

Programming Techniques

1st Semester 2018/2019

Exercises

Vectors

1. Write a program that reads a vector of real numbers and determines its minimum and maximum values, the mean and median.
2. Write a function that computes the dot product between two vectors.
3. Write a program that reads a vector of int numbers. Create functions to determine:
 - the sum of the first n elements of the vector
 - a vector whose elements are the differences between two consecutive elements of the first vector
 - the number of times a given number appears in the vector
4. Create a program to find all the prime numbers between 1 and 100 using the Sieve of Eratosthenes.
5. Write a program with functions to read and write vectors. The program should contain a function to create a vector with elements equal to the square root of the numbers in another vector and return the sum of these values. Test your program with the following main function:

```
1 int main()
2 try {
3 vector<double> x=leVect();
4 vector<double> y;
5 cout << "Sum of square roots: " << calcSqrt(x,y) << endl;
6 cout << "Vector of square roots: ";
7 writeVect(y);
8 return 0;
9 }
10 catch(NegativeSqrt) {
11 cerr << "Can't compute the square root of negative numbers";
12 return 1;
13 }
14 catch(exception& e) {
15 cerr << e.what() << endl;
16 return 2;
17 }
18 catch(...) {
19 cerr << "Unexpected error";
20 return 3;
21 }
```

GSL

1. Create a program that creates a vector to store the value of uniform random variables .
2. Create a program that creates a vector to store the value of normal random variables with $\mu = 5$ and $\sigma = 3$.
3. (*) Write a program to simulate the results of the Euromillions (5 numbers (1-50) and 2 star numbers (1-12)).
4. (*) **MONTY HALL** Consider the following problem faced by a TV show participant: It is given the opportunity to select one closed door of three, behind one of which there is a prize. The other two doors hide "goats"(or some other such "non-prize"). Once the contestant have made his selection, Monty Hall (the TV-show host) will open one of the remaining doors, revealing that it does not contain the prize . He then asks the contestant if he would like to switch his selection to the other unopened door, or stay

with his original choice. Write a program that helps to decide the best strategy (i.e. the strategy a contestant should choose in order to obtain a larger probability of winning) .