# Class 17

Recursion, Arrays

# Recursion

- It is a function that calls itself for the task
- Rule 1: We must code for base or simplest versions of the task (base case)
- Rule 2: It can only call “simpler” versions of its task (recursive case)

- Advice 1: Trust C++ to do recursion – don’t ask how the value is returned correctly!
- Advice 2: Planning – ask what simpler case can help?
- Advice 3: Coding – try to start by detecting base case

# Example 1

- sumDigits
  - recursively sum the digits of an integer

# Example 2

- biggestDigit
  - return the biggest digit in an integer

# Example 3

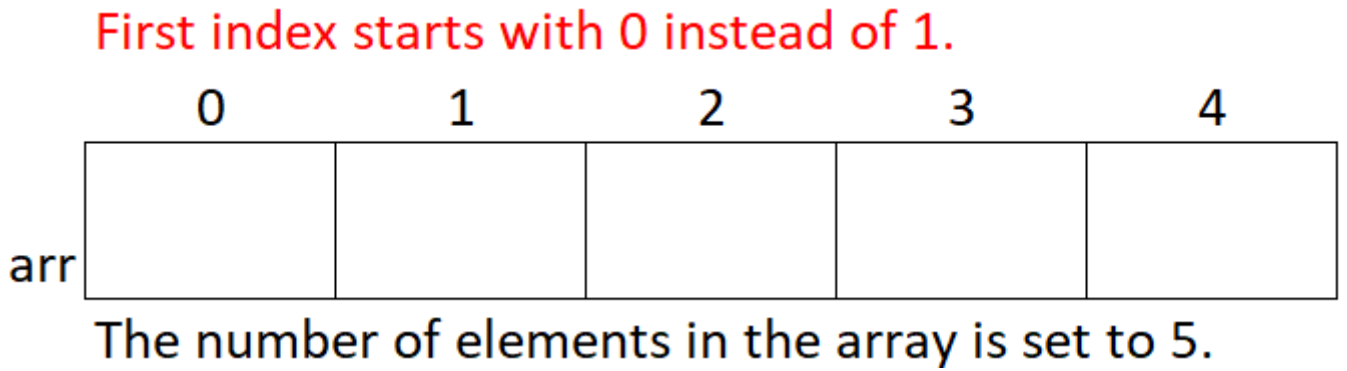
- removeFirstDigit
  - remove the first digit of an integer

# Example 4

- Greatest Common Divisor (gcd)
  - Use Euclid’s algorithm to get the gcd of two integers
  - cout << gcd(91, 133) << endl; //Print 7

# Arrays

- If a variable is a box in which we can store a specific data type (such as int, double, char) then we can think of an array as a row of boxes
- The row of boxes can be almost any quantity and type, however all the boxes must be of the same type



# Working with arrays

- Must declare an array before we can use it
- Model:  BASETYPE NAME[CAPACITY]
  - int someInts[10];

- Arrays can also be initialized to specific values
- Example:  int someInts[5] = {7, 8, 12, 9, 2};

# Working with arrays

- Store a value in the first box of the array
  - someInts[0] = 11;
- Store a value in the second box of the array
  - someInts[1] = 15;

- Notice that the first element in an array is stored at index 0

- To process entire arrays, we typically use for loops, with the counter starting at 0

# Example 5

- Use an array to store five numbers entered by a user.
- Print the numbers in reverse order.

# Terminology

- An array called someInts gives us access to lots of variables like someInts[1], someInts[2], someInts[3], etc.
- These variables are called the ELEMENTS or ENTRIES of the array
- The number in [] is called the INDEX of the element
- The index can be an actual number, e.g., someInts[3], a variable like someInts[i], or an expression like someInts[n+2]

# Example 6

- Goal:
  - Initialize array to 10 random numbers between 1 and 20
  - Print the array
  - Print the even numbers in the array from left to right
  - Print the odd numbers in the array from right to left