. Create a char array with a string message. Print out each character one line at a time from the array.

```
Serial.begin(9600);  // Start serial communication

// Create a char array (C-style string)
char message[] = "Hello, Arduino!";

Serial.println("Characters in the message:");

// Loop through the array until the null terminator '\0'
for (int i = 0; message[i] != '\0'; i++) {
  Serial.println(message[i]);
}
```

4. Create an array with 100 random numbers. Find the average of all those numbers.

```
Serial.begin(9600);
randomSeed(analogRead(A0)); // Seed the random number generator

const int SIZE = 100;
int numbers[SIZE];
long sum = 0;

// Fill the array with random numbers and calculate the sum
for (int i = 0; i < SIZE; i++) {
  numbers[i] = random(1, 101); // Random number between 1 and 100
  sum += numbers[i];
}

// Calculate average
float average = sum / (float)SIZE;

Serial.println("100 Random Numbers:");
for (int i = 0; i < SIZE; i++) {
  Serial.println(numbers[i]);
}

Serial.print("Average: ");
Serial.println(average, 2);
```

5. Create an array with 5 names. Create another array with 5 numbers. Assume each name matches up with each number. Ask someone to enter a name and then find the number that matches up with it.

```
Serial.begin(9600);

String names[5] = {"Alice", "Bob", "Charlie", "Diana", "Eve"};
int numbers[5] = {10, 20, 30, 40, 50};

Serial.println("Enter a name (Alice, Bob, Charlie, Diana, Eve):");

while (Serial.available() == 0) {} // Wait for input
String input = Serial.readStringUntil('\n');
input.trim(); // Remove extra spaces/newlines

for (int i = 0; i < 5; i++) {
  if (input.equalsIgnoreCase(names[i])) {
    Serial.print("Number for ");
    Serial.print(names[i]);
    Serial.print(": ");
    Serial.println(numbers[i]);
    return;
  }
}

Serial.println("Name not found.");
```

6. Randomly fill a 1000 element array with random numbers between 1 and 100. Use the array to calculate the average of all those numbers.

```
Serial.begin(9600);
randomSeed(analogRead(A0)); // Seed random generator

const int SIZE = 1000;
int numbers[SIZE];
long sum = 0;

for (int i = 0; i < SIZE; i++) {
  numbers[i] = random(1, 101); // Random number between 1–100
  sum += numbers[i];
}

float average = sum / (float)SIZE;

Serial.print("Average of 1000 random numbers: ");
Serial.println(average, 2); // 2 decimal places
```

7. Fill an array with 100 random numbers between 1 and 100. Ask a user for any number between 1 and 100. Find out if and where the number first appears in the array.

```
Serial.begin(9600);
randomSeed(analogRead(A0)); // Seed random generator

const int SIZE = 1000;
int numbers[SIZE];
long sum = 0;

for (int i = 0; i < SIZE; i++) {
  numbers[i] = random(1, 101); // Random number between 1–100
  sum += numbers[i];
}

float average = sum / (float)SIZE;

Serial.print("Average of 1000 random numbers: ");
Serial.println(average, 2); // 2 decimal places
```

8. Do the same as #7 but this time display how many instances of the number appears in the array.

```
Serial.begin(9600);
randomSeed(analogRead(A0)); // Seed random generator

const int SIZE = 1000;
int numbers[SIZE];
long sum = 0;

for (int i = 0; i < SIZE; i++) {
  numbers[i] = random(1, 101); // Random number between 1–100
  sum += numbers[i];
}

float average = sum / (float)SIZE;

Serial.print("Average of 1000 random numbers: ");
Serial.println(average, 2); // 2 decimal places
```

9. Create a program to ask a user for 5 numbers and fills an array with these numbers. Next ask them for the first, middle and last numbers. Finally tell them how many they got right.

```
Serial.begin(9600);
randomSeed(analogRead(A0)); // Seed random generator

const int SIZE = 1000;
int numbers[SIZE];
long sum = 0;

for (int i = 0; i < SIZE; i++) {
  numbers[i] = random(1, 101); // Random number between 1–100
  sum += numbers[i];
}

float average = sum / (float)SIZE;

Serial.print("Average of 1000 random numbers: ");
Serial.println(average, 2); // 2 decimal places
```