# Week 9

Suppose function S(n) is defined like this:

S(0) = 0  
  
S(n) = n + S(n-1) if n > 0

What is S(5)?

How could you write S(n) as a function in C++?

## The Fibonacci Sequence

The **Fibonacci sequence** goes like this: 1, 1, 2, 3, 5, 8, 13, 21, ….

The first two numbers are 1, and every other number is the sum of the 2 that come before it.

How could you write this as a recurrence relation in mathematics?

How could you write the recurrence relation as a C++ function?

Why is the C++ function so **inefficient**?

## Recursion on C++ vectors

Explain in words and pictures the idea for summing the elements of a C++ vector using recursion.

Write a function call **sum(v, begin)** that returns the sum of the numbers in the n-element **vector<int> v** starting at index location begin, i.e. v[begin + 0] + v[begin + 1] + v[begin + 2] + … + v[n-1]

Write a function call **sum\_even(v, begin)** that returns the sum of the **even numbers** in the n-element **vector<int> v** starting at index location begin. For example, **sum\_even({1, 0, 6, 3, 2})** is 8. Recall that the int n is even just when **n % 2 == 0**.