NOTES

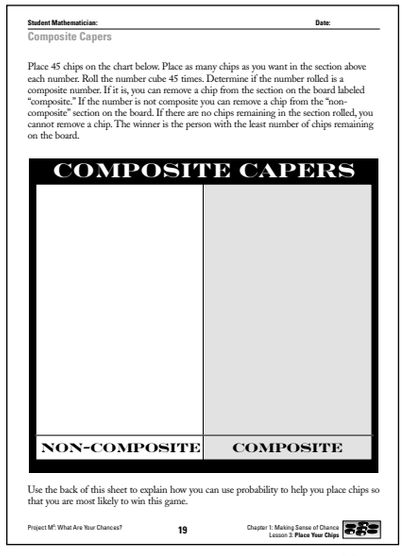
Theoretical probability is found by analyzing situations, whereas experimental probability is based on the outcome of a specific experiment. The theoretical probability of an event will always be the same, but the experimental probability of the same event can differ from one time to another and also depends on the number of trials conducted each time.

In this experiment, if you roll a number cube many times, each number should occur about $\frac{1}{6}$ of the time. In 24 rolls, each number will be rolled about four times. If you haven't done so already, play the game again. Watch to see which students place their chips to reflect the theoretical probability. Remember that the theoretical probability gives us information about what we can expect to happen with a large number of trials, but that there may be variations when we gather experimental data using a small number of trials. Depending on the level of understanding in your classroom, you may wish to discuss these concepts again.

Investigate

Have students turn to the "Composite Capers" worksheet in their Student Mathematician's Journals. This second number cube game directs students to place 45 chips above either "composite" or "non-composite." Chips are removed based on whether a composite or a non-composite number appears on the number cube. (Again, students can either draw a total of 45 Xs in the two sections or mark the game board first with a highlighter and then draw an X on each mark as each number is called.) For example, if a 5 is rolled, a non-composite chip may be removed since 5 is not composite. If a 4 is rolled, a composite chip may be removed since 4 is composite. You may need to review the meaning of composite (i.e., having more than two unique factors) with students. There are two composite numbers on a number cube (i.e., 4 and 6) and four numbers that are not composite (i.e., 1, 2, 3 and 5). Note that 2, 3 and 5 are classified as prime numbers since they each have two unique factors and 1 is neither prime nor composite since it only has one unique factor.

After students have placed chips on their gameboards, conduct a discussion about the placements. Ask students to justify their decisions. Encourage sound explanations and discourage pure guessing. If no one suggests that they considered the theoretical probability, bring it up yourself — either before or after playing the game. Ask students if the theoretical probability of rolling a


Student Mathematician: Date:

Composite Capers

Place 45 chips on the chart below. Place as many chips as you want in the section above each number. Roll the number cube 45 times. Determine if the number rolled is a composite number. If it is, you can remove a chip from the section on the board labeled "composite." If the number is not composite you can remove a chip from the "non-composite" section on the board. If there are no chips remaining in the section rolled, you cannot remove a chip. The winner is the person with the least number of chips remaining on the board.

COMPOSITE CAPERS

NON-COMPOSITE | COMPOSITE

Use the back of this sheet to explain how you can use probability to help you place chips so that you are most likely to win this game.

Project M³: What Are Your Chances? 19 Chapter 1: Making Sense of Chance Lesson 3: Place Your Chips

Student Mathematician's Journal p. 19