

Math 4997-1 Quiz 2: Due by Tuesday, September 10

Exercises

1. Programming on paper (2 credits):
Write a program that computes the median of the elements in a vector.
2. Interpreting programs (2 credits):
What does this program do?

```
#include <iostream>
#include <cstdlib>
#include <vector>
#include <string>

int main()
{

    std::string x;
    std::cin >> x;
    std::cout << equal(x.begin(), x.begin() + x.size() / 2, x.rbegin()) << std::endl;

    return 0;

}
```

Programming exercises

1. Monte Carlo method: (4 credits)
In Lecture 2, we discussed the Monte Carlo Method to estimate the value of π by
 - (a) Read n_{total} from the terminal
 - (b) Generate random coordinates $(x, y) \in [0, 1]$
 - (c) Check if $x^2 + y^2 \leq 1$
 - Update N_c if ≤ 1
 - (d) Increment n
 - (e) If $n < n_{\text{total}}$ go to (b)
 - (f) Calculate $\pi \approx 4N_c/n_{\text{total}}$
 - (g) Print result

2. Measuring time: (2 credits)

To measure the computation time, one can use the timers `std::chrono::high_resolution_clock` of the `#include <chrono>` header¹.

```
// Get starting timepoint
auto start = std::chrono::high_resolution_clock::now();
// Do work
// Stop timer
auto stop = high_resolution_clock::now();
// Get the duration
auto duration = duration_cast<microseconds>(stop - start);
// Print the execution time
cout << "Time taken by function: "
      << duration.count() << " microseconds" << endl;
```

Write a program that fills a vector and a list with n elements and measure the execution time of both and print them to the terminal.

This work is licensed under a Creative Commons "Attribution-NonCommercial-NoDerivatives 4.0 International" license.



¹https://en.cppreference.com/w/cpp/chrono/high_resolution_clock