Chapter 2

Answers to Section 1 Review

1. First, make observations or measurements to gather information. Second, use these observations to form a hypothesis, and make a prediction based on the hypothesis. Next, conduct an experiment to test the hypothesis under controlled conditions. Organize and analyze information, or data, that is gathered from the experiment. Use the data to form conclusions about the original hypothesis. Repeat the experiment and share the results.
2. Sample answers: Curiosity leads scientists to ask new questions. Skepticism leads scientists to question explanations they doubt. Openness to new ideas prevents scientists from limiting their thinking. Intellectual honesty helps ensure accurate conclusions. Imagination and creativity help scientists conceive new ideas and explanations.
3. A hypothesis considers information gathered by observation, while a guess might not. A hypothesis is also a testable explanation, while a guess may not be testable.
4. Scientists study correlations, reliable associations between two events, to answer questions that cannot be investigated with experiments. The more correlations that exist between variables, the more sure scientists can be of their conclusions.
5. The two essential parts of a good experiment are testing only one variable and using a control. It is important to test only one variable so you can be sure that this variable is the cause of any changes that occur. It is important to use a control so that you have something to compare with the experimental treatment.
6. Answers may vary. A skeptical scientist does not believe everything he or she is told. In being skeptical about established ideas, a scientist is open to new ones.

Answers to Section 2 Review

1. A statistical sample needs to be large enough to reflect a population. If a sample is not large enough it can easily misrepresent probability.
2. The statement means that someone has determined how many weeds are in each of three plots of land, added these numbers together, and divided by three. In this case, the "mean" represents the average number of weeds in the three plots.
3. Answers may vary. Students should include three of the following: Physical models are three dimensional and closely resemble the object sor system they represent. Graphical models, which include maps and charts, illustrate data such as positions or amounts graphically. Conceptual models show how something works or how it is organized. Mathematical models use one or more equations to represent how a system or process works.
4. Probability is the chance that an event will occur. Risk is the probability of an unwanted outcome.
5. Answers may vary.
6. Answers may vary. Students may say that conceptual and mathematical models represent ideas and relationships clearly and precisely.

Answers to Section 3 Review

1. Gathering information is important to fully understand a problem. It is necessary to consider values so that a decision is made based on what is important to the decision-maker. Exploring the consequences is important because it is necessary to consider the longterm impact of a decision. It is important to make a decision so that something can be done and the decision maker's values can be implemented.
2. Answers may vary, but may include the following: Environmental values are values based on how important nature and the environment are to you. Economic values are values based on monetary costs and benefits. Recreational values are values based on the importance of leisure and having fun.
3. Answers may vary. Accept any reasonable, thoughtful answer.
4. The tables may vary but should show an understanding of the decision-making model and a thoughtful exploration of an issue.
5. Answers may vary. Students may offer improvements such as quantifying the positive and negative consequences to better assess the situation.

Chapter 2 Review

Using Key Terms

1. Sample answer: The scientist conducted an experiment to verify her hypothesis.
2. Sample answer: Storm clouds and rain have a strong correlation.
3. Sample answer: The doctor

showed his patient a model to demonstrate how the heart works.
4. Sample answer: To see if there are more elderly people than young people, you could look at a distribution of ages.
5. Sample answer: My mother always considers her values before making a decision.
6. A hypothesis is a testable explanation for an observation, while a prediction is an educated guess of what will happen when the hypothesis is tested.
7. A risk is the chance that an unwanted event will occur. A probability is the likelihood that something will happen.
8. A distribution is the arrangement of the members of a population in relation to a characteristic. A population is a group of similar things that is being studied.
9. A population is a group of similar things that is being studied, while a sample is a smaller group studied to represent the population.

Understanding Key Ideas

10. d
11. c
12. a
13. b
14. d
15. c
16. a
17. b
18. d
19. b

Short Answer

20. When an observation warrants further examination, a good scientist knows what questions to investigate to fully understand the observation.
21. In an experiment, the control group provides a standard to compare with the experimental treatment. The control group provides a set of data unaffected by the variable or with the variable at a baseline value.
22. Statistics help people quantify and analyze different kinds of information, including information about the environment.
23. Environmental scientists use mathematical models to express quantifiable relationships in the most precise form possible.
24. Making a table can help in a decision-making situation by organizing all the positive and negative consequences of a decision for comparison.

Interpreting Graphics

25. The density of the alligator population fell drastically—from almost 22 per kilometer of shoreline to about 3 per kilometer of shoreline.
26. The alligator concentration increased. In 1994 there was less than one alligator per kilometer. In 1998 there were almost 5 alligators per kilometer.
27. The alligator population was more than five times greater in 1986.

Concept Mapping

28. Answers to the concept mapping questions are on pp. 715–720.

Critical Thinking

29. The scientist means that there is an 8 out of 10 chance that a tornado will strike the area over the next 10 years.
30. Answers may vary, but students should recognize that a map is a graphical model of the city that illustrates the relative size and location of streets and landmarks.
31. No, complicated models are not necessarily more accurate. Adding detail to a model is only justified if that detail truly reflects relevant aspects of the system in question.
32. The statement proves very little because it does not state the sample size in relation to the population size. It only proves that 60% of those surveyed own dogs and 40% own cats.

Cross-Disciplinary Connection

33. Answers may vary.

Portfolio Project

34. Answers may vary.

Standardized Test Prep Answers

1. C
2. H
3. A
4. I

5. Answers will vary. See Test Doctor for detailed scoring rubric.
6. Answers will vary. See Test Doctor for detailed scoring rubric.
7. A
8. H
9. D
10. H
11. A
12. F
13. C