Arrays in Parallel

Course Level:

CS0

PDC Concepts Covered:

PDC Concept	Bloom Level
Concurrency	K/C
Data Dependency	K/C
Serial vs Parallel	K

Programming Knowledge Prerequisites:

Concept of Arrays

Tools Required:

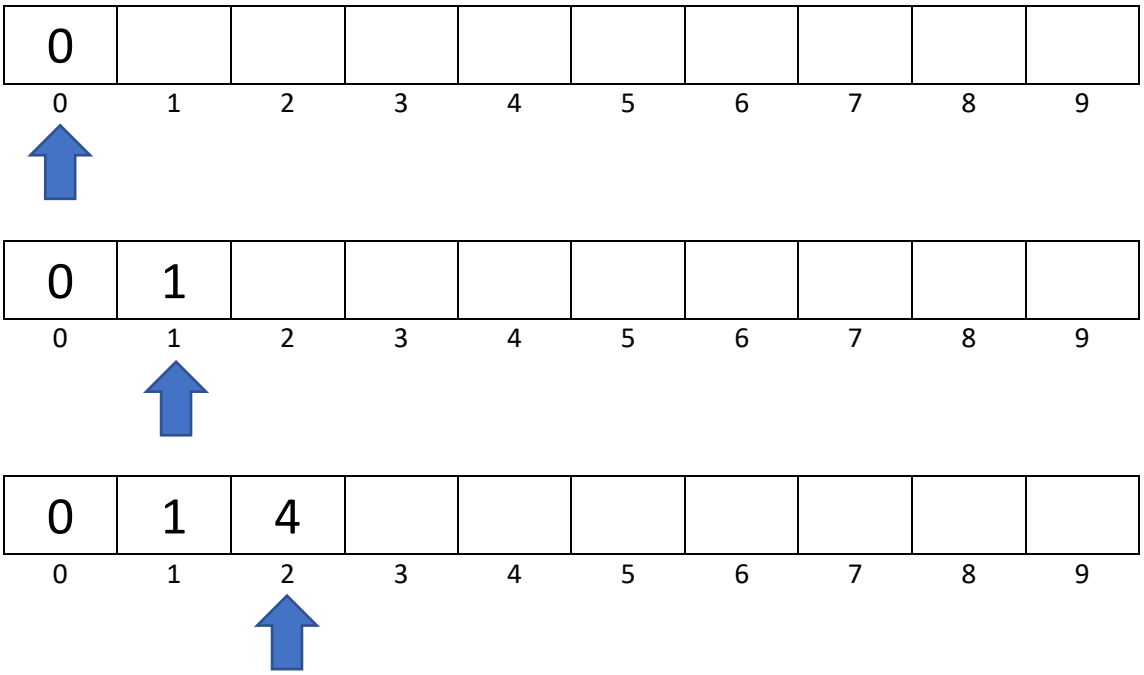
1. A whiteboard or chalkboard

Introduction:

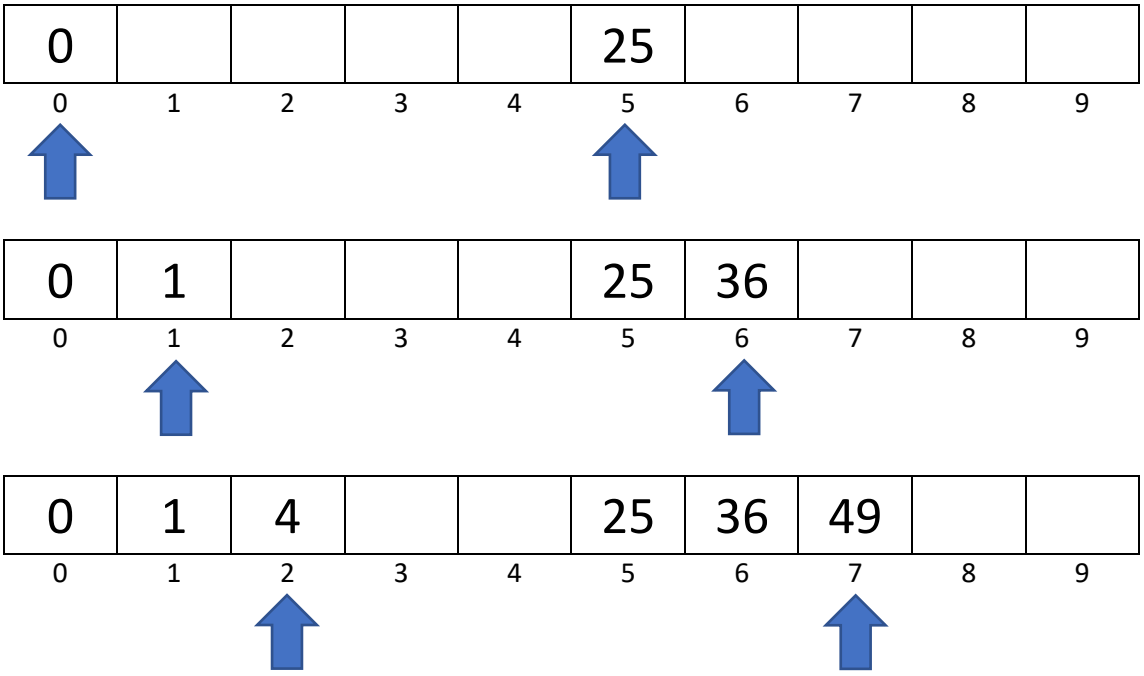
Arrays are generally introduced early in a programming class and provide a simple way to introduce parallel concepts.

Activity Description:

We want to populate an array with the outputs of a function. A simple function to pick would be $f(x) = x^2$ where x is the index of the array. Draw an array on the whiteboard with boxes representing the contents of each index. Make the array take up the whole width of the whiteboard; a good size for the array is 10-12. Label each box with its index under it. Have a student come up and fill out the array using the function. Time how long it takes them to complete it. This represents a standard (serial) loop.



Now erase the contents of the array and have two students fill out the array. Have one student start at the beginning and the other start in the middle. Time this also. It should take roughly half the time it took one student.



Important Points:

This task is easy to parallelize because each task (filling out a single array index) is independent from the others. The array could be filled out in any order and still be correct.

Extensions:

Let the class decide where the two students should start.

Have more students work at once. At some point adding more students actually results in a slower time.