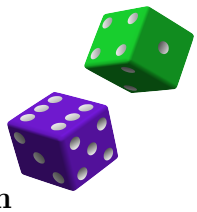
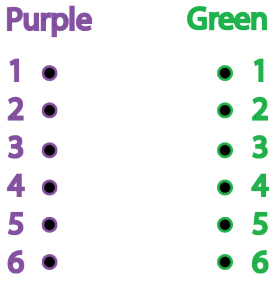


Problem of the Week
Problem B and Solution
Dicey Products

Problem

Jordyn and Langdon have two dice, one purple and one green. When they roll the dice, they know there are a total of $6 \times 6 = 36$ possible outcomes for the top two numbers on the dice.

(a) In the diagram, join any dot on the left with one on the right such that the product of those two numbers is odd. How many ways are there to obtain an odd product?



(b) What does your result in part (a) tell you about how many ways there are to obtain an even product?

(c) Is the product 4 or 6 more likely to occur? Why?

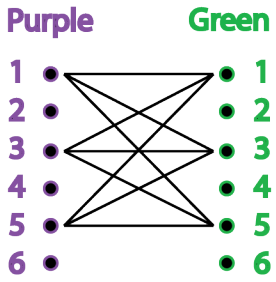
(d) In the table, enter the possible odd products in the first column, the number of ways that product could occur in the middle column, and the theoretical probability of that outcome in the third column. (This has been done for odd product 1.)

Odd Product	Number of Ways	Theoretical Probability
1	1	$\frac{1}{36}$

(e) Roll two dice 36 times and record the product of the top two numbers for each roll. Count the number of each odd product that occurred, and then calculate the experimental probability of rolling that number. Compare the experimental probability to the theoretical probability calculated in part (d).

Solution

(a) Odd products will occur exactly when the top two numbers are odd. We connect each odd number on the left with each odd number on the right to obtain the completed diagram shown. Counting the number of connections, we determine that there are 9 ways to obtain an odd product.



(b) Since there are 36 possible products in total, and a product must be either even or odd, there must be $36 - 9 = 27$ ways to obtain an even product.

(c) The product 6 is more likely to occur. This is because $6 = 1 \times 6$, $6 = 6 \times 1$, $6 = 2 \times 3$, and $6 = 3 \times 2$, and so can be formed by 4 different rolls. However, since $4 = 1 \times 4$, $4 = 4 \times 1$, and $4 = 2 \times 2$, it can only be formed by 3 different rolls.

(d) Noting that there is only one way to get each of 1, 9, and 25, and two ways to get each of 3, 5, and 15, the appropriate data and the theoretical probabilities are calculated.

Odd Product	Number of Ways	Theoretical Probability
1	1	$\frac{1}{36}$
3	2	$\frac{2}{36}$
5	2	$\frac{2}{36}$
9	1	$\frac{1}{36}$
15	2	$\frac{2}{36}$
25	1	$\frac{1}{36}$

(e) Answers will vary. Note that the result of a single experiment won't necessarily agree very closely with the theoretical probabilities.

SUGGESTION: Average the experimental probabilities obtained by all students in your class for each of the six odd products. Do these average probabilities agree more closely with the theoretical probabilities for each odd product than those of individual students?