

## The Garlic Problem

**Class level:** 11th grade

**Objectives:**

- Students will be able to use one-variable statistics with TI calculator.
- Students will be able to relate real-life with mathematics.
- Student will be able to apply her knowledge into given formulas.
- Student will be able to represent a data set with graphs and tables.

**MONE Objectives:**

- Student will be able to gather data, arrange the data and interpret them in order to solve a real life problem.
- Student will be able to use technology.

**Materials:**

- Bulb of garlic for each student
- Weigher
- TI calculator
- A spreadsheet



**A Brief Introduction to Garlic**

True seed production in garlic quite rare because of their small size, scapes can require two years to produce a harvestable bulb of garlic. The typical method of propagation is to simply break up a mature bulb of garlic and plant the large cloves.

Suppose you want to grow enough garlic for cooking for the coming year and have enough left over for seed to plant in the fall. Follow the instructions to find out:

- How much garlic should you purchase to have adequate seed?
- How big an area do you need to cultivate for this seed?
- How much money will you save by buying and growing plants rather than buying bulbs of equivalent quality at the supermarket?

**Step 1**

- Get a bulb of garlic from grocery.
- Weigh the bulbs and write down your result and then break the bulbs into individual cloves.
  
- Decide what fraction of a given bulb would be useful for seed stock or for eating. Write down your answer.

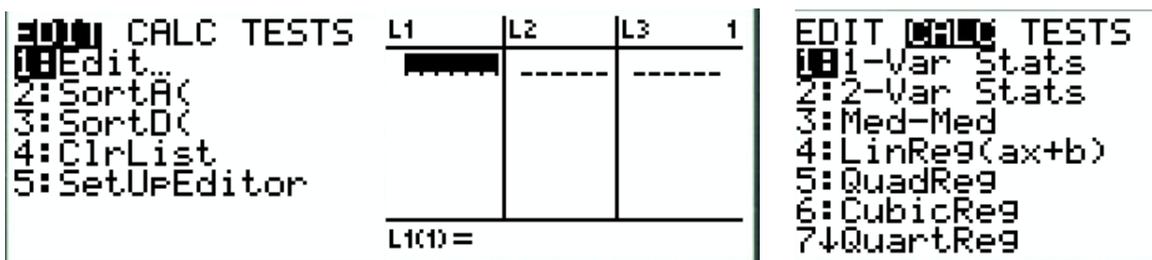
**Step 2**

- Use a spreadsheet and fill the given table with your classmates.

| Student number | Bulb Mass (g) | Number of plantable Cloves | Plantable cloves mass (g) | Number of unplanted cloves | Unplanted Cloves Mass (g) |
|----------------|---------------|----------------------------|---------------------------|----------------------------|---------------------------|
| 1              |               |                            |                           |                            |                           |
| 2              |               |                            |                           |                            |                           |
| 3              |               |                            |                           |                            |                           |
| 4              |               |                            |                           |                            |                           |
| 5              |               |                            |                           |                            |                           |

**Step 3**

- Press [STAT] and choose [1: Edit] you will see a table, move cursor to only L1 and enter the first data set (bulb mass) which you found. Press [STAT] again and move cursor to the CALC, choose [1: 1- Var Stats]. Make sure that List: L1 and move to cursor [Calculate] press enter. Now you have 1-variable statistics results. Find the mean, median and standard deviation.



- Now, you should follow this process for every data set. Add your findings to the spread sheet. Print out your spread sheet and attach your worksheet.

**Step 4**

- The planned garlic patch is tentatively a 12 foot × 15 foot section of soil. If we assume that the rows run the long way down the patch and that the cloves are planted every four inches

along the row, you can use dimensional analysis to calculate the number of cloves that can be planted in a single row.

- To be able to calculate, examine the following table, which points will be representing your cloves? Show them and find that how much cloves do you need per row?

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|   | • |   | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
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| • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |   |
| • | • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |   | • |
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- Decide how many row do you plan to plant? And calculate your planting area and total garlic.  
Write down your results and show your work.

**Step 5**

- Examine your data set. Assume that garlic sells for \$2.69 per pound. Calculate your seed total cost. Remember that 20% of the garlic is lost in the storage.

**Hint:** The number of cloves needed to be calculated using dimensional analysis;

$(x \text{ cloves})(1 \text{ bulb/y plantable cloves})(\text{mean of bulb mass/bulb})(1\text{lb./}454 \text{ g})$

- Observe that how many garlic your family consume per week? And calculate how much money do you spend in year for garlic consumption?

- Now you can decide whether planting is more economic or not according to your results. Explain your reasoning by writing a paragraph about your investigation.

**Step 6**

- Assume that you have a bulb of garlic left over. How many cloves would you guess are in one of those bulbs? How much would one clove weigh based on your guess? Write down your guesses.
- Press [2nd] and [STAT] and enter different numbers of plantable cloves in L1. (Do not enter the same numbers). Move the cursor and enter frequency of each number in L2. For example if in your data set there are three 12 then you should enter 12 in L1 and 3 in L2. Then press [2<sup>nd</sup>] and [STAT PLOT] and chose [1:]. Enter [ON], move to cursor down and chose histogram type. Your Xlist should be L1 and Freq should be L2. Press [WINDOW] and enter Xscale 2, you can arrange your min and max values according to your data set. Press [GRAPH]. When you press [TRACE] you will be able to move cursor on the graph.

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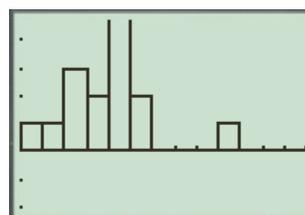
STAT PLOTS
1:Plot1...On
   ▽ L1  L2
2:Plot2...Off
   ▽ L1  L2
3:Plot3...Off
   ▽ L1  L2
4↓PlotsOff
  
```

```

Plot1 Plot2 Plot3
Off Off
Type: ▽ ▽ ▽
      ▽ ▽ ▽
Xlist:L1
Freq:L2
  
```

```

WINDOW
Xmin=12
Xmax=25
Xscl=1
Ymin=-2
Ymax=4.68
Yscl=1
  
```



- Examine the histogram graph and compare to your guess. How many cloves do you expect to find in a bulb now? Write down your findings.

### **Reflection**

In this reflection; I focused on resources which I used during the preparation of the worksheet and mentioned about some difficulties that I faced on. Firstly; I used "NCTM Mathematics Teacher" magazine which was very useful for me because in my opinion it is hard to find good real life examples. Secondly I used TI 84 plus guide book for the TI instructions. I knew some basic things about statistics but I still need to check myself. It was beneficial for me because I learned different features of TI when I was scanning. Lastly, I had some difficulties to add something further with TI. I guess, I should do more research. When I was preparing this worksheet I learn some resources which are really useful for me and I can use them for other topics rather than statistics. I also realize my lacks when I faced the difficulties.