## Division 2 - Problem A – Don't Call Me Average

The Equinox Game Simulation Engine simulates all kinds of weather conditions during game play. It uses realistic weather data to create simulated weather. The designers have an interesting question that they would like you to answer. Is the temperature on a given day ever actually equal to the average temperature for that day?

You will write a program that takes as its input temperature data (in degrees Celsius) and performs a statistical analysis of it. Specifically, given a list with an odd number of integers, you should compute the median and mean temperature values, and then determine the answer to the following three questions.

1. Is the mean value in the list?
2. Is the median value in the list?
3. Is the mean value equal to the median value?

For example, suppose the list contains five rather cool temperatures: 2, 6, 1, 7, and 8. The mean temperature would be 4.8 and the median temperature is 6. The mean temperature is not in the list, the median temperature is in the list, and the mean is not equal to the median.

Your task is to write a program that first reads a single integer input from the keyboard. This integer represents the size of the list. Next, read that many more integers from the keyboard. They represent the temperature data. Compute the mean and median, and then print the answers to the above questions to the screen. Each answer should be "Yes" or "No" on a line by itself. The answers should be in the same order as the questions above.

- Use the console for all input / output (no GUIs or file I/O).
- Do not prompt the user, and do not print out extra information.
- The input list size value will be an odd integer between 1…999.
- The input temperature values will be integers within the range -40…80.
- Be careful, watch out for rounding errors.

Example 1:

Input:

```
3 1 3 2
```

(This represents a list of three values: 1, 3, and 2. The mean and median value are both 2.)

Output:

```
Yes
Yes
Yes
```

(There are more examples on the back of this page.)

Example 2:

Input:

```
11 5 7 -9 10 2 3 4 1 78 23 -20
```

Output:

```
No
Yes
No
```

Example 3:

Input:

```
5
10 10 10 20 50
```

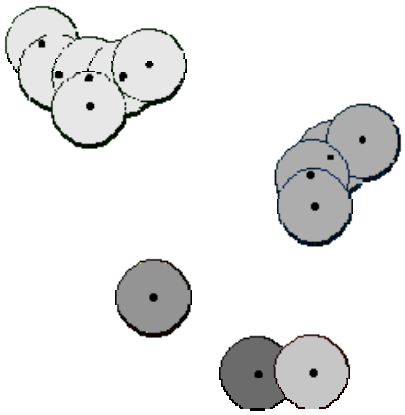
Output:

```
Yes
Yes
No
```

## Division 2 - Problem B – Radio Contact

The Spring Game Company is beta testing a new real-time strategy game. In the game, players are soldiers who communicate with each other with virtual radios, and your game limits the range of this virtual radio signal. This reduces the number of other soldiers each player can talk to; each player can only talk to a small group of other players. Because of this, all soldiers get split up into several different squads, and each squad can only relay communications within its own group.

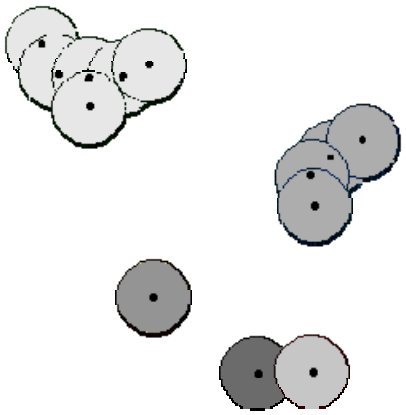
Given that the radius of the communications range is 50 units, you must determine how many squads are formed while only knowing the soldiers' *X* and *Y* positions. In order to be considered part of a squad, a soldier must be standing at or within the communications range of another soldier in that squad. (A message can be relayed from one soldier to another within a squad making it possible for two soldiers to be in the same squad without directly communicating with each other.) The diagram below shows a graphic representation of soldiers (dots) with their communications range (larger circles). There are five squads in the picture below. At the bottom, notice how two communications ranges can overlap without the soldiers being in the same squad if one soldier is not within range of the other. Also notice how networks can be formed by relaying messages from soldier to soldier.



Write a program that first reads a single integer input from the keyboard. This integer represents the number of soldiers in the game. Next, read one pair of *(X, Y)* coordinates for each soldier. Assuming a 50 unit radius for the communications range, your program should determine the number of squads within the game, and output that number as an integer.

- Use the console for all input / output (no GUIs or file I/O).
- Do not prompt the user, and do not print out extra information.
- The number of soldiers will be between 1 and 100.
- All *(X, Y)* inputs will be pairs of integers within the range 1…1000.
- The output value should be a single integer.
- Be careful, watch out for rounding errors.

(Continued on the other side of this page.)



Example (for the given diagram):

Input:

```
13
118 136
200 386
338 486
412 266
410 484
54  54
194 80
408 226
476 180
116 98
76 94
160 96
434 202
```

Output:

```
5
```

## Division 2 - Problem C – There's No Going Back

A game company called "Unctuous of Umbrellas" (U of U for short) would like your help to recover from a disaster. They just finished a second beta release of their radical upcoming game, and everyone said the first beta was better ('masterpiece' was the word that was used). Unfortunately, the company did not save the original code, and sadly the company wasn't using source code version control software. Fortunately, they did keep track of the changes that were made since the first beta.

The company has given you the responsibility of writing an Already Created Masterpiece (ACM) retriever program. Given a document and the changes, you only need to undo the changes to the document, and you will have rebuilt their masterpiece. You are to write this program.

Your input will come from the console (keyboard) in three stages:

- First, a changed document will be input on one line between a set of double quotes.
- Next, an integer will specify how many changes were used to change the original document into the given document.
- Finally, a list of changes will be specified. These are the changes that were applied to the original document. They will be specified as follows:

| | |
|---|---|
| `INSERT c pos` | Character *c* was inserted before the character at the specified position. *c* will be a single letter. |
| `DELETE pos` | The character at the specified position was deleted. |
| `REPLACE textA textB` | All substrings of "textA" were replaced with "textB". (All non-overlapping occurrences of "textA" were first located left to right, then all these occurrences were replaced.) Both "textA" and "textB" will contain only letters. |

Your output should be the original document printed on a single line between a set of double quotes. (Don't worry about accidental wrapping of text.) In many cases there are many possible original documents. You may print out *any* document that would be a valid original document.

- Use the console for all input / output (no GUIs or file I/O).
- Do not prompt the user, and do not print out extra information.
- The original document will be between 1 and 100 characters.
- Documents will only contain letters (uppercase and lowercase) and space characters.
- The number of changes will be between 1 and 10.
- The first character of the document is at position 0.

(There are examples on the back of this page.)

Example 1:

Input:

```
"This is a test so  lose your cool"
4
DELETE 19
DELETE 18
DELETE 19
DELETE 18
```

Note that this input has two spaces in a row in it.

One possible correct output:

```
"This is a test so      lose your cool"
```

Another possible correct output:

```
"This is a test so dont lose your cool"
```

Example 2:

Input:

```
"Springtime in Salt Lake City"
3
INSERT X 12
REPLACE XX in
DELETE 4
```

One possible correct output:

```
"Spri ngtime X Salt Lake City"
```

Example 3:

Input:

```
"aaaaaa"
2
INSERT a 0
REPLACE ab a
```

One possible correct output:

```
"abababababa"
```

(During the competition a clarification was made: The list of changes is specified in the order that they were made to the original document.)

## Division 2 – Web design problem – Utah peaks

On the back of this page is a text description of mountain peaks and trails in Utah. You are to create a webpage that more clearly conveys this information. You should try to organize the information in an easy-to-use manner, and you should download or draw artwork that improves the look of your webpage.

Use webpage development application(s), a text editor, or raw HTML, CSS, and/or JavaScript (if you wish) to create a webpage. Place your webpage in the file specified on the front instruction page. (To keep other teams from copying your information, do not tell this filename to other teams.)

Important: All of your web page files *must* be within your "`public_html`" directory, and your webpage must have the correct name. See the front instruction page for more details.

This problem is intended to be open-ended. You are allowed to be creative in how you express this information. You are allowed to get supplementary information from the Internet. You are allowed to use and modify images that you find on the Internet. You may create several linked-together pages, or you may put all the information on a single page.

There are a few restrictions:

- Your text (and tables) must be in your own words. Do not cut-and-paste text or tables from web pages.
- Your web pages must be your own design. Do not copy and/or modify existing web pages. (You may use templates built-in to an application.)
- You may not link outbound to other web pages. Any links in your webpage must be internal, relative links. Absolute links are not allowed. (No "http://www.eng.utah.edu/~myschool/image.jpg", use "image.jpg" instead.)
- You may not copy scripts of any kind from the Internet. You may not do server-side processing, send email, write data to files, or use Java Applets.

At the end of the contest, your webpage directory will be copied into the judge's directory and judged from there. Please, no absolute links or your webpage will not display.

Your webpage will be judged and scored based on accuracy of the information, artistic design, use of language, completeness, and overall usefulness.

# Creatively present the following information on a webpage:

The Wasatch Mountains are a narrow mountain range running north to south for about 200 miles from the Idaho border to the town of Nephi in central Utah. The Wasatch Mountains are located on the western edge of the Rocky Mountains.

The highest peak in the Wasatch is Mt. Nebo, located at the southern end of the range. Mt. Nebo rises more than 1670 meters from the land surrounding it. The elevation of its highest peak is 3636 meters. A strenuous hike with 1158 meters' elevation gain will bring hikers to the summit. Parts of the mountain are covered in snow 10 months of the year.

The second highest mountain along the Wasatch is Mt. Timpanogos, at 3582 meters, which is found east of Orem and Provo, Utah. A hike to the peak from the major trailheads has 1450-1500 meters' elevation gain and may take an experienced hiker 10-11 hours round trip. Mt. Timpanogos is said to have the shape of a sleeping Indian maiden. A series of beautiful underground caves are found on the northwest slope of the mountain.

Lone Peak is not as tall, at 3430 meters, but it is known for being quite rugged. A hike to the summit requires an elevation gain of 1845 meters. Lone Peak is situated between Little Cottonwood and American Fork Canyons. It is the centerpiece of Utah's first congressionally designated Wilderness Area. Lone Peak Wilderness Area was established in 1977.

Mt. Olympus and Grandeur Peak are found just east of Salt Lake City. Both mountains are very popular for hiking and are accessible to beginning and intermediate hikers. The summit of Mt. Olympus is 2751 meters in elevation; the easier trail has an elevation gain of 1234 meters. Grandeur Peak is 2529 meters tall. A favorite route to the top is trail all the way and rises just under 800 meters in elevation. The summit can be reached in less than three hours.

Mt. Ben Lomond, located east of Ogden, Utah, is one of the better-known mountains in the northern Wasatch. The elevation of the summit is 2960 meters. Hiking trails are long but not overly steep. A round trip to the top will take 6-7 hours. Spectacular views of the Great Salt Lake and Willard Bay reward those reaching the summit. Parts of the trail are suitable for mountain biking in summer and cross-country skiing in the winter.

Many of the mountain peaks in the Wasatch have interesting histories to their names. Some are named for more famous mountains located elsewhere in the world. Mt. Olympus, for example, is named for Mount Olympus in Greece, the home of the principal gods in Greek mythology. Mt. Nebo is named after Mount Nebo of Jordan, said to be the place where Moses died. Mount Ben Lomond was named for a mountain in the highlands of Scotland. The origin of the name Timpanogos is not entirely clear; some say it is a Paiute word for "river of rock", others say it comes from the name of a legendary Indian maiden. Other mountains are named for their appearance, such as Lone Peak and Grandeur Peak.