

Finding the Median Value In A List of Numbers

There are four problems the student must solve to create this algorithm:

- 1) Making sure the list is sorted
- 2) Determining if the list has an **odd** or **even** number of elements.
- 3) Calculating the median if there is an **odd** number of elements.
- 4) Calculating the median if there is an **even** number of elements.

Problem #1 - Sort the list

Sorting the list can be done using the `.sort()` function or a new sorted list can be created using the `sorted()` function. Think of which method would be the best in this situation. Does it matter if the numbers are sorted in ascending or descending order?

Problem #2 - Determining if there are an odd or even number of elements

The number of elements a list has can be found using the `len (listName)` function.

There are two ways to determine if a number is odd or even:

- 1) Comparing the result when a number is divided by 2 and the result when it is “integer divided” by 2. For example:

```
number = int (input (“Enter an integer”))
if number / 2 == number // 2 :
    print (number, “is even”)
else
    print (number, “is odd”)
```

- 2) If the remainder of the number divided by 2 is 0, the number must be even. For example:

```
number = int (input (“Enter an integer”))
if number % 2 == 0 :
    print (number, “is even”)
else
    print (number, “is odd”)
```

Either method is fine to use in your algorithm.

Mark
0
35
1
43
2
67
3
81
4
95

Problem #3 - Finding the median value of a list with an odd number of elements

To find the median value, the value of the “middle” element of the list must be found.

Given the list on the left, the median value is 67. This is found by calculating the index of the middle element by finding the length of the list (5) and then “integer dividing” the length by 2 for a result of 2. The middle element therefore is `mark [2]` which has a value of 67.

Generally, two calculations are required to find the median of a list with an odd number of elements:

```
midElemIndex = len (list) // 2
median = list [midElemIndex]
```

Mark	
0	35
1	43
2	67
3	81

Problem #4 - Finding the median value of a list with an even number of elements

If there is an even number of elements, the median value is calculated as the average of the values of the two “middle” elements.

Given the list to the left, the median value would be 55 which is the average of the two “middle” elements (*mark* [1] and *mark* [2]). The index of one of the middle elements is calculated by finding the length of the list (4) and then “integer dividing” the length by 2 for a result of 2. The other middle element is the element before. The two middle elements are therefore *mark* [1] and *mark* [2]. The median value is then calculated by adding the values of *mark* [1] and *mark* [2] (43 + 67) and dividing the sum by 2 (110 / 2).

Generally, two calculations are required:

$\text{midElemIndex} = \text{len}(\text{list}) // 2$ # Finds one of the “middle” indexes

$\text{median} = (\text{list}[\text{midElemIndex} - 1] + \text{list}[\text{midElemIndex}]) / 2$