

CIT 131 - Beginning C Programming

Fall 2019

Programming Assignment 8 (pa08)

Due Date

This assignment is due at the beginning of class on the date shown below. No late submissions accepted.

Section	Due
3001	2019-10-14

Problem Description

Write a C program to compute the arithmetic **maximum** value, **minimum** value, **mean** (average), **median**, and **mode** for *up to* 100 integers. The data are read from the **stdin** stream.

The program should start with a function to read the **stdin** stream and fill the array. Note that there may be fewer than 100 integers. This will require that the read function return the number of elements read into the array.

To determine the median, you must first sort the array using the *selection sort* algorithm. The median is the integer in the middle of the range. This can be determined by selecting the integer at `size / 2` if `size` is even and by averaging the integers at floor and ceiling of `size / 2` if `size` is odd. The mode is the integer that occurs the most often. Note that multiple integers may occur the same number of times. If no integer appears more than once, print n/a for the mode.

Program Requirements

- A well-structured program design is *required*. A typical solution will use several functions besides **main**. Programs not using a structured design will receive a zero score.
- Non-recursive functions may have exactly one **return** statement.
- Use of **exit** should be reserved for critical failures only (e.g., failure to open a file).
- Do not use Variable Length Arrays (VLAs) – array sizes must be specified using a defined constant.

Input specification

Input consists of 0 to 100 signed integers read from `stdin`. EOF signals the end of input. (I have provided a sample input data file for your use, `/home/shared/cit131/integers.dat`.)

Output Specification

Output should be formatted as shown in the sample solution. The mean and the median should be displayed with one decimal digit.

Sample Interaction

Command Line

```
$ echo -25 -10 21 87 -85 -23 32 21 16 38 | ./pa08
```

```
count: 10
min:   -85
max:   87
mean:  7.2
median: 18.5
mode:  21
```

```
$ echo 90 -73 -67 -42 99 | ./pa08
```

```
count: 5
min:   -73
max:   99
mean:  1.4
median: -42.0
mode:  n/a
```

```
$ ./pa08 < /home/shared/cit131/integers.dat
```

```
count: 100
min:   -30935
max:   32472
mean:  3359.0
median: 4679.5
mode:  42
```

```
$
```

Submission Instructions

Name your source code file `pa08.c`. Remember to put the required documentation header at the top of your source code for credit. Use the following command to submit your solution:

Command Line

```
$ turnin -c cit131 -p pa08 -v pa08.c
```