

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Department of Mathematics and Statistics

AMAT-2120

Fall 2004

Assignment 5. Due at 10:00am Monday November 29

1. Write a program that computes the maximum, minimum and mean values of a given sequence of numbers and the standard deviation.

Mathematical problem. Given a finite sequence of real numbers a_1, \dots, a_N , find:

1) $a_{\min} = \min_{i=1, \dots, N} a_i$

2) $a_{\max} = \max_{i=1, \dots, N} a_i$

3) The mean value $\bar{a} = \frac{1}{N} \sum_{i=1}^N a_i$

4) The standard deviation

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (a_i - \bar{a})^2}.$$

Technical requirements. The program will have two command line arguments: the names of the input and output files. The data will be read from the input file and automatically counted. (User provides only the numbers a_i , but not N .) The results will be printed to the output file. (A parallel console output is allowed, too, and in fact encouraged).

2. Suppose that variable `x` of type `double` is defined in `main()`. The following line in `main()` is supposed to increment the value of `x` by 1:

```
inc(&x);
```

The program is written in C (the compiler to be used is `gcc`). Which of the following implementations of function `inc` is correct? Explain your answer.

- A. `void inc(double x)`
 `{`
 `x++;`
 `}`
- B. `void inc(double* x_ptr)`
 `{`
 `(*x_ptr)++;`
 `}`
- C. `void inc(double &x)`
 `{`
 `++x;`
 `}`
- D. `double inc(double x)`
 `{`
 `return (x+1);`
 `}`

3. Now the program is a C++ program (to be compiled with g++), in which the following line in `main()` is supposed to increment the value of `x` by 1:

`inc(x);`

Which of the above implementations A–D of function `inc` is correct in this case and why?

4. Trace execution of the following program. (Show table with line numbers and values.) Determine the output. Which member function(s) in class A could be declared private?

```

1   class A
2   {
3       public:
4           A();
5           ~A();
6           void init();
7           int modify(int x);
8           int getValue();
9   
```

```

10     private:
11         int value;
12     };

13 #include <stdio.h>

14 int main()
15 {
16     A a;
17     int t=27;
18     printf("Main(1): a.value=%d, t=%d\n", a.getValue(), t);
19     t=a.modify(t);
20     printf("Main(2): a.value=%d, t=%d\n", a.getValue(), t);
21     return(0);
22 }
23
24 A::A()
25 {
26     printf("Constructing A\n");
27     init();
28 }
29
30 A::~~A()
31 {
32     printf("Destructing A with value %d\n", value);
33 }
34
35
36 void A::init()
37 {
38     value=5;
39 }
40
41 int A::modify(int x)
42 {
43     x=x/2;
44     value+=x;
45     return (x-1);
46 }

```

```
47
48 int A::getValue()
49 {
50     return (value);
51 }
```