Sums Dilemma

Mr. Frye and I were having a disagreement about a game he was playing with a friend. They would roll a pair of polyhedra (that is what Mr. Frye calls dice) and find the sum of the numbers rolled. He had a feeling that you might get some sums more than others. I am not so sure - it seems to me that it would be just as likely to get any of the sums. Please help us solve this problem.

Do some experiments (do as many as you think is needed to get reliable results) and keep track of your work. Be very specific as to your results. Be sure to find out why you get the results you do.

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Grade Levels 6 - 8

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Context

We were studying probability. The unit has a nice connection to fractions and decimals, and I introduced the class to percents through this unit. We had experimented with drawing blindly from six chips (three green, two blue, one red) and comparing the theoretical and experimental probabilities. We also did an experiment with tossing two coins and recording the results and discussing the fact that HT comes up half the time because HT is different than TH. We also did the problems in our textbook. I gave this assessment to see who had made the connections between the likelihood of events happening and that the die acted much like the coins in their individuality. I found that in my sixth grade class there were a small number of students who still think everything happens just by chance.

What This Task Accomplishes

This task shows which students have a working knowledge of probability and the likelihood of certain events happening. It is a way to connect fractions, decimals and percents.

What the Student Will Do

Most of the students began by making a prediction and then threw the polyhedra and kept track of the results. I was surprised at how many students only did 10 or 20 trials. Some students felt that they understood the problem so well that they did not have to experiment, and they just described the theoretical probabilities even though the problem said to experiment (and this was after most predicted that the toss of two coins would be just as likely to get HH, HT and TT). Many students did not connect the number of events to the coin toss (that rolling a three + four was different than four + three), but did understand that the sums would come up differently.

Time Required for Task

45 minutes

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Interdisciplinary Links

This task could be linked to a discussion of lotteries and gambling.

Teaching Tips

I allowed the students to work in pairs, but each person had to write up their own report.

Suggested Materials

- Dice
- Graph paper

Possible Solutions

P (sum of 2) = 1/36 (1 + 1)
P (sum of 3) = 2/36 (1 + 2, 2 + 1)
P (sum of 4) = 3/36 (1 + 3, 2 + 2, 3 + 1)
P (sum of 5) = 4/36 (1 + 4, 2 + 3, 3 + 2, 4 + 1)
P (sum of 6) = 5/36 (1 + 5, 2 +4, 3 + 3, 4 + 2, 5 + 1)
P (sum of 7) = 6/36 (1 + 6, 2 +5, 3 + 4, 4 + 3, 2 + 5, 1 + 6)
P (sum of 8) = 5/36 (2 + 6, 3 +5, 4 + 4, 5 + 3, 6 + 2)
P (sum of 9) = 4/36 (3 + 6, 4 +5, 5 + 4, 6 + 3)
P (sum of 10) = 3/36 (4 + 6, 5 +5, 6 + 4)
P (sum of 11) = 2/36 (5 + 6, 6 + 5)
P (sum of 12) = 1/36 (6 + 6)

Benchmark Descriptors

Novice

This student has no evidence of mathematical reasoning. There was no reasoning in the number of trials or the results. There is no evidence of mathematical representation or mathematical language.

Apprentice

This student used a strategy that is partially useful, leading some way toward a solution, but not to a full solution. There is some evidence of mathematical reasoning in the fact that the student listed the ways to get each sum. There is some use of mathematical representation and some mathematical language.

Practitioner

This student has a broad understanding of the problem and the major concepts necessary for its solution. S/he uses a strategy that leads to a solution of the problem and uses effective

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mathematical reasoning. There is a clear explanation. There is effective (although not labeled) mathematical representation and effective mathematical terminology.

Expert
This student has a deep understanding of the problem, including the ability to identify the appropriate mathematical concepts necessary for its solution. They use an efficient strategy leading directly to a solution. S/he applies procedures accurately to solve the problem. There is a clear and effective explanation. Mathematical representation and language is actively used to communicate ideas related to the solution.

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