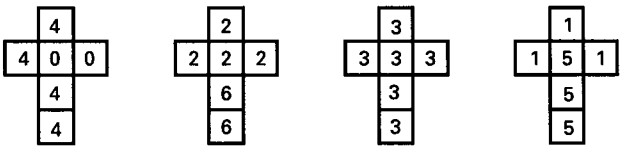
Carla Tayeh

A Dicey Situation

Problem

Kristin loved playing this game with the strange dice because she would usually win. Here's how to play this game. You need two players. Each of you constructs **one** of the dice following the schema pictured below. Each player rolls his or her die. The person who rolls the higher number wins that round. After 12 rounds, the person who wins the most rounds wins the game. Can you figure out Kristin's strategy for winning? Which of the dice would you choose to win the game? Would you prefer to choose a die first or second? Explain your strategy.



A B C D

The goal of the "Problem Solvers" department is to foster improved communication among teachers by posing one problem each month for K–6 teachers to try with their students. Every teacher can become an author: Pose the problem, reflect on your students' work, analyze the classroom dialogue, and submit the resulting insights to this department. Every teacher can help us all better understand children's capabilities and thinking about mathematics with their contributions to the journal. Remember that even student misconceptions provide valuable information.

Classroom Setup

Spend time discussing this problem with your students and even modeling how the game is played. Encourage students to guess which dice might increase their chance of winning the game. Ask them for their "gut feeling" about a game-winning strategy. Give students blank dice or wooden cubes so that they can test their strategies. Following the dice diagrams shown in the problem, have the students write each digit on a sticky dot and place it on the appropriate face of the die. Discuss ways that they might approach the problem or organize their thinking. Encourage the students to collect data to support their strategy.

For younger students, consider the same problem; however, use only two of the dice instead of all four. For example, given the choice between dice A and D, which die would you choose to have the better chance of winning? Perhaps introduce a third die after the students have come to a conclusion with dice A and D.

For older students, after exploring the problem experimentally, they might explore the theoretical probability of winning with each of the dice. There is not one die that wins all the time. The "winning die" varies and depends on your opponent's choice.

In addition, one might extend this problem with a further investigation of fair and unfair games. For example, in this particular game, if one opponent chose die C and the other D, he or she would each have a 50 percent chance of winning. Games in which both opponents have the same probability of winning are called *fair games*. Using these dice or some other dice that you create, invent other fair (and unfair) games.

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Edited by **Barbara Britton**, *barbara.britton@emich.edu, and* **Carla Tayeh**, *carla.tayeh@emich.edu, Eastern Michigan University, Ypsilanti, MI 48197. Readers are encouraged to submit problems to the editors to be considered for future "Problem Solvers" columns. Receipt of problems will not be acknowledged; however, problems selected for publication will be credited to the author.*