Simulating Families with Three Children

To simulate the births of three children to a family, a coin can be flipped three times and the results recorded. The results of 40 trials of this simulation are shown below. In each trial, H stands for heads, which represents the birth of a girl, and T stands for tails, which represents the birth of a boy.

HHT	TTT	HHH	HTT	HHH
THH	THT	HHH	HHH	HTH
TTT	THT	THH	THH	HHT
TTT	HTT	HTH	THH	TTH
HTT	HHT	THT	HTT	THT
THH	HHH	TTT	THT	HHT
TTH	HHT	HTH	TTT	HHT
THH	THT	HTT	THH	TTH

1. Conduct 10 more trials of this simulation. Record your results in the table below.

Trial #	1	2	3	4	5	6	7	8	9	10
Result										

2. Complete the following frequency table using the given 40 trials along with the results of your 10 trials in part a.

Type of Family	Frequency
No girls	
One girl and two boys	
Two girls and one boy	
Three girls	
Total Number of Trials	50

3. Use your frequency table to estimate the probability that a family with three children will have:

   a. Exactly one gir
   b. Exactly one boy
   c. Three girls
   d. Three boys

4. Do the four types of families in the frequency table appear to be equally likely? Use mathematics to justify your answer.

5. **Optional Extension Problem:** Based on your data, what is the mean number of girls in a family with three children? Use mathematics to explain how you determined your answer. Use words, symbol, or both in your explanation.

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Answer Key

1. Answers will vary. Consider the following ten trials:

Trial #	1	2	3	4	5	6	7	8	9	10
Results	HHH	HHT	HTH	HTT	TTT	TTT	TTT	HTT	HTT	THH

2. Answers will vary. The frequency table with the results from the above trials is shown below:

Type of Family	Frequency
No girls	8
One girl and two boys	17
Two girls and one boy	19
Three girls	6
Total Number of Trials	50

3. a. Answers will vary. Using the above frequency table: $\frac{17}{50} = 0.34$

   b. Answers will vary. Using the above frequency table: $\frac{19}{50} = 0.38$

   c. Answers will vary. Using the above frequency table: $\frac{6}{50} = 0.12$

   d. Answers will vary. Using the above frequency table: $\frac{8}{50} = 0.16$

4. No. The four types of families are not equally likely because the frequencies would be different in the long run.

5. The theoretical expected value is 1.5 girls in a family of three children, since half of the children in a family should be girls. Using the above frequency table: $\frac{0(8)+1(17)+2(19)+3(6)}{50} = 1.46$.