Data Analysis & Probability

Supporting your child’s educational journey every step of the way.

*Spectrum* provides specific support in the skills and standards that your child is learning in today’s classroom.

- Comprehensive, grade-specific titles to prepare for the year ahead
- Subject-specific practice to reinforce classroom learning
- Skill-specific titles to enrich and enhance educational concepts
- Test preparation titles to support test-taking skills

No matter your need, *Spectrum* is with you every step of the way.

*Spectrum* is available in these titles for grades 6–8:

- Geometry Grades 6–8
- Algebra Grades 6–8
- Measurement Grades 6–8
- Geometry & Probability Grades 6–8

Other titles available:
- Fractions Grade 6
- Word Problems Grades 6–8
- Language Arts Grades 6–8
- Writing Grades 6–8
- Science Grades 6–8
- Test Prep Grades 6–8

Focused Practice for Data Analysis & Probability Mastery

- Ratios
- Measures of central tendency
- Interpreting graphs
- Answer key

carsondellosa.com/spectrum
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
</table>
| Chapter 1 | Probability Models                         | Chapter 1 Pretest: ............................. 1  
|           |                                            | Lessons 1–6: ....................................... 2–17  
|           |                                            | Chapter 1 Posttest: ........................... 18  |
| Chapter 2 | Calculating Probability and Compound Events| Chapter 2 Pretest: ............................. 19  
|           |                                            | Lessons 1–5: ....................................... 20–33  
|           |                                            | Chapter 2 Posttest: ........................... 34  |
| Chapter 3 | Statistical Thinking                       | Chapter 3 Pretest: ............................. 36  
|           |                                            | Lessons 1–4: ....................................... 37–45  
|           |                                            | Chapter 3 Posttest: ........................... 46  |
| Chapters 1–3 Mid-Test |                              |                                             47  |
| Chapter 4 | Measures of Central Tendency and Measures of Variability | Chapter 4 Pretest: ............................. 51  
|           |                                            | Lessons 1–10: ...................................... 53–70  
|           |                                            | Chapter 4 Posttest: ........................... 71  |
| Chapter 5 | Displaying Data                            | Chapter 5 Pretest: ............................. 73  
|           |                                            | Lessons 1–6: ....................................... 75–83  
|           |                                            | Chapter 5 Posttest: ........................... 84  |
| Chapter 6 | Scatter Plots and Bivariate Data           | Chapter 6 Pretest: ............................. 85  
|           |                                            | Lessons 1–7: ....................................... 86–99  
|           |                                            | Chapter 6 Posttest: ........................... 100  |
| Chapters 1–6 Final Test |                          |                                             101  
|           | Scoring Record for Posttests, Mid-Test, and Final Test | 107  
|           | Answer Key                                 | 108  |
Check What You Know

Probability Models

Determine the probabilities in each situation. Express each probability as a fraction in simplest form.

1. What is the probability of spinning a 3? __________

2. What is the probability of spinning an odd number? __________

3. What is the probability that a cube any color but red is picked from a bag containing 5 red cubes, 3 yellow cubes, and 2 white cubes? __________

4. A spinner has 12 equally spaced sections numbered 1 through 12. If it is spun, what is the probability of it landing on a number divisible by 3? __________

5. A purse contains the following coins: 12 pennies, 3 nickels, and 5 dimes.
   a. Which coin has the highest probability of being randomly selected? __________
   b. What is that probability? __________

Write yes or no to tell if each situation describes uniform probability.

6. selecting a student from a class of 10 boys and 15 girls __________

7. selecting a letter from the word “palace” __________

8. rolling a number with a 6-sided die __________

Solve the problems below. Express each probability as a fraction in simplest form.

9. A file cabinet contains 3 white folders, 2 red folders, 5 blue folders, and 3 green folders.
   What is the probability of randomly choosing a blue or red folder? __________

10. In a simulation of tossing a coin, a random number generator generates 255 zeros and 245 ones. Zero represents heads and one represents tails.
    a. What is the experimental probability of tossing a coin and getting heads? __________
    b. Which is greater, the experimental or theoretical probability of getting heads? __________
Lesson 1.1 Understanding Probability

An experiment is an activity in which results are observed. Each round of an experiment is called a trial, and the result of a trial is called an outcome. A set of one or more outcomes is called an event.

The probability of an event is a measure of the likelihood that the event will occur. This measure ranges from 0 to 1 and can be written as a ratio, fraction, decimal, or percent. To calculate probability, you must first know the number of possible outcomes.

The possible outcomes when you roll a die are the following: 1, 2, 3, 4, 5, and 6. Every outcome is equally likely. There is no chance that you can roll a 7.

Answer each question below based on the experiment described.

# a b

1. You flip a coin.
   Possible outcomes? Outcomes equally likely? (Yes or no)
   __________________ _________________

2. You roll a pair of dice and find the sum.
   Possible outcomes? An impossible outcome?
   __________________ _________________

3. A bowl contains 15 red marbles and 5 green marbles.
   Possible outcomes? Most likely outcome?
   __________________ _________________

4. Twenty names are written on slips of paper in a basket.
   Possible outcomes? Outcomes equally likely? (Yes or no)
   __________________ _________________
Lesson 1.1 Understanding Probability

An **outcome** is a possible result of an activity or experiment. **Probability** is a measure of how likely it is that a specific outcome will occur. To find probability, create a ratio comparing the number of a specific outcome with the total number of possible outcomes.

\[
\text{Probability (P)} = \frac{\text{number of a specific outcome}}{\text{number of possible outcomes}}
\]

A bag contains 12 marbles: 7 blue and 5 red. If you choose a marble at random, the probability that it will be red is:

\[
\text{Probability (P)} = \frac{5}{12}
\]

You can express probability as a ratio, fraction, decimal, or percent.

When tossing a coin, what is the probability that it will land on heads?

- specific outcome: heads
- possible outcomes: heads, tails
- probability of heads: 1:2, \( \frac{1}{2} \), 0.5, or 50%

Find the probability. Express your answer as a fraction in simplest form.

If you spin the spinner at right, what is the probability that the spinner will stop on each of the following?

1. a number ____________
2. an even number ____________
3. an odd number ____________
4. a consonant ____________
5. a vowel ____________
6. the number 6 ____________
7. a number < 6 ____________
8. a number > 6 ____________

Spectrum Data Analysis and Probability
Grades 6–8
Lesson 1.1 Understanding Probability

Solve the problems based on one spin of the spinner. Express each probability as a fraction in simplest form.

1. The number of possible outcomes is __________.

2. The probability of stopping on 4 is __________.

3. The probability of stopping on an odd number is __________.

4. The probability of not stopping on an odd number is __________.

5. The probability of stopping on 5 or 3 is __________.

6. The probability of stopping on a number > 1 is __________.

Solve each problem. Express probabilities as fractions in simplest form.

A bag contains 3 pennies, 2 nickels, and 4 dimes. You will select a coin at random.

7. The probability that you will choose a nickel is __________.

8. The probability that you will choose either a penny or a dime is __________.

9. The probability that you will not choose a penny is __________.

10. The probability that you will choose a coin worth more than 10 cents is __________.
Lesson 1.1 Understanding Probability

Solve each problem. Express each probability as a fraction in simplest form.

A box contains 3 red balls, 1 white ball, and 3 green balls. You pick one item at random.

11. The probability that you will choose 1 green ball is ____________.

12. The probability that you will choose 1 white ball is ____________.

The names of 8 girls and 7 boys are written on slips of paper, which are placed in a hat. The teacher will choose names at random to decide the order in which students will present their projects.

13. The probability that a girl will be chosen first is ____________.

14. The probability that a boy will be chosen first is ____________.

A snack shop sells hamburgers and turkey burgers with a choice of buns. The tree diagram shows all possible combinations. Use the diagram to answer the questions.

15. There are ____________ possible combinations.

16. If you choose a sandwich at random, the probability that you will choose a turkey burger on a wheat bun is ____________.

17. The probability that you will choose a sandwich on rye is ____________.
Lesson 1.2 Calculating Probability

An event is a set of possible outcomes from an activity or experiment. Sample space is the set of all possible outcomes of an activity or experiment. An event is a subset of sample space. Suppose you roll a 6-sided die once. The sample space is \{1, 2, 3, 4, 5, 6\}. You might roll a 2. Thus, one event of this experiment is \{2\}. If you roll the die twice, you might get a 3 and a 6. Thus, the set \{3, 6\} is one possible event of rolling the die twice.

**Mutually exclusive events** are events that cannot occur at the same time. If one event occurs, none of the other events will occur. If you roll a die and get a 6, you cannot get a 1, 2, 3, 4, or 5 at the same time.

If Events A and B are mutually exclusive, then the probability of A or B occurring is:

\[
P(A) + P(B)
\]

In one roll of a die, the probability of getting a 3 is \(\frac{1}{6}\) and the probability of getting a 4 is also \(\frac{1}{6}\). The probability of getting either a 3 or a 4 in one roll is \(\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}\).

**Complementary events** are events that together make up the entire sample space. The probabilities of complementary events add up to 1, or 100%. Complementary events are mutually exclusive, but not all mutually exclusive events are complementary.

If A’ is the complement of A, then the probability of A occurring is:

\[
P(A) = 1 - P(A')
\]

In one roll of a die, the probability of getting a 3 is \(\frac{1}{6}\). Therefore, the probability of not getting a 3 is \(1 - \frac{1}{6} = \frac{5}{6}\).

Determine each probability. Express your answer as a fraction in simplest form.

1. On one roll of a 6-sided die, what is the probability of getting a 1, 2, 4, or 6?
   
   The probability of getting a 1, 2, 4, or 6 is _____________________.

2. A bag holds 3 red marbles, 2 green marbles, and 3 black marbles. What is the probability of not choosing a black marble?
   
   The probability of not choosing a black marble is _____________________.

3. Events A and B are mutually exclusive. \(P(A) = \frac{3}{10}\). \(P(B) = \frac{1}{5}\). What is the probability that either A or B will occur?
   
   \(P(A) \text{ or } P(B)\) is _____________________.

4. Events X, Y, and Z are complementary. \(P(X) = \frac{1}{8}\). \(P(Y) = \frac{1}{2}\). What is the probability that Z will occur?
   
   \(P(Z)\) is _____________________.

Spectrum Data Analysis and Probability
Grades 6–8

Lesson 1.2
Probability Models
Lesson 1.2 Calculating Probability

Probability can also be thought of as the ratio of desired outcome(s) to the sample space. It can be expressed as a ratio, fraction, decimal, or percent.

When tossing a coin, what is the probability that it will land on heads?

desired outcome: heads   sample space: heads, tails   probability: 1:2, $\frac{1}{2}$, 50%, 0.5

Find the probability. Write answers as fractions in simplest form.

A box contains 3 red pencils, 4 blue pencils, 2 green pencils, and 1 regular pencil. If you take 1 pencil without looking, what is the probability of picking each of the following?

1. a red pencil
2. a blue pencil
3. a green pencil
4. a regular pencil

If you spin the spinner shown at the right, what is the probability of the spinner stopping on each of the following?

5. a letter
6. an odd number
7. an even number
8. a vowel
9. the number 3
10. a consonant
Lesson 1.2 Calculating Probability

Determine the probability for each of the following events. Write answers as fractions in simplest form.

1. drawing a gray marble
2. drawing a white marble
3. drawing a black marble
4. drawing either a gray or a black marble

5. spinning a gray section
6. spinning a 4
7. spinning a 1
8. spinning either a 4 or 5
9. spinning an even number

10. spinning a red section
11. spinning a blue section
12. spinning a yellow section

A jar contains 25 pennies, 20 nickels, and 15 dimes. If someone picks one coin without looking, what are the chances that they will pick the following:

13. penny
14. nickel
15. dime
Lesson 1.3 Uniform Probability Models

When all outcomes of an experiment are equally likely, the event has uniform probability.

This spinner has 8 equally divided sections. Every time it is used, there is an equal chance ($\frac{1}{8}$) that it will land on any given number.

- Chance of spinning 6 — $\frac{1}{8}$
- Chance of spinning 3 — $\frac{1}{8}$
- Chance of spinning 7 — $\frac{1}{8}$

Write yes or no to tell if each situation describes a uniform probability model.

a  b
1. rolling one die  rolling two dice
   ___________  ___________
2. flipping a coin  a spinner with 3 stars and 2 diamonds
   ___________  ___________
3. calling on a girl in class  calling on any student in class
   ___________  ___________
4. winning the lottery  drawing an 8 from a deck of cards
   ___________  ___________
5. calling on a boy in class  a spinner with 5 red and 2 blue sections
   ___________  ___________
6. flipping a coin and rolling a die  a spinner with 3 squares and 3 triangles
   ___________  ___________
Chapter 1
Check What You Know, page 1
1. \( \frac{1}{8} \)
2. \( \frac{1}{2} \)
3. \( \frac{1}{2} \)
4. \( \frac{1}{3} \)
5a. penny
5b. \( \frac{3}{5} \)
6. no
7. no
8. yes
9. \( \frac{7}{13} \)
10a. \( \frac{51}{100} \)
10b. experimental

Lesson 1.1, page 2
1. a heads, tails b yes
2. 2, 3, 4, 5, 6, 7, Answers will vary. 8, 9, 10, 11, 12
3. red marble, green marble b red marble
4. a all names b yes

Lesson 1.1, page 3
1. \( \frac{1}{2} \)
2. \( \frac{1}{3} \)
3. \( \frac{1}{3} \)
4. \( \frac{1}{3} \)
5. \( \frac{1}{2} \)
6. \( \frac{1}{5} \)
7. \( \frac{1}{3} \)
8. 0

Lesson 1.1, page 4
1. 5
2. \( \frac{1}{5} \)
3. \( \frac{3}{10} \)
4. \( \frac{2}{3} \)
5. \( \frac{3}{5} \)
6. \( \frac{4}{5} \)
7. \( \frac{2}{5} \)
8. \( \frac{7}{6} \)
9. \( \frac{2}{3} \)
10. 0

Lesson 1.2, page 6
1. \( \frac{2}{3} \)
2. \( \frac{5}{6} \)
3. \( \frac{1}{2} \)
4. \( \frac{3}{5} \)

Lesson 1.3, page 9
1. a yes b no
2. a yes b no
3. a no b yes
4. a no b no
5. a no b no
6. a no b yes

Lesson 1.1, page 5
11. \( \frac{3}{7} \)
12. \( \frac{1}{7} \)
13. \( \frac{8}{15} \)
14. \( \frac{7}{13} \)
15. 8
16. \( \frac{1}{8} \)
17. \( \frac{1}{4} \)

Lesson 1.2, page 7
1. \( \frac{3}{10} \)
2. \( \frac{2}{5} \)
3. \( \frac{1}{5} \)
4. \( \frac{1}{10} \)
5. \( \frac{1}{2} \)

Lesson 1.2, page 8
1. \( \frac{1}{2} \)
2. \( \frac{3}{10} \)
3. \( \frac{1}{5} \)
4. \( \frac{1}{10} \)
5. \( \frac{1}{3} \)
6. \( \frac{1}{6} \)
7. \( \frac{1}{6} \)
8. \( \frac{5}{12} \)
9. \( \frac{1}{6} \)
10. \( \frac{1}{3} \)
11. \( \frac{1}{3} \)
12. \( \frac{1}{6} \)
13. \( \frac{5}{12} \)
14. \( \frac{1}{3} \)
15. \( \frac{1}{4} \)

Lesson 1.3, page 9
1. a yes b no
2. a yes b no
3. a no b yes
4. a no b no
5. a no b no
6. a no b yes