

Pick-Up Sticks

Mean
Median
Pi
Collecting Data

This activity is an example of **Buffon's Principle** (or needle problem) developed by Comte de Buffon in 1777.

Deleting a List

Place cursor in desired List to delete.

Press F6 (\triangleright).
F4 (DEL-A).
F1 (YES).

? represents a high level question

Entering a List

Enter the STAT menu.
Place cursor in List 1 row 1.
Enter value.
Press EXE.
Enter next value.
Press EXE.
Repeat process for remaining values.

Activity from Brumbaugh, Ashe, Ashe, and Rock. (1997). *Teaching Secondary Mathematics*. Mahwah, New Jersey: Laurence Erlbaum Associates.

Standards: Problem Solving, Communication, Reasoning, Algebra, Statistics, and Probability.

Materials: CFX-9850G or CFX-9850Ga PLUS, 1 piece of plain paper, 1 ruler, and 20 toothpicks

Calculator Menus: RUN and STAT

Preparation:

Draw parallel line segments a toothpick's length apart on a piece of unlined paper. It is crucial that the segments are separated by the length of the toothpick.

Experiment:

Drop 20 toothpicks on the center of the paper from a height of 2 - 3 feet.

A toothpick crossing or touching a drawn segment is an "ON" toothpick and one not crossing or touching a line segment is an "OFF" toothpick. If one toothpick rests on top of another toothpick but still passes over a line segment, it is counted as an "ON." Any toothpick off the paper, or hanging over the edge, is not considered. For each drop, record the number of "ON" toothpicks and "OFF" toothpicks in table 1 below.

Drop	ON	OFF	Drop	ON	OFF
1	_____	_____	11	_____	_____
2	_____	_____	12	_____	_____
3	_____	_____	13	_____	_____
4	_____	_____	14	_____	_____
5	_____	_____	15	_____	_____
6	_____	_____	16	_____	_____
7	_____	_____	17	_____	_____
8	_____	_____	18	_____	_____
9	_____	_____	19	_____	_____
10	_____	_____	20	_____	_____

Table 1

Pick-Up Sticks

Using an Expression to Fill a List

Highlight the top of LIST 3 as shown below.

List 1	List 2	List 3	List 4
1	14	4	
2	11	6	
3	13	5	
4	9	7	
5	12	5	

2xList 1÷List 2
List L+M Dim Fill Sep D

With data in List 1 and 2,

Enter: 2

x

OPTN

F1 (LIST)

F1 (List)

1

÷

F1 (List)

2

The screen will be similar to the one shown above.

Press EXE.

List 1	List 2	List 3	List 4
1	14	4	
2	11	6	
3	13	5	
4	9	7	
5	12	5	

SRTA SRTD DEL DELP INS D

Figure 1

List 1	List 2	List 3	List 4
1	14	4	
2	11	6	
3	13	5	
4	9	7	
5	12	5	

2xList 1÷List 2
List L+M Dim Fill Sep D

Figure 2

What is the average (mean) of the elements in LIST 3? **A.** _____

What is the median of the elements in LIST 3? **B.** _____

Drop the toothpicks 20 more times. Record the data in Lists 1 and 2 in rows 21 - 40. Highlight the top of List 3 and re-enter the expression shown in Figure 2, **2xList 1 ÷ List 2** and press EXE.

What is the average (mean) of the elements in List 3 after 40 drops? **C.** _____

What is the median of the elements in LIST 3 after 40 drops? **D.** _____

Repeat the process above for 20 additional drops for a total of 60 drops.

What is the average (mean) of the elements in List 3 after 60 drops? **E.** _____

What is the median of the elements in LIST 3 after 60 drops? **F.** _____

Compare the differences between the mean and medians for 20, 40 and 60 drops. Was there a significant increase or decrease in the difference between the means and the medians? **G.** _____

Why do you suppose this is true? **H.** _____



If you dropped the toothpicks 200 times, what would you expect the average of List 3 to be? **I.** _____

Why? **J.** _____



Compare your averages to that of others. What did you learn? **K.** _____

Generating One-

Variable Statistics in the STAT Menu

With data in LIST 3

Press F2(CALC).

F4(SET).

Highlight 1VAR X:

Press F3(List3).

EXIT key.

F1(1VAR).

A description of the statistics generated by the CFX-9850G is shown below.

\bar{x} = mean of data

$\sum x$ = sum of data

$\sum x^2$ = sum of squares

$x\sigma n$ = pop. stan. dev.

$x\sigma n-1$ = samp. stan. dev.

n = num. of elements

minX = min of data

Q1 = 1st quartile

Med = median

Q3 = 3rd quartile

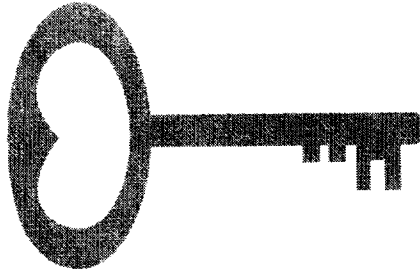
$\bar{x} - x\sigma n$ = mean - pop dev.

$\bar{x} + x\sigma n$ = mean + pop dev.

maxX = max of data

Mod = mode of data

Solution Key



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- A. - J.** Answers will vary.
- K.** Approaches π .