

Middle Grades Activity: One-Variable Statistics and Cell-Phone Text

Message Plans

CALCULATORS: Casio *fx-300ES*

INTRODUCTION:

This activity introduces the Statistics mode of the *fx-300ES*. Students will learn how to calculate 1-variable statistics (the mean).

Students will apply these statistics to the real-life question of determining whether or not to sign up for cell phone companies' text message plans.

PROCEDURE:

Suppose your cell phone company has just come out with a series of text-messaging plans. Each of these plans allows you to pay a fee each month for a certain number of text messages, rather than paying for each message one at a time.

- Plan A: \$4.99 for 250 messages
 - Plan B: \$9.99 for 1000 messages
 - Plan C: \$14.99 for unlimited messages
- (Without a plan, messages cost 5 cents each.)

During the last 12 months, you've kept track of how many text messages you've sent and received:

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Se p | Oct | No v | Dec |
|-------|-----|-----|-----|-----|-----|-----|----------|-----|---------|-----|---------|-----|
| Texts | 343 | 112 | 300 | 415 | 299 | 706 | 1 183 | 988 | 782 | 630 | 281 | 589 |

Let's investigate this data.

Turn the calculator **[ON]**.

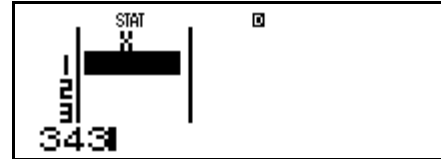
Enter the Statistics mode by pressing **[MODE]** **[2]**.

Press **[1]** to access the 1-Variable Statistics entry area.

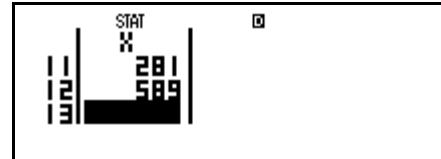
```
1:COMP  2:STAT
3:TABLE
```

```
1:1-VAR  2:A+BX
3:Y+CX2 4:ln X
5:eX      6:A·BX
7:A·XB  8:1/X
```

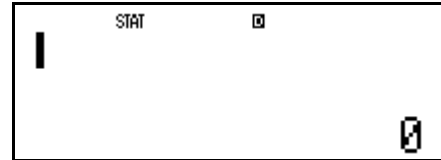
Type **[3][4][3] [=]** to input January's number of text messages into a statistical list.



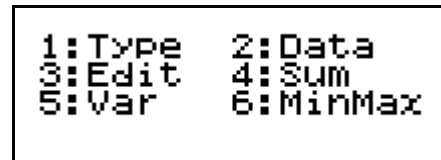
Input the data for the rest of the months in the same way. (The screenshot to the right shows what your list should look like when you are finished.)



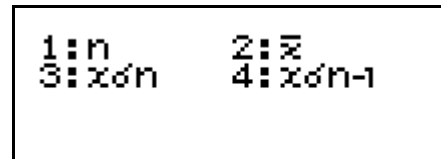
Press **[AC]** to enter the Statistics computation area.



Press **[SHIFT]-[1]** to access the Statistics menu.



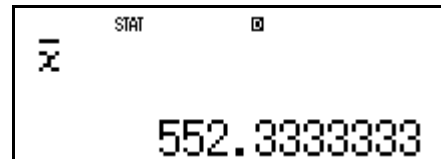
Press **[5]** (Var) to show a list of statistical variables.



Press **[2]** (\bar{x}) to display the *variable* for the mean.

Then press **[=]** to display the *value* of the mean.

This is the average number of text messages you sent and received over the last 12 months.



Exercise 1. Based on the mean you found, would you sign up for a text-messaging plan? Explain your reasoning.

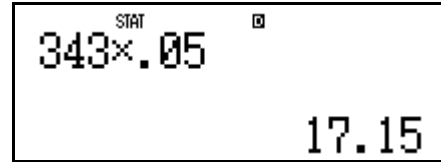
Let's make a table that shows how much your messages would cost at the normal rate of 5 cents each:

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|
| Texts | 343 | 112 | 300 | 415 | 299 | 706 | 1 183 | 988 | 782 | 630 | 281 | 589 |

| | | | | | | | | | | | | |
|------|--|--|--|--|--|--|--|--|--|--|--|--|
| Cost | | | | | | | | | | | | |
|------|--|--|--|--|--|--|--|--|--|--|--|--|

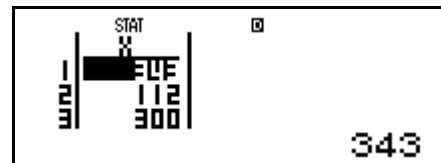
The Statistics computation area can be used to perform normal tasks as well, which you will need to complete the table.

Type **[3][4][3] [x] [.] [0][5] [=]**. Write \$17.15 in the “Cost” row underneath “Jan”.

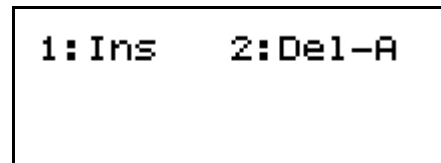


Exercise 2. Complete the rest of the “Cost” row by multiplying each month’s number of text messages by \$.05.

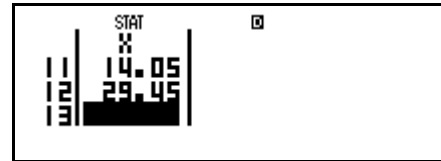
You can return to your statistical list by typing **[SHIFT]-[1]**, then pressing **[2]** (Data).



Delete the entire list by pressing **[SHIFT]-[1]**, then **[3]** (Edit) and **[2]** (Del-A).



Input the numbers from the “Cost” row into the statistical list.



Exercise 3. Use the fx-300ES to calculate the mean of the “Cost” row.

Exercise 4. Based on the mean cost you found, would you sign up for a text-messaging plan? Explain your reasoning.

SOLUTIONS TO EXERCISES:

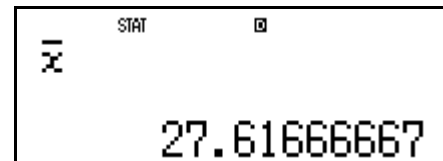
Exercise 1. Answers may vary. One possible response is that the mean is between 500 and 1000, so the \$9.99 plan (1000 messages) should be purchased so that on average, you won't "go over" your purchased number of messages.

Exercise 2. The completed table should appear as follows:

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------|-------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Texts | 343 | 112 | 300 | 415 | 299 | 706 | 1183 | 988 | 782 | 630 | 281 | 589 |
| Cost | 17.15 | 5.60 | 15.00 | 20.75 | 14.95 | 35.30 | 59.15 | 49.40 | 39.10 | 31.50 | 14.05 | 29.45 |

Exercise 3. The keystrokes necessary are:

[AC] [SHIFT]-[1] [5] (Var) [2] (\bar{x}) [=]



The mean cost per month is about \$27.62.

Exercise 4. Since the cost of an average month at 5 cents per message is over \$27, and the most expensive text-message plan (unlimited messaging) costs only \$14.99 per month, it will definitely save money to sign up for *some* kind of plan.

(An interesting extension now is: which plan would have *minimized* the cost over the previous 12 months? Keep in mind that messages over a plan's limit will still cost 5 cents each.)