P3 - Normalized Histogram

A histogram is a bar graph, and a convenient way to view a distribution of values. Each bar of the graph represents a range of values, and the length of a bar represents the number of input values in that range. Your program must read a collection of non-negative integer input values, and display it as a histogram. The bars of the histogram are represented as horizontal rows of "#" characters. The parameters of the histogram are:

- the *lo* bound (the lowest value that the histogram can represent)
- the *step* size (the range of values represented by a single bar)

The bars of the histogram are numbered from 0 up to some maximum number. The number of "#" characters in histogram bar number *n* is the number of input values which lie between *lo+n*step* and *lo+(n+1)*step-1*. So bar 0 of a histogram where *lo* is 30 and *step* is 10 will represent values between 30 and 39, bar 1 of the same histogram will represent values from 40 to 49.

For this problem, all input values, and the histogram parameters, are non-negative integers. Histogram parameters must be chosen to be “nice” round numbers that will allow the histogram to have no more than 20 bars. The constraints are as follows:

- The *step* size must be 1 or 2 or 5, possibly multiplied by some positive integer power of 10. For example: 2, 100, 5000. The *step* size is thus an integer.
- The *lo* bound must be some multiple of the *step* size.
- The *lo* bound and the *step* size must be chosen so that the minimum input value counts towards the first histogram bar, and the maximum input value counts towards a histogram bar number which is less than 20, but otherwise is as large as possible. That is, the histogram *has as many bars as possible*, up to a *maximum* of 20.

The input to your program consists of a series of data sets. Each data set begins with a single integer in the range 2 to 500 inclusive, on a line by itself. This is the number of input values. It is followed by the non-negative integer data values, which may be split across lines arbitrarily. The input values may or may not be sorted. The entire input is terminated by an empty data set (where the initial count is zero).

For each data set, the program must print out the corresponding histogram. The histogram is a series of histogram bars, one to a line. Each bar is preceded by the bottom of the range of values for that bar, displayed right justified in a field eight characters wide. This bound is followed by one space, and then a row of “#” characters, corresponding to the number of input values for this histogram bar. The input data is such that no bar will have more than 70 “#”’s. The histogram should be printed from the first non-empty bar to the last non-empty bar, inclusive, and should be followed by one blank line.

As a special case, if all input values in a given set are equal, then no histogram is displayed, and the program must give a line exactly in the following form:

```
All inputs equal 15.
```

There must be exactly three spaces at the positions indicated, and a full stop at the end of the line. As with a valid histogram, this message must be followed by a blank line.

SAMPLE INPUT

```
55
  0  10  20  30  40  50  60  70  80  90
  0  10  20  30  40  50  60  70  80  90
 81  82  83  84  85  86  87  88  89  81
 81  82  83  84  85  86  87  88  89  81
150 200 250 300 350 400 450 500 550 600
700 750 800 850 900
12
11 11 11 11 11 11 11 11 11 11 11 11
2
5001 3099
0
```

SAMPLE OUPUT

```
       0 ##########
      50 ##############################
     100
     150 #
     200 #
     250 #
     300 #
     350 #
     400 #
     450 #
     500 #
     550 #
     600 #
     650
     700 #
     750 #
     800 #
     850 #
     900 #

All inputs equal 11.

    3000 #
    3200
    3400
    3600
    3800
    4000
    4200
    4400
    4600
    4800
    5000 #
```