EXPLORATIONS

Activity 2

Parts is Parts

Teacher Notes

Prerequisites

Students need no prior calculator experience. It would be helpful if they are familiar with the [STO▶] and [RCL] keys on the calculator.

Problem

Show one way 100 families can have a mean of 2.58 children in the table below and explain your example in a sentence or two.

Activity

Briefly discuss *The Phantom Tollbooth* by Norman Juster (Random House; New York; 1996; ISBN: 0-394-82037-1). Milo, a young boy, goes on an imaginary adventure during which he meets many unusual characters. Focus on the situation from the book that is described at the top of the Student Activity Sheet. Have students write and share their responses to the first question posed on their sheet.

Middle school students often have difficulty understanding averages. Hearing their explanations for what an average (mean) of 2.58 children represents can be quite an eye-opener! It is invaluable to know what the students understand before they really dig into this activity.

For some groups, before/instead of the activity given on the student sheet, you will need to work together through a simpler problem. For example, you may have students find a group of ten families that have an average of 2.5 children.

You may want to remind students how to use the STO▶, and RCL keys with TI-30X IIS and TI-34 II calculator, as they would be helpful in adding the columns. For example, one student could keep the cumulative total of families on his/her calculator while another kept up with the total number of children during their attempts at making a plan.

The plan below is the most common one.

# Children in each Family	# of Families	Total # of Children
2	42	84
3	58	174
TOTALS	100	258

Of course, some plans will be more complicated.

Example:

# Children in each Family	# of Families	Total # of Children
1	18	18
2	29	58
3	30	90
4	23	92
TOTALS	100	258

The STAT mode can be used to find the mean for any plan. As long as the total number of children is 258 and the total number of families is 100, the plan works. Students love to find a variety of workable plans.

If students have trouble finding a plan that works, you can help them use the STAT function to examine what happens if the number of families in a particular category is changed. For example, if the number of families with four children is increased in the plan above, how does this affect the mean in that plan? Have them examine this question by re-entering a plan they have tried, changing only the FRQ for X = 4 and noting the larger mean. Have them predict and verify the results of other changes. Once they grasp the effects of such changes, you can have them return to the original problem.

The second part of this activity works best as a project over several days. When the students are preparing to design their own plans for determining the number of children in the average family in their grade, they need to brainstorm in small groups and share their thoughts before actually making

a plan. Often one or more groups do not think to include answers to the following questions:

> What kind of sample do we need? (How large, who to ask, and so forth.)

> Is it important that our sample be randomly selected? If so, how can we do that?

Wrap-Up

Have students write paragraphs about what they found and learned. Be sure these questions are answered:

♦ *What does an average (mean) mean?*

Some possible answers:

- The mean is a number that represents a set of data in a special way. To find it, you find the sum of all the items and divide that sum by the total number of items.

- The mean is a measure of central tendency. To find it, you find the sum of all the items and divide that sum by the total number of items.

♦ *What strategies did you learn about finding a particular average for a sample of a certain size?*

Some possible answers:

- Because the mean is between 2 and 3, we used some families with two children and some families with three children. Also, because the mean is closer to 3 than 2, more families have 3 children.

- You make a plan with exactly 100 families. If you have too many children (more than 258), trade in some larger families for some smaller ones. If you have too few children, trade in some smaller families for some larger ones.

- You have to realize that if you trade a family in your plan with one child for a family with four children, you keep the same number of families, but increase the total number of children by three.

Assessment

The completed charts and written paragraphs serve as an assessment tool. It is also appropriate to give a similar problem for students to solve individually.

Example:

Show one way two hundred families can have an average of 1.89 children.

Extensions

Have students gather data from the Internet or the library about the average number of children for a family in the United States and for other countries. Have them use the data and make up a problem for their classmates to solve.

One good Internet site is http://www.census.gov/population/socdemo/hh-fam/rep96/96fmst1. According to the information there, in 1997 the average number of children under age 18 per family in the US was .89 for all families. The average number of children for all families that had children was 1.89.

Also, the following information can be found in *The Illustrated Book of World Rankings* by George Kurian (Armonk, NY ME Sharpe, Inc., 1997 ISBN#1-56324-892-1):

Top Ten Average Household/Family Size

1.	Iraq	8.9
2.	Senegal	8.8
3.	Gambia	8.3
4.	Nauru	8.0
5.	Western Samoa	7.8
6.	Kuwait	7.4
7.	Maldives	7.1
8.	Algeria	6.9
9.	Nicaragua	6.9
10.	United Arab Emirates	6.8

Bottom Ten Average Household/Family Size

178.	France	2.6
179.	United States	2.6
180.	Netherlands	2.4
181.	Finland	2.3
182.	Germany	2.3
183.	Denmark	2.2
184.	Monaco	2.2
185.	Norway	2.2
186.	Sweden	2.2
187.	Switzerland	2.2

Note: United Kingdom and Canada are 2.7

A c t i v i t y 2

Parts is Parts

Objective: *You will find a sample of one hundred families with an average of 2.58 children.*

One of the odd people Milo met during his travels was half a child. Actually, as the child explained, "...we're just an average family...mother, father, and 2.58 children – and, ... I'm the .58."

1. Of course, there are never really 2.58 children in a family. How would you explain what this average means to someone who was confused?

2. Using the table below, show one way 100 families can have a mean of 2.58 children and explain your example in a sentence or two. (You may not need all the rows in the table for your example.)

# Children in each Family	# of Families	Total # of Children
	100	

Estimate how many children are in the average family in your grade at your school. _____

3. Design a plan to determine the number of children in the average family in your grade at your school. Describe your plan below.

4. Carry out your plan. Then list and explain your results below. How did your estimate compare with the actual results? Try to explain any differences.

5. Write a short paragraph explaining what you learned from doing this activity.

Parts is Parts
Keystrokes for the TI-34 II

Example: *Solution with 2 and 3 children in families:*

# Children in each Family	# of Families	Total # of Children
2	42	84
3	58	174
TOTALS	100	258

To find a mean, students may use the following keystrokes:

PRESS	DISPLAY
2nd [STAT]	<u>1-Var</u> 2-Var
(Press ◁ or ▷ if necessary, to underline <u>1-Var</u>) ENTER	STAT
DATA	X1 =
2	X1 = 2
▽	FRQ = 1
4 2	FRQ = 42
▽	X2 =
3	X2 =3
▽	FRQ = 1

PRESS	DISPLAY
5 8	FRQ = 58
[STAT VAR]	n x̄ Sx σx → 100 STAT
⊕ or ⊖ to underline x̄	n x̄ Sx σx → 2.58 STAT

Note: You must use [2nd] [EXIT STAT] to exit the STAT mode.

Parts is Parts
Keystrokes for the TI-30X IIS

Example: *Solution with 2 and 3 children in families:*

# Children in each Family	# of Families	Total # of Children
2	42	84
3	58	174
TOTALS	100	258

PRESS	DISPLAY
[2nd] [STAT]	<u>1-Var</u> 2-Var
◀ or ▶ if necessary, to underline 1-Var, then [ENTER]	STAT
[DATA]	X1 =
2	X1 = 2
⌄	FRQ = 1
42	FRQ = 42
⌄	X2 =
3	X2 =3
⌄	FRQ = 1

PRESS	DISPLAY
58	FRQ = 58
STAT VAR	n x̄ Sx σx → 100 STAT
◗ or ◖ to underline x̄	n x̄ Sx σx → 2.58 STAT

Note: You must use 2nd [EXIT STAT] to exit the STAT mode.