Investigation 6:
The Probability of an Event Through Simulation

Kenn Pendelton

CALCULATORS: Casio: *fx-260 Solar* • Casio: *fx-260 Solar School*

Teaching Notes

Simulation is commonly done using tosses of a coin or rolls of a die, but unintended human errors can prevent the results from being truly random. Additionally, the number of different outcomes is limited: two in the case of the coin, and six in the case of the die. The random number generator on the calculator solves both of these problems.

Above the decimal point • is **RAN#**. As is the case for all second functions printed in yellow above keys, this is accessed by first pressing **SHIFT**. A three decimal place number from .000 to .999 is generated randomly.

It is suggested that students work in pairs. All pairs need not make the same selection of digits representing boys and girls, but the two people in each pair will find the process that follows easier if they agree on what the digits represent. Each pair will generate ten "families." One student in the pair should generate the random numbers for the first five families while the other student records the calculator output. The students should then reverse roles. You may want the student pairs to write their names and pair number on the data collection page and hand it in at the end of the investigation.

Collect the data from the groups and record in the table below.

Pair	# families with G ≥ 2	Pair	# families with G ≥ 2	Pair	# families with G ≥ 2
1		6		11	
2		7		12	
3		8		13	
4		9		14	
5		10		15	

The probability that a family will have at least two girls equals the number of trials in which this occurred divided by the total number of trials. Ask the following questions:

Based on this simulation, what is the probability that there will be at least two girls in a family of four children?

Did all "trials" generate the same number of girls in a family of four children?

If only one trial was conducted (one family of four children), what are the only two answers that could be obtained for the probability of having two or more girls in a family of four children?

Why is it better to use many trials?

If the investigation were repeated, would the result have to be exactly the same? Why?

NOTE: In the long run, the probability is approximately 0.69.

Name _____ **Date** _____

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Student Worksheet Investigation 6

What is the probability that AT LEAST two children in a family of four will be girls?

Assume that the probabilities that a baby will be a boy or a girl are both 1/2. Half of the digits 0 through 9 will represent boys, and the other half of the digits will represent girls. Decide what you want each of the digits to represent and circle your choices below.

0 represents a:	Boy	Girl	5 represents a:	Boy	Girl
1 represents a:	Boy	Girl	6 represents a:	Boy	Girl
2 represents a:	Boy	Girl	7 represents a:	Boy	Girl
3 represents a:	Boy	Girl	8 represents a:	Boy	Girl
4 represents a:	Boy	Girl	9 represents a:	Boy	Girl

Above the decimal point • is **RAN#**. As is the case for all second functions printed in yellow above keys, this is accessed by first pressing **SHIFT**. A three decimal place number from .000 to .999 is generated randomly.

Generate a random number on the calculator. Look at the last digit (thousandths place value). Based on your assignment of boys and girls to the digits 0 though 9, identify which gender the number represents. Repeat the process four times. Count the number of girls. This represents one family of four, or one "trial." Repeat the process until you have recorded ten "families."

Family #1

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #2

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #3

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #4

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Name _____ **Date** _____

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Student Worksheet Investigation 6 (continued)

Family #5

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #6

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #7

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #8

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #9

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Family #10

RAND#_____ B G
RAND#_____ B G
RAND#_____ B G
RAND#_____ B G

At least two girls? Y N

Circle the numbers of the families with at least two girls.

1 2 3 4 5

6 7 8 9 10

How many families had at least two girls? _____