

11.4

Experimental Design

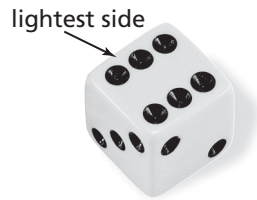
For use with Exploration 11.4

Essential Question How can you use an experiment to test a conjecture?

1 EXPLORATION: Using an Experiment

Work with a partner. Standard white playing dice are manufactured with black dots that are indentations, as shown. So, the side with six indentations is the lightest side and the side with one indentation is the heaviest side.

You make a conjecture that when you roll a standard playing die, the number 6 will come up more often because it is the lightest side, and the number 1 will come up least often because it is the heaviest side. To test your conjecture, roll a standard playing die 25 times. Record the results in the table. Does the experiment confirm your conjecture? Explain your reasoning.



Number						
Rolls						

11.4 Experimental Design (continued)**2** **EXPLORATION:** Analyzing an Experiment

Work with a partner. To overcome the imbalance of standard playing dice, one of the authors of this book invented and patented 12-sided dice, on which each number from 1 through 6 appears twice (on opposing sides). See *BigIdeasMath.com*.



As part of the patent process, a standard playing die was rolled 27,090 times. The results are shown below.

Number	1	2	3	4	5	6
Rolls	4293	4524	4492	4397	4623	4761

What can you conclude from the results of this experiment? Explain your reasoning.

Communicate Your Answer

- How can you use an experiment to test a conjecture?
- Exploration 2 shows the results of rolling a standard playing die 27,090 times to test the conjecture in Exploration 1. Why do you think the number of trials was so large?
- Make a conjecture about the outcomes of rolling the 12-sided die in Exploration 2. Then design an experiment that could be used to test your conjecture. Be sure that your experiment is practical to complete and includes enough trials to give meaningful results.

11.4

Notetaking with Vocabulary

For use after Lesson 11.4

In your own words, write the meaning of each vocabulary term.

controlled experiment

control group

treatment group

randomization

randomized comparative experiment

placebo

replication

Core Concepts

Comparative Studies and Causality

- A rigorous randomized comparative experiment, by eliminating sources of variation other than the controlled variable, can make valid cause-and-effect conclusions possible.
- An observational study can identify *correlation* between variables, but not *causality*. Variables, other than what is being measured, may be affecting the results.

Notes:

11.4 Notetaking with Vocabulary (continued)**Extra Practice**

In Exercises 1 and 2, determine whether the study is a randomized comparative experiment. If it is, describe the treatment, the treatment group, and the control group. If it is not, explain why not and discuss whether the conclusions drawn from the study are valid.

1.

<i>Baby DVDs</i>
Baby DVDs Improves Language Ability To test whether baby DVDs that highlight words and introduce music and art can improve language ability, parents with babies 0–24 months were given the choice of whether to let their babies watch the DVDs. Fifty babies who watched the DVDs were observed for a year as well as 50 other babies who did not watch the DVDs. At the end of the year, babies who watched the DVDs scored higher in a language development test.

2.

<i>Type 1 Diabetes</i>
New Drug Improves Blood Glucose Control In a clinical trial, 100 Type 1 diabetic patients volunteered to take a new drug. Fifty percent of the patients received the drug and the other fifty percent received a placebo. After one year, the patients who received the drug had better blood glucose control while the placebo group experienced no significant change.

