PROGRAMMING WITH C++

LAB 5

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Example 1: Ending a Loop with a Sentinel Value

- Often, the number of times a loop executes is not predetermined. In such cases, you can use a specific input value to signal the loop's end—and this value is called a **sentinel value**.
- Write a program that reads an unspecified number of integers and calculates their sum. For this program, inputting **0** will signify the end of the input (i.e., 0 is the sentinel value).

Example 2: Finding the Greatest Common Divisor

Problem: Write a program that prompts the user to enter two positive integers and finds their greatest common divisor.

Solution:

Suppose you enter two integers 4 and 2, their greatest common divisor is 2.

Suppose you enter two integers 16 and 24, their greatest common divisor is 8.

So, how do you find the greatest common divisor? Let the two input integers be n1 and n2.

You know number 1 is a common divisor, but it may not be the greatest commons divisor.

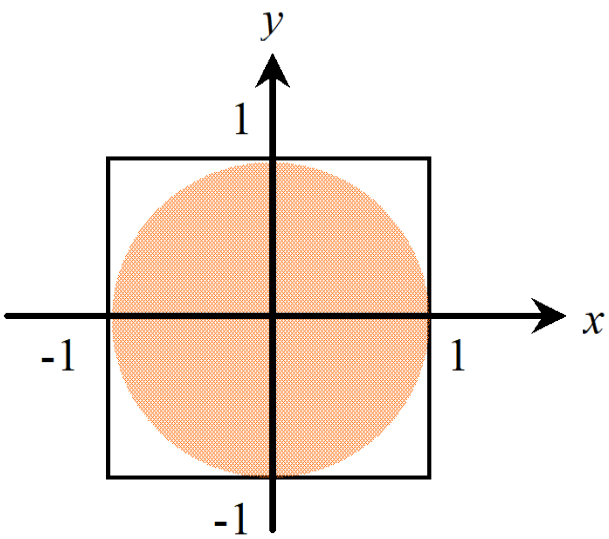
So you can check whether k (for k = 2, 3, 4, and so on) is a common divisor for n1 and n2, until k is greater than n1 or n2.

Example 3: Predicting the Future Tuition

Suppose that the tuition for a university is $10,000 this year and tuition increases 7% every year. In how many years will the tuition be doubled?

Example 4: *Monte Carlo Simulation*

The Monte Carlo simulation refers to a technique that uses random numbers and probability to solve problems. This method has a wide range of applications in computational mathematics, physics, chemistry, and finance. This section gives an example of using the Monto Carlo simulation for estimating π.



circleArea / squareArea = π / 4.

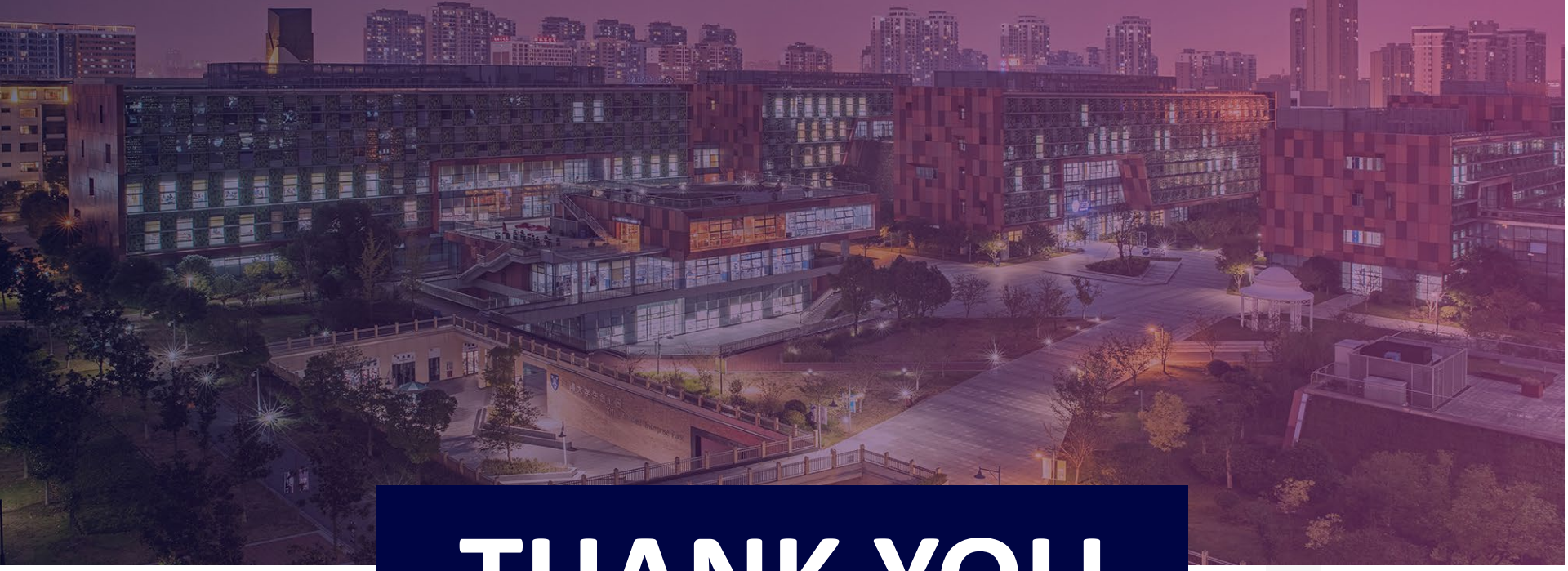
π can be approximated as 4 * numberOfHits / 1000000.

Example 5: Displaying Prime Numbers

Problem: Write a program that displays the first 50 prime numbers in five lines, each of which contains 10 numbers. An integer greater than 1 is *prime* if its only positive divisor is 1 or itself. For example, 2, 3, 5, and 7 are prime numbers, but 4, 6, 8, and 9 are not.

Solution: The problem can be broken into the following tasks:

- For number = 2, 3, 4, 5, 6, ..., test whether the number is prime.
- Determine whether a given number is prime.
- Count the prime numbers.
- Print each prime number, and print 10 numbers per line.



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