Name Date

Enrichment and Extension

10.3

What’s the Difference?

Many card games involve making choices based on how likely it is to choose a certain card. By performing an experiment with a regular deck of cards, you will be finding the probability of certain outcomes when cards are chosen at random. A deck of cards has 4 suits. Each suit has 13 cards: a Jack, Queen, King, Ace, and the numbers 2 through 10. For this experiment, the Ace is worth 1, the Jack is worth 11, the Queen is worth 12, and the King is worth 13.

**Experiment Directions:** Put all of the cards face down and spread them out. Choose two cards at random. Find the absolute value of the difference between the values of the cards. Replace the two cards. Mix the cards and repeat.

Answer Exercises 1 and 2 *before* performing the experiment.

1. Make a list of all the possible outcomes and design a frequency table to record your results.

2. Make some predictions. Will all the outcomes be equally likely? If not, what outcomes will be most likely? least likely? Explain your reasoning.

3. Perform the experiment at least 60 times. Record the results in your frequency table from Exercise 1.

4. Make a bar graph of your results. Compare your results with your classmates. Were they similar? Explain.

5. Describe any patterns you notice. Did they fit your predictions? What outcomes are most likely? least likely? Explain.

6. Explain why it would be difficult to find theoretical probability for this situation.

7. What is the advantage to doing a large number of trials? Explain why   
doing more trials is especially important for this experiment.

8. You want to change the experiment. Instead of taking the absolute value   
of the difference, this time you will take the value of the first card minus   
the value of the second card. How would this change your results? Explain.

9. A friend asks you to play the following game. Two cards are chosen at random. If the absolute value of the difference is between 1 and 6, Player 1 gets a point. If the absolute value of the difference is between 7 and 12, Player 2 gets a point. If the difference is zero, both players get a point. Replace the cards, shuffle, and repeat. The first person to get 10 points wins. Explain why this game is not fair. Rewrite the rules to make the   
game more fair.