CSE 4108: Structured Programming I Lab Mid Test
Duration: 1 Hour

Naming Convention: The file naming format is `ID_Mid.c`, eg. `230041101_Mid.c`.
Ensure that your file is properly named, otherwise it will not be evaluated.

Task — Ten Percentiles

Problem Statement

Given an array of n integers between 1 to 100, you must divide the values into ten-percentiles defined as:

- P_1 **(First Ten-Percentile)**: Contains values in the range $[1, 10]$
- P_2 **(Second Ten-Percentile)**: Contains values in the range $[11, 20]$

  $\vdots$
- P_{10} **(Tenth Ten-Percentile)**: Contains values in the range $[91, 100]$

For each ten-percentile, report the range of values it contains along with the frequency of numbers within that range.

Once the ten-percentile frequencies are determined, compute an *approximate average* for the values using the midpoints of each ten-percentile range and the frequency of numbers in each range. The *approximate average* can be calculated by iterating over the ten-percentiles as follows:

$$\text{Approximate Average} = \frac{1}{n}\sum_{i=1}^{10}(m_i \times f_i)$$

Where:

- m_i is the midpoint of the i^{th} ten-percentile range, *i.e.*,

$$m_i = \frac{(\text{range\_start}_i + \text{range\_end}_i)}{2}$$

- f_i is the frequency of numbers in the i^{th} ten-percentile.
- n is the total number of elements in the array.

Input

The first line contains a single integer n ($1 \leq n \leq 10^5$), denoting the number of values in the array.
The second line contains n space-separated integers a_i ($1 \leq a_i \leq 100$), each representing an array value.

Output

Print ten lines, each representing a ten-percentile in order from P_1 to P_{10}. For each ten-percentile, display the percentile range and the frequency of numbers in that range.
In the last line, output the *approximate average* of the dataset. See the sample output for more clarity.

Sample Test Case(s)

Sample Case 1

Input	Output
5 99 99 1 2 50	P1 [1,10]: 2 P2 [11,20]: 0 P3 [21,30]: 0 P4 [31,40]: 0 P5 [41,50]: 1 P6 [51,60]: 0 P7 [61,70]: 0 P8 [71,80]: 0 P9 [81,90]: 0 P10 [91,100]: 2 Approximate Average: 49.50

Explanation:

In this sample, the input contains 5 values: 99, 99, 1, 2, and 50. These values are distributed across the ten-percentile ranges as follows:

- 1 and 2 fall into P_1 $[1, 10]$, giving P_1 a frequency of 2.
- 50 falls into P_5 $[41, 50]$, giving P_5 a frequency of 1.
- 99 appears twice and falls into P_{10} $[91, 100]$, giving P_{10} a frequency of 2.

The other ten-percentiles are empty, and have a frequency of 0.
The approximate average is calculated using the midpoint of each occupied percentile and its frequency:

$$\text{Approximate Average} = \frac{1}{5}\left((5.5 \times 2) + (45.5 \times 1) + (95.5 \times 2)\right) = 49.5$$

where 5.5, 45.5, and 95.5 are the midpoints of percentiles P_1, P_5, and P_{10}, respectively

Sample Case 2

Input	Output
10 15 72 82 63 51 92 23 36 90 100	P1 [1,10]: 0 P2 [11,20]: 1 P3 [21,30]: 1 P4 [31,40]: 1 P5 [41,50]: 0 P6 [51,60]: 1 P7 [61,70]: 1 P8 [71,80]: 1 P9 [81,90]: 2 P10 [91,100]: 2 Approximate Average: 63.50