Intermath Investigation: Rolling Dice Teacher Directions

Roll a pair of dice 10 times, recording the sum of the two dice at each roll. What is the experimental probability of getting a sum of 7? A sum of 4? A sum of 2? How does this compare to the theoretical probability?

Roll the dice 20 more times, recording the sum each time. Consolidate this data with the previous data. What is the experimental probability of getting a sum of 7? A sum of 4? A sum of 2? How does this compare to the theoretical probability?

Use a spreadsheet to simulate a large number of trials or consolidate your data with other students in the class. Construct a distribution graph using the data. How does the number of trials affect the experimental probability?

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Discussion, Suggestions, Possible Solutions

Task taken from the InterMath website (<u>http://www.intermath-uga.gatech.edu/topics/datanlss/prob/r01.htm</u>) If computers are unavailable for the simulation, then graphing calculators can be used. Most likely, a statistics simulation module will have to be downloaded for the specific calculator, which can be found on the associated web site. For example:

Probability Simulation for the TI-83: <u>http://education.ti.com/us/product/apps/probsim.html</u> Casio World Wide Support: <u>http://world.casio.com/edu/download/en/manual/</u> Graphing Calculator Help: <u>http://www.prenhall.com/divisions/esm/app/calc_v2/</u> You might begin by tracking 10 rolls and computing the difference from the theoretical probability.

For 10 rolls, your results might look like:

	2	3	4	5	6	7	8	9	10	11	12	ΤΟΤ
Experimental	0.000	0.000	0.200	0.300	0.000	0.100	0.100	0.100	0.100	0.100	0.000	1.000

Theoretical	0.028	0.056	0.083	0.111	0.139	0.167	0.139	0.111	0.083	0.056	0.028 1	000.1
Difference	0.028	0.056	0.117	0.189	0.139	0.067	0.039	0.011	0.017	0.044	0.028	0

To continue your investigation, you may build a spreadsheet to model the dice rolling and keep track of the results. A spreadsheet function to simulate rolling dice (six equally likely outcomes) is =INT(6 * RAND()) + 1.6 * RAND() returns a number between 0 and 6. INT(6 * RAND()) returns an integer from the set 0, 1, 2, 3, 4, 5. So, =INT(6 * RAND()) + 1 returns values of 1, 2, 3, 4, 5 or 6.

For 20 rolls, your results might look like:

	2	3	4	5	6	7	8	9	10	11	12	тот
Experimental	0.000	0.060	0.090	0.170	0.100	0.210	0.110	0.090	0.090	0.060	0.000	1.000
Theoretical	0.028	0.056	0.083	0.111	0.139	0.167	0.139	0.111	0.083	0.056	0.028	1.000
Difference	0.028	0.004	0.007	0.059	0.039	0.043	0.029	0.021	0.007	0.004	0.028	0

For 100 rolls, your results might look like:

	2	3	4	5	6	7	8	9	10	11	12	тот
Experimental	0.020	0.020	0.080	0.080	0.180	0.140	0.170	0.100	0.130	0.050	0.030	1.000
Theoretical	0.028	0.056	0.083	0.111	0.139	0.167	0.139	0.111	0.083	0.056	0.028	1.000
Difference	0.008	0.036	0.003	0.031	0.041	0.027	0.031	0.011	0.047	0.006	0.002	0

As the number of rolls increases, the experimental probability becomes closer to the theoretical probability.