Chapter 1 Planning Chart

Section Suggested Timing	Teacher's Resource Blackline Masters	Assessment Tools	Materials and Technology Tools
1 Probability (TR page 2) (15 min)	Master 1 Budget Tracker	Diagnostic Assessment (TR page 3)	• contest version of coffee cup or similar resource (optional)
Skills Practice 1: Fractions, Decimals, and Percents (TR page 4) (40 min)	Master 3 Fractions, Decimals, and Percents SP BLM 1 Fractions, Decimals, and Percents		• measuring tape or rulers • currency manipulatives
1.1 What's the Chance? (TR page 6) (75–150 min)	Master 1 Budget Tracker BLM 1–1 Standard Deck of Cards	Ongoing Assessment (TR page 10)	• coin manipulatives • standard decks of playing cards (optional) • standard dice (optional)
1.2 In a Perfect World (TR page 11) (75–150 min)	Master 1 Budget Tracker Master 9 Fraction Circles BLM 1–1 Standard Deck of Cards	Ongoing Assessment (TR page 15)	• standard decks of playing cards • standard dice • coin manipulatives
Tech Tip: Experimenting with a Random Number Generator (TR page 16) (10–20 min)	Tech 1 Using a Random Number Generator in Fathom		• graphing calculators
Skills Practice 2: Equivalent Fractions (TR page 17) (15–30 min)	Master 8 Fraction Strips Master 9 Fraction Circles SP BLM 2 Equivalent Fractions	Ongoing Assessment (TR page 17)	• rulers (optional)
1.3 Roll the Bones (TR page 19) (75–150 min)	Master 1 Budget Tracker	Ongoing Assessment (TR page 23)	• standard dice (2 different colours—optional)
1.4 Heads, Heads, Heads (TR page 24) (75–150 min)	Master 1 Budget Tracker BLM 1–1 Standard Deck of Cards	Ongoing Assessment (TR page 27)	• coin manipulatives • cardboard box (optional) • 3 each of 3 different fruits or pictures of fruits (optional) • candies (optional)
1.5 Free Coffee (TR page 28) (75–150 min including Tech Tip)	Master 1 Budget Tracker BLM 1–2 Free Coffee Spinner	Ongoing Assessment (TR page 31)	• standard dice • possible materials for a simulation, such as a cup or a small box • paper clips • graphing calculators
1.6 What Are the Odds? (TR page 32) (150–225 min)	Master 1 Budget Tracker BLM 1–1 Standard Deck of Cards	Ongoing Assessment (TR page 36)	• data about the population of your school
Chapter 1 Review (TR page 37) (75 min)	Master 2 Chapter Summary BLM 1–3 Chapter 1 Word Puzzle		• standard decks of playing cards • coin manipulatives (optional) • standard dice (optional)
Chapter 1 Practice Test (TR page 39) (60–75 min)	Master 2 Chapter Summary	BLM 1–4 Chapter 1 Test	• standard dice • standard decks of playing cards (optional) • coin manipulatives (optional)
Task: Play Klass Kasino (TR page 41) (30–75 min)	BLM 1–5 Chapter 1 Task Recording Chart BLM 1–6 Chapter 1 Task BLM 1–8 Chapter 1 BLM Answers	BLM 1–7 Chapter 1 Task Rubric	• calculators • standard decks of playing cards)

CHAPTER 1

Probability (page 3)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTER
15 min	• contest version of coffee cup or similar resource (optional)	Master 1 Budget Tracker

Overall Expectations

A.1 – collect, organize, represent, and make inferences from data using a variety of tools and strategies, and describe related applications

A.2 – determine and represent probability, and identify and interpret its applications

Contributing Expectations

C.1 – determine and estimate measurements using the metric and imperial systems, and convert measures within and between systems

C.3 – identify and describe situations that involve proportional relationships and the possible consequences of errors in proportional reasoning, and solve problems involving proportional reasoning, arising in applications from work and everyday life

Speed Bump

- Some students may find the subject matter objectionable and may not wish to enter the discussion.

R_x Encourage students to consider other probabilities, such as the chance of getting all green traffic lights on the way to school.

What's the Math?

Throughout this chapter, students work through activities involving simple probability. It may be the first time that they have done this since elementary school.

The chapter opener is designed to start students thinking about games of chance, probability, and their own habits. You might start by discussing the situation in the cartoon. Consider

- defining gambling
- discussing the difference between the activity in the cartoon and gambling

The calculations throughout the chapter involve decimals, fractions, and percent. Proportional reasoning is stressed. The numeracy required for this chapter is used throughout the course.

Activity Planning Notes

Budget Tracking: In Chapter 2, students will need to use collected data about their current spending patterns. In order to collect enough data, they need to start tracking their spending at the beginning of Chapter 1. You may wish to have them start this on the first day of the course. They should start *at least* within the first week. Provide students with **Master 1 Budget Tracker** and encourage them to enter the previous day's spending. Have them fill in their previous day's spending at the beginning of each class.

Give students several minutes to examine the cartoon and answer the questions. Encourage them to share their answers and to discuss openly. Many students will have experience with contests, lotteries, games of chance, etc. As students provide ideas, you may wish to record and display notes.

Diagnostic Assessment

The discussion with the class should give the teacher a sense of students' general understanding of contests or games, and their willingness to participate in discussions.

Some things to consider:
- Are students able to see how math may be involved in contests and games?
- Are students' comments reasonable?

Use your assessment of students' awareness of these concepts to help you estimate the timing of the lessons that will follow and the amount of assistance students will need. If students seem to have little experience, you may wish to lead many of the activities as a class exercise. If students seem to have a good understanding of the concepts, you may find that they can work at their own pace.

Literacy Link

Provide students with many opportunities to talk and listen as they discuss this cartoon and the related questions. Many will have stories of personal experiences. Encourage them to share these.

Answers (page 3)

1. a) Answers will vary. Sample answers include school raffles, scratch-and-win cards, and a contest to win concert tickets.

b) Answers will vary. Look for exaggeration with respect to the frequency of winning.

Skills Practice 1: Fractions, Decimals, and Percents (page 4)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
40 min	• measuring tape or rulers • currency manipulatives	Master 3 Fractions, Decimals, and Percents SP BLM 1 Fractions, Decimals, and Percents

Specific Expectation

C.1.4 – convert measures within systems, as required within applications that arise from familiar contexts

Accommodations

- Provide struggling students with **Master 3 Fractions, Decimals, and Percents**. Review the first four visuals on this worksheet and relate them to money. It will be easier for students to remember that one quarter is 25¢, which can also be written as $0.25. Discuss how this can help them with many of the parts of question 3. For questions that give the percent, you may wish to discuss going backwards. So, 85% is like saying 85¢. What is another way of recording this? (85¢ = $0.85, so 85% is also 0.85) How can you express this as a fraction? (% means out of 100, so $85\% = \frac{85}{100}$)
- Students who need additional reinforcement of these skills could use **SP BLM 1 Fractions, Decimals, and Percents**.

What's the Math?

Students work through a Skills Practice that reviews converting between fractions, decimals, and percent. These are numeracy skills that students will continue to use during this course. Encourage students to use what they know (money, measurement) to convert between fractions, decimals, and percents.

Activity Planning Notes

Use this Skills Practice as an early diagnostic assessment of students' basic numeracy skills as they relate to fractions, decimals, and percent. It may be necessary to complete the first row of the table in question 3 so students understand what is required. Students should not use a calculator for question 3. Encourage struggling students to relate the questions to money, measurement, or some other quantity, as shown in questions 1 and 2.

Literacy Link

Review the meaning of percent and how it is related to fractions and decimals.

Answers to Skills Practice 1 (pages 4–5)

1. a) 75¢, \$0.75
b) $\frac{3}{4} = \frac{75}{100}$
c) 100, 75

2. a) 12
b) 6
c) 3
d) 9
e) 50%
f) $\frac{1}{12}$

3. Answers are in italics.

Fraction	Decimal	Percent
$\frac{1}{2}$	*0.50*	*50%*
$\frac{1}{4}$	*0.25*	*25%*
$\frac{3}{4}$	*0.75*	*75%*
$\frac{2}{10}$ *or* $\frac{1}{5}$	0.2	*20%*
$\frac{3}{10}$	0.3	*30%*
$\frac{8}{10}$ *or* $\frac{4}{5}$	*0.8*	80%
$\frac{85}{100}$ *or* $\frac{17}{20}$	*0.85*	85%
$\frac{1}{3}$	*0.33*	*33%*
$\frac{2}{3}$	*0.67*	*67%*
$\frac{1}{100}$	0.01	*1%*
$\frac{5}{100}$ *or* $\frac{1}{20}$	0.05	*5%*
$\frac{8}{100}$ *or* $\frac{2}{25}$	*0.08*	8%
$\frac{13}{100}$	*0.13*	13%
$\frac{0}{10}$	*0.00*	*0%*
$\frac{10}{10}$	*1.00*	*100%*

Challenge!

Have students convert 1.05 to a fraction and a percent.

1.1 What's the Chance? (page 6)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
75–150 min	• coin manipulatives • standard decks of playing cards (optional) • standard dice (optional)	Master 1 Budget Tracker BLM 1–1 Standard Deck of Cards

Specific Expectations

A.1.4 – represent categorical data by constructing graphs using a variety of tools
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.2 – identify examples of the use of probability in the media and various ways in which probability is represented

Cumulative Review

This cumulative review section, which appears only in the Teacher's Resource, provides an opportunity for students to continue to review skills from earlier in the course. The cumulative review consists of a maximum of 5 questions. In Chapter 1 only, it will provide an ongoing review of skills used in the current chapter.

1. How many months are in one year?

2. Name them, in order.

3. How many cents are in a dollar?

4. How many centimetres are in a metre?

5. Show 25¢ as a fraction of a dollar.

Answers to Cumulative Review

1. 12

2. January, February, March, April, May, June, July, August, September, October, November, December

3. 100

4. 100

5. $\frac{1}{4}$

What's the Math?

Students are introduced to simple activities involving theoretical probability and use fractions, decimals, and percents to report the probability of various events. Stress using proportional reasoning (also used extensively throughout the course) to make some of the necessary calculations. Consider using concrete representations of quantities.

Students create bar graphs and circle graphs to show the probability of various events. They review the format of these two types of graphs.

Warm Up Notes

Accommodations

- Students who have difficulty with the Warm Up questions could benefit from additional reinforcement.

The main purpose of the Warm Up is to provide structure to the classroom environment and to provide students with an opportunity to work with basic mathematics skills. This exercise will also provide you with some sense of how comfortable students are working with mathematics and may provide an opportunity for diagnostic and ongoing assessment of basic skills. The Warm Up at the beginning of each section reviews specific skills that students will need during that section or that students may need to remember from the current chapter. Allot 5–10 minutes for students to do the Warm Up and 10–15 minutes to take up and discuss the answers.

When discussing answers with students, stress the mathematical processes at work as well as merely obtaining "the right answer." Wherever appropriate, look for and have students consider multiple representations and multiple strategies for working through questions.

In this first Warm Up, students work with fractions, decimals, and percents. You may wish to extend the discussion of question 1 to consider the number of months in one quarter of a year. This will lead to question 2, where students review that each season is one quarter of a year, or three months. You may wish to have students write question 3a) in the margin with the decimals directly in line with each other. This may help remind them that the answer is 1.0 rather than 0.10. Question 4 reviews what students did in Skills Practice 1. Observe whether they leave the fraction as is or show it in lowest terms. This will help you assess students' knowledge of fractions.

Answers to Warm Up (page 6)

1. a) 52
b) 26

2. a) 4
b) 13

3. a) 1.0
b) 90%
c) $\frac{100}{100}$ or 1

4. penny = $\frac{1}{100}$, nickel = $\frac{5}{100}$ or $\frac{1}{20}$, dime = $\frac{10}{100}$ or $\frac{1}{10}$

Activity Planning Notes

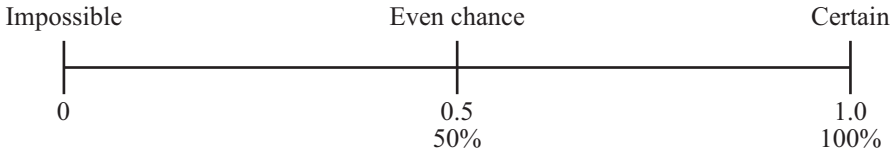
Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

If you started the class with Skills Practice 1 on page 4, you may wish to skip the Warm Up questions, as this section is likely to take longer than one period. The Warm Up questions could be used to start the next period.

You can establish vocabulary and the concept of probability using a number line with both words and numbers plotted on it. You may wish to start with a simple probability line such as the following.

Accommodations

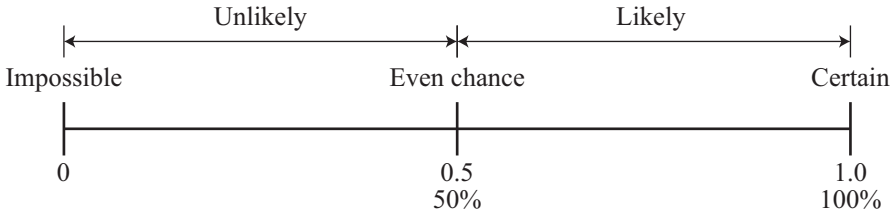
- Some students may benefit from working in pairs or in a group of three.
- A money tray is a useful tool for reinforcing many concepts involving decimals, fractions, and percents. For example, since a nickel is 0.05, you need 20 to make a dollar. So, a nickel is $\frac{1}{20}$ of a dollar. Since there are 100 cents in a dollar, 5 cents are 5% of a dollar. Similarly, if a student uses only nickels to count out 85 cents, 17 nickels will be used. So, \$0.85 = 85% of \$1 $= \frac{85}{100}$ or $\frac{17}{20}$ \$1.



This will allow the students to establish approximate probabilities for various events. For example, ask students:

- What's the chance of the sun rising tomorrow?
- Where would you mark this on the number line?
- How would you describe this chance using words or numbers?
- What's the chance of the sky being green tomorrow?
- What the chance of you winning an Olympic medal next week?
- What's the chance of you eating lunch next week?
- What's the chance of the next person to walk into the room being a female?

Once they feel comfortable thinking about probability using the terms *impossible*, *even chance*, and *certain*, present a number line similar to the one below to introduce the terms *likely* and *unlikely*.



Students can use this number line to establish approximate probabilities for real-life events. For example, ask:

- What's the chance of rain or snow tomorrow?
- Where would you mark this on the number line?
- How would you describe this chance using words or numbers?
- How likely is it that the Maple Leafs will win the Stanley Cup this year?

Have students ask and discuss their own probability questions and answers. This way, students can compare probabilities in a visual manner. You may wish to make a large copy of the probability number line to post in the classroom for discussion during the chapter.

Speed Bump

- Some students may struggle with converting decimals, fractions, and percents.

R$_x$ Use currency manipulatives and/or additional tools at your disposal to reinforce the concepts. If these students have not completed Skills Practice 1 or **SP BLM 1 Fractions, Decimals, and Percents**, have them do it now.

Work through question 1 as a whole class to get a sense of students' prior knowledge with respect to cards. You may wish to provide students who are unfamiliar with cards with **BLM 1–1 Standard Deck of Cards**. This worksheet shows each of the cards in a standard deck. It would be better to provide a standard deck of cards for these students to examine. Some may need to count the cards to understand why there is a 1 in 2 theoretical probability of picking a red or black card and a 1 in 4 theoretical probability of picking a heart.

Assign questions 2 and 3 and then discuss the results.

It may be beneficial to do questions 4 and 5 as a whole group activity. Again, it would be beneficial for each student to have a die to examine in order to answer these questions.

Question 6 can also be used as a quick formative assessment of students' understanding of calculating theoretical probability.

Conclude the section by having students complete the Check Your Understanding. You may wish to couple the phrases here with the terms you used in the probability number lines at the beginning of the lesson.

- impossible = It will not happen.
- unlikely = It is not likely to happen.
- even chance = It might happen, it might not.
- likely = It is likely to happen.
- certain = It will happen.

Literacy Link

Link the word *probability* to its root word, *probable*. With the class, discuss what probable means. How might this meaning help them remember the meaning of probability?

Also link the word *theoretical* to its root word, *theory*. Discuss how this concerns the number of possible results compared to the one(s) you are looking for.

Use the provided glossary of terms and encourage students to create their own definitions of key terms to enhance their understanding. Have them write these terms and definitions in the Probability Glossary starting on page 1. You may wish to have them start by writing the terms in alphabetical order in the boxes provided.

Answers to Activity Questions (pages 6–9)

1. a) $\frac{13}{52}$ or $\frac{1}{4}$

b) $\frac{26}{52}$ or $\frac{1}{2}$

c) $\frac{26}{52}$ or $\frac{1}{2}$

d) $\frac{4}{52}$ or $\frac{1}{13}$

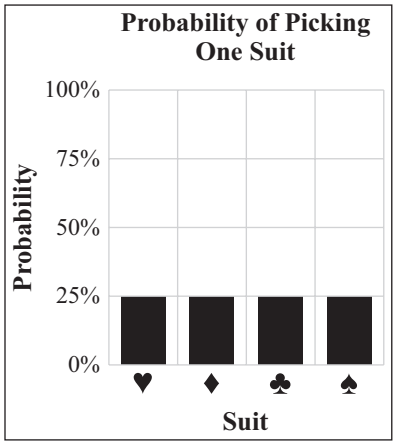
2.

	Write as a Fraction	Write as a Decimal	Write as a Percent
a) A Heart	$\frac{13}{52}$ or $\frac{1}{4}$	0.25	25%
b) A Black Card	$\frac{26}{52}$ or $\frac{1}{2}$	0.50	50%
c) A Red Card	$\frac{26}{52}$ or $\frac{1}{2}$	0.50	50%
d) An Ace	$\frac{4}{52}$ or $\frac{1}{13}$	0.08	8%

3. a) 25%

b) 25%

c)



d) There is a 100% chance of picking a club, a spade, a heart, or a diamond.

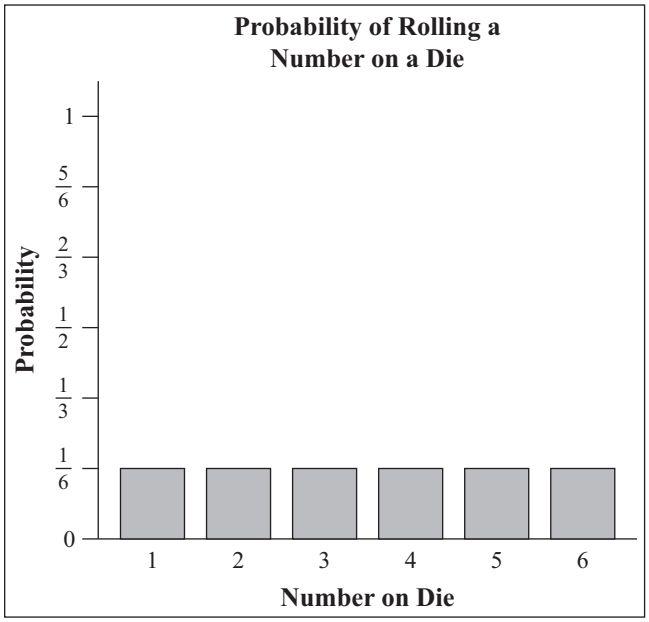
e) Answers will vary. Possible answers include that each card has a suit. So, there is a 100% chance of picking a card with a suit.

4. a) 6

b) $\frac{1}{6}$

c) $\frac{1}{6}$

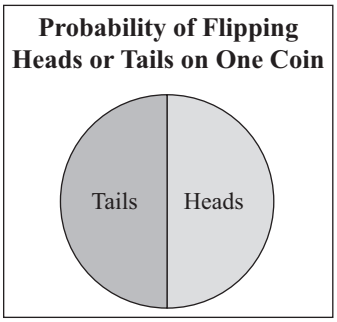
d)



e) $\frac{0}{6}$

f) There is no 7 on a die, so it cannot be rolled. There is 0% probability.

5.



6. a) blue = 40%, green = 30%, red = 20%, yellow = 10%

b) The probability is 50%.

c) The probability is 70%.

d) The probability is 60%.

Answers to Check Your Understanding (page 9)

100%: It will happen; 51%–99%: It is likely to happen;
50%: It might happen, it might not;
1%–49%: It is not likely to happen;
0%: It will not happen

Ongoing Assessment

- Check students' ability to make correct calculations.
- Check that students title their graphs, label axes when relevant, and fill in the bars or sectors with reasonable accuracy.
- Check answers to the Check Your Understanding to make sure that students understand the concepts being addressed.

Challenge!

Students can create their own activity or game, similar to the spinner in question 6. Have them ask each other questions related to the theoretical probability of various events using the spinners they create.

1.2 In a Perfect World (page 10)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
75–150 min	• standard decks of playing cards • standard dice • coin manipulatives	Master 1 Budget Tracker Master 9 Fraction Circles BLM 1–1 Standard Deck of Cards

Specific Expectations

A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.4 – represent categorical data by constructing graphs using a variety of tools
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event
A.2.4 – compare, through investigation, the theoretical probability of an event with the experimental probability, and describe how uncertainty explains why they might differ
A.2.5 – determine, through investigation using class-generated data and technology-based simulation models, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases

Cumulative Review

1. Express 45¢ as a decimal and as a percent of a dollar.

2. What fraction of a dollar is 75¢?

3. How many cards are in each suit in a standard deck?

4. What is the total number of face cards (jacks, queens, and kings) in a standard deck?

Answers to Cumulative Review

1. 0.45, 45%
2. $\frac{3}{4}$
3. 13
4. 12

What's the Math?

Students begin to differentiate between theoretical probability and experimental probability. The section title, In a Perfect World, refers to theoretical probability. In a perfect world, if you flip a coin 10 times, you will get 5 heads and 5 tails. In the real world, however, this does not always occur. Sometimes you get more or less than 5 heads. If you continue to flip the coin enough times, however, your results should average out to the theoretical probability. This is what students experiment with during this lesson.

Students conduct a number of experiments and collect data. The data is used to reinforce numeracy skills and to compare student-generated results (the data collected through the experiments or experimental probability) and the theoretical probability associated with each experiment. Students create a number of graphs that display their results and the results that would be obtained according to the theoretical probability of each activity.

Accommodations

- Students who have difficulty with the Warm Up questions could benefit from additional reinforcement.

Warm Up Notes

Questions 1 and 2 are closely related. In order to do both, students need to remember that to develop equivalent fractions, they need to divide or multiply both the numerator and the denominator by the same number.

If students do not remember how to do question 1, ask what number they could divide into both the numerator and denominator. Some students may use a number such as 2 or 5. That's fine. Have them continue to check their results to see if they can simplify the fraction further.

You may need to assist some students with the first equivalent fraction for question 2. Have them develop two more on their own.

Encourage students to use their work from Skills Practice 1 to start question 3, then to use the same pattern as they did in question 1.

For question 4, they will need to consider what fraction is shaded, and then consider what percent that might be. Encourage them to consider currency manipulatives. What amount is two-fifths of a dollar?

Question 5 is closely related to question 4. Encourage students to use similar thinking.

For question 6, they may want to review their work from Section 1.1 What's the Chance?. You may wish to provide them with **BLM 1–1 Standard Deck of Cards**.

When discussing answers with students, stress the mathematical processes at work. Look for and have students consider multiple representations and multiple strategies for working through questions.

Answers to Warm Up (page 10)

1. $\frac{1}{4}$

2. Answers will vary. Possible answers include $\frac{1}{2} = \frac{50}{100} = \frac{5}{10} = \frac{3}{6}$.

3. $\frac{9}{10}$

4. 40%

5.

6. $\frac{4}{52} = \frac{1}{13}$

Activity Planning Notes

Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

Work through questions 1 and 2 as a class. Lead students to the answers needed later in the section.

You may want to use proportional reasoning to help students with some of the questions. For example,

- A coin has two sides. There is a 50% chance of getting either side each time it is flipped. If I flip the coin 50 times, I am likely to get heads for half of the flips. That's 25.
- A die has 6 sides. There is a 1 in 6 chance of getting any number each time I roll it. So if I roll it 60 times, there must be a 10 in 60 chance of getting any number.

Encourage students to share their thinking as they work through these proportional reasoning calculations. Make sure that they understand the meaning of theoretical probability related to the events in questions 1 and 2.

You might start question 3 by flipping a coin 10 times. How many heads do you get? How many tails? Chances are it won't be 5 and 5. Explain that what happens each time you flip coins is not always perfect. In question 3, students are going to compare their results (experimental probability) to perfect world results (theoretical probability).

You may wish to do all of question 3 as a class. If not, create the graph in question 3a) to demonstrate what a completed graph should look like. Assign questions 3b)–d). Stress the need to roll the die *exactly* 60 times. Discuss the results before moving to question 4.

It may be possible to assign all of question 4. Otherwise, do #4a), then assign #4b)–d). The same process can be used to handle question 5. For #5c), have students estimate the size of each sector in the circle graph. In Chapter 2, students again sketch a circle graph and then use technology and a spreadsheet to develop one.

It is important in this section to discuss the similarities and the differences between the perfect world results and the results obtained by students (compare the theoretical probability to the experimental probability).

Conclude the section by having students complete the Check Your Understanding.

Accommodations

- Some students may benefit from working in pairs or in a group of three. This may help to ensure that they conduct the correct number of experimental trials.
- Students who need assistance estimating the size of various fractions of a circle might use **Master 9 Fraction Circles** to help them with question 5c).

Speed Bump

- Some students may struggle with keeping track of the number of rolls, flips, etc., completed.

R_x Have students work in pairs, with one partner doing the experiment and one partner recording results. Switch roles after one student has completed the experiment.

Literacy Link

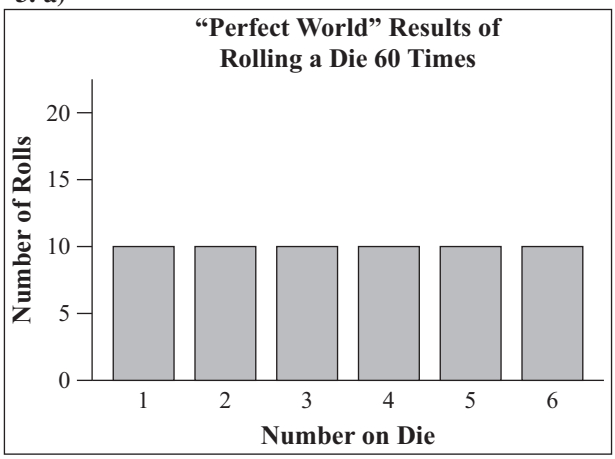
Stress the terminology of probability and graphing. Use and encourage students to use the terms *labels, titles, sectors, theoretical probability*, and *experimental probability*. Have them write the key terms and definitions in the Probability Glossary starting on page 1. You may wish to have them add some rows to the table on page 2 and add and define the graphing terms there.

Answers to Activity Questions (pages 10–13)

1. a) You would get 25 heads and 25 tails.
b) 10
c) 10

2. theoretical probability

3. a)

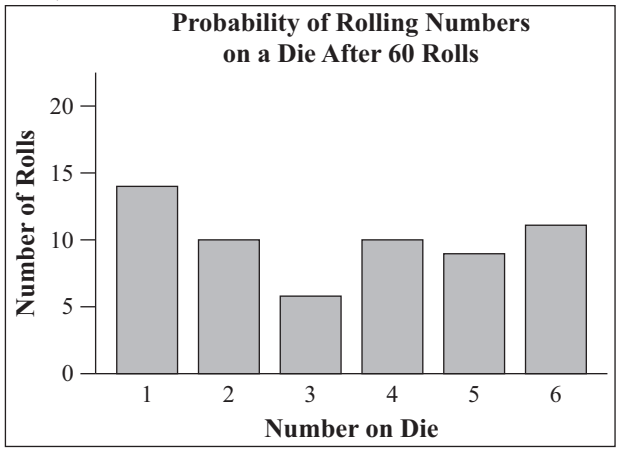


Answers to parts b), c) and d) will vary depending on the experimental results. Encourage students to shake the die well before rolling and to record their results accurately. An example is provided for each.

b) Answers will vary for parts b)–d). Make sure that the graph matches the experimental results recorded in the table. Example:

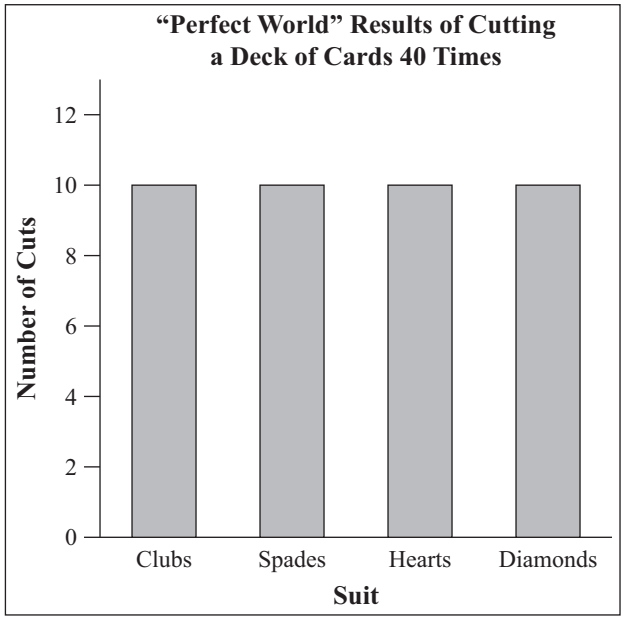
1	14
2	10
3	6
4	10
5	9
6	11

c)



d) $1 = \frac{14}{60}$ or $\frac{7}{30}$, $2 = \frac{10}{60}$ or $\frac{1}{6}$, $3 = \frac{6}{60}$ or $\frac{1}{10}$,
$4 = \frac{10}{60}$ or $\frac{1}{6}$, $5 = \frac{9}{60}$ or $\frac{3}{20}$, $6 = \frac{11}{60}$

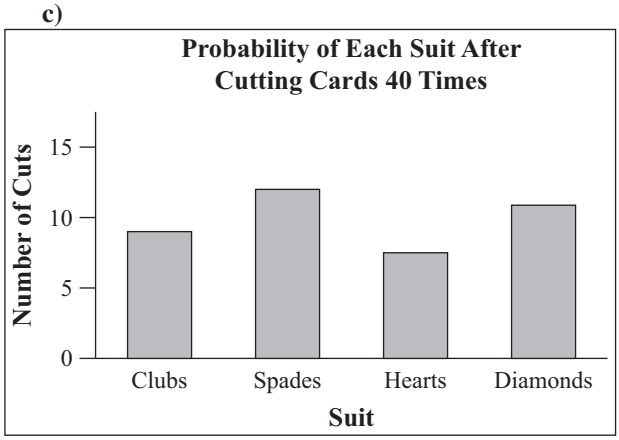
4. a)



b) Answers to parts b), c), and d) will vary depending on the experimental results. Encourage students to record their results accurately. Example:

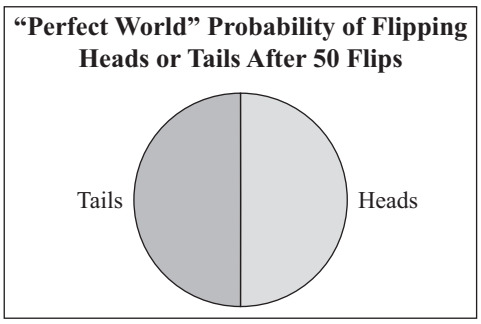
♣	9
♠	12
♥	8
♦	11

c)



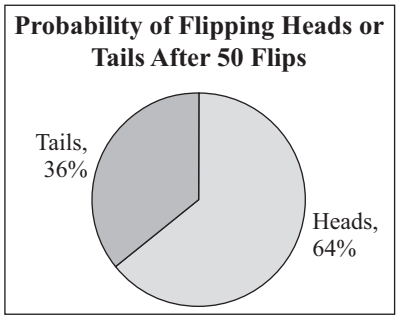
d) clubs = $\frac{9}{40}$, 22.5%; spades = $\frac{12}{40}$ or $\frac{3}{10}$, 30%; hearts = $\frac{8}{40}$ or $\frac{1}{5}$, 20%; diamonds = $\frac{11}{40}$, 27.5%

5. a)



b) Answers to parts b) and c) will vary. Example: heads = 32, tails = 18

c)



Answers to Check Your Understanding (page 13)

1. a) Answers will vary depending on experimental results. Some students may have results that are close to the expected "perfect world" results, but none should be exact, particularly for all three experiments.

b) We did not have a large enough sample to get an experimental probability close to the theoretical probability. That is, ours is not a perfect world.

Challenge!

Students can create a spinner like the one in the previous section and perform an experiment. Alternatively, they can use the game that they created in the Challenge for the previous section. Have them compare the theoretical probability of getting specific results to the experimental probability when they use the spinner a given number of times.

Ongoing Assessment

- Check students' ability to graph and to make correct calculations.
- Check answers to the Check Your Understanding to make sure that students understand the concepts being addressed.

Tech Tip: Experimenting with a Random Number Generator (page 14)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
10–20 min	• graphing calculators	Tech 1 Using a Random Number Generator in Fathom

Specific Expectations

A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event

A.2.5 – determine, through investigation using class-generated data and technology-based simulation models, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases

Speed Bump

- Some students may have no experience using a graphing calculator.

R_x Work with these students individually or pair each with a stronger student.

Accommodations

- Some students may benefit from working in pairs.
- Students may require additional reinforcement.

Technology Link

To access a Web site with a random number generator, go to **www.mcgrawhill.ca/books/workplace12** and follow the links.

What's the Math?

This Tech Tip introduces students to using a random number generator on a graphing calculator.

Activity Planning Notes

Distribute graphing calculators and have students work through the Tech Tip independently or in pairs. Display the screen of a graphing calculator using a projector or an interactive whiteboard. Ensure that students follow the directions in their proper sequence and can generate random numbers. Assist as necessary.

Alternatively, you can teach this Tech Tip as a teacher-led exercise. Some students will be able to complete questions 3b)–4 on their own, while some may benefit from a continued demonstration. Use the graphing calculator to collect another complete set of data for each student and, thus, the whole class. Compare the results to those obtained previously.

If you do not have access to graphing calculators, you may wish to use **Tech 1 Using a Random Number Generator in Fathom**. Alternatively, you can use an online random number generator.

Literacy Link

Have students define the term *random* in their own words. Encourage them to provide an example of something that is random or could be random.

Answers to Tech Tip (pages 14–15)

3. c) 13

d) 52

e) 6

Challenge!

Try This!

The calculator displays the option as "5:randInt(." Have students define the term *integer* and explain how it differs from *number*.

Skills Practice 2: Equivalent Fractions
(page 16)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
15–30 min	• rulers (optional)	Master 8 Fraction Strips Master 9 Fraction Circles SP BLM 2 Equivalent Fractions

Specific Expectation

C.3.1 – identify and describe applications of ratio and rate, and recognize and represent equivalent ratios and equivalent rates, using a variety of tools

Activity Planning Notes

Use this Skills Practice as an early diagnostic assessment of students' basic numeracy skills as they relate to fractions. Work through the Example with the class. The remainder of the Skills Practice can be assigned. Encourage students to discuss and share the strategies they use as they develop answers for each part. Some students may use strategies that will help others better understand what is needed.

Some students may need to use a ruler to prove that the three bars in the Example have exactly the same amounts shaded.

For question 1, have them use a ruler to check the same thing. The visual gives them one equivalent fraction for $\frac{2}{3}$. Challenge students to develop another and share how they did it. Some students will use proportional reasoning. Others may try using a pencil to divide each segment of the bar a different way.

$\frac{2}{3} = \frac{4}{6}$

Display and discuss both methods. What other strategies do students use?

Question 2 follows the same pattern as question 1. Again, the same fraction of each circle is shaded. What strategies can students use to develop additional equivalent fractions? Display and discuss their ideas, then have them answer question 3.

For question 4, students may wish to develop their own visuals, then share them with a peer and challenge the peer to provide two more equivalent fractions.

Have students use the strategies they developed during questions 1 to 4 to answer question 5. Some students will use proportional reasoning here. That is an efficient way to answer this question; however, other strategies can also be used.

Accommodations

- Some students may benefit from working in pairs or in a group of three.
- Students who have difficulty with equivalent fractions could benefit from additional reinforcement. Have them use **Master 8 Fraction Strips** and **Master 9 Fraction Circles** to develop additional equivalent fractions. These students would also benefit from completing **SP BLM 2 Equivalent Fractions**.

Speed Bump

- Some students will benefit from using hands-on materials.

R$_x$ Provide fraction manipulatives or fraction strips such as those on **Master 8 Fraction Strips** and **Master 9 Fraction Circles**.

Ongoing Assessment

- Check students' ability to develop equivalent fractions using a number of strategies, including proportional reasoning.

Literacy Link

Read the opening three lines of Skills Practice 2 with students. Discuss the two words that go together to make *equivalent*: *equal* and *value*. Have students consider how this understanding might help them develop equivalent fractions.

Answers to Skills Practice 2 (pages 16–17)

1. a) $\frac{2}{3}, \frac{6}{9}$

b) Answers will vary. Possible answers include $\frac{6}{9}$.

2. a) $\frac{1}{2}$

b) $\frac{2}{4}$

c) $\frac{4}{8}$

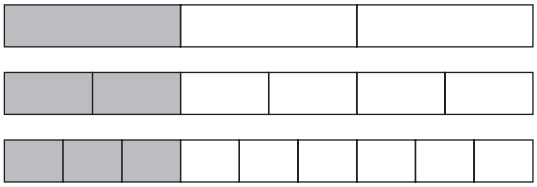
3. Answers will vary. It may be helpful for students to find fractions equivalent to $\frac{1}{2}$ starting with numerators and denominators close to 1 and 2, respectively. Possible results include:

a) $\frac{1}{2} = \frac{4}{8} = \frac{6}{12} = \frac{10}{20}$

b) I know that $\frac{1}{2}$ of 20 is 10, so $\frac{10}{20}$ is equivalent to $\frac{1}{2}$.

4. Answers will vary. Encourage students to choose examples other than those shown in the text or used in earlier examples. Possible answers include

a)



b) $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}$

5. Answers are in italics.

$\frac{1}{2} = \frac{2}{\textit{4}} = \frac{\textit{3}}{6} = \frac{10}{\textit{20}} = \frac{20}{\textit{40}} = \frac{\textit{25}}{50} = \frac{\textit{50}}{100} = \frac{250}{\textit{500}}$

1.3 Roll the Bones (page 18)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
75–150 min	• standard dice (2 different colours—optional)	Master 1 Budget Tracker

Specific Expectations

A.1.1 – read and interpret graphs obtained from various sources
A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.4 – represent categorical data by constructing graphs using a variety of tools
A.1.5 – make inferences based on the graphical representation of data, and justify conclusions orally or in writing using convincing arguments
A.1.6 – make and justify conclusions about a topic of personal interest by collecting, organizing, representing, and making inferences from categorical data from primary sources or secondary sources
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event
A.2.4 – compare, through investigation, the theoretical probability of an event with the experimental probability, and describe how uncertainty explains why they might differ
A.2.5 – determine, through investigation using class-generated data and technology-based simulation models, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases
C.3.2 – identify situations in which it is useful to make comparisons using unit rates, and solve problems that involve comparisons of unit rates

Cumulative Review

1. How many clubs would you expect if you cut a deck of cards 100 times?

2. What is the theoretical probability of rolling a 5 with one standard die?

3. Write two equivalent fractions for $\frac{1}{3}$.

4. What fraction of an hour is 5 minutes?

5. What percent of an hour is 15 minutes?

Answers to Cumulative Review

1. Approximately 25

2. $\frac{1}{6}$

3. Answers will vary. Example: $\frac{2}{6}$ and $\frac{3}{9}$.

4. $\frac{5}{60} = \frac{1}{12}$

5. 25%

What's the Math?

Students continue to work with both theoretical probability and experimental probability, this time considering the results that can be obtained using two dice. They consider the different ways that two dice can land and why certain results (e.g., totals) have a greater likelihood of occurring. Again, students conduct

experiments to collect data they then display and analyse. They compare the theoretical results they have determined to their experimental results, and consider when experimental probability might approach theoretical probability.

Warm Up Notes

At this point in the chapter, students should have no problem with question 1. If they do, you may wish to provide coaching tips such as:

- Multiply the numerator and denominator by 2.
- What fraction do you have now?
- Draw a picture of that fraction.
- Is it the same as $\frac{1}{4}$?
- How do you know?
- What other number(s) could you multiply the numerator and denominator by to get another equivalent fraction?

Encourage students to share their strategies for answering question 2. Some may be able to do this mentally using their knowledge of money. Ask them to share how they transfer from a fraction to a money equivalent to a decimal. Ask students what other strategies they use.

Questions 3 and 4 are closely related to question 1. Students are looking for an equivalent fraction, this time using division. What number can they divide the numerator and denominator by? When they get the answer, can they divide that numerator and denominator by the same number? If so, they are not yet in lowest terms. Have students share what numbers they divide by and why. The process is more important than the answer. Dividing by 2 and then 2 $\left(\frac{4}{12} = \frac{2}{6} = \frac{1}{3}\right)$ shows the process as well as does dividing by 4 $\left(\frac{4}{12} = \frac{1}{3}\right)$. After students have completed questions 3 and 4, you might ask them for three equivalent fractions for $\frac{1}{3}$ $\left(\frac{4}{12}, \frac{6}{18}, \frac{5}{15}\right)$.

Question 5 checks that students can read graphs similar to the ones they have been creating. Students may need a ruler to evaluate each bar. In many cases, they will have to approximate numbers. Encourage them to pencil the value of each bar right on the bar. That way, they won't forget why they arrived at the answers they did.

Answers to Warm Up (page 18)

1. Answers will vary. Possible answers include $\frac{2}{8}$, $\frac{3}{12}$, and $\frac{4}{16}$.

2. 0.25, 0.20

3. $\frac{1}{3}$, $\frac{1}{3}$

4. $\frac{1}{3}$

5. Answers may vary slightly, depending on how students interpret the value of each bar.
a) 240
b) 310
c) 1770

Activity Planning Notes

Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

Question 1 uses theoretical probability. Do the question as a whole group. Ask students to explain their answers to part d). Since this is a prediction exercise, expect a wide variety of answers.

Set up the activity in question 2, emphasizing that students need to roll the dice *exactly* 50 times. Students may wish to compare their graphs for part b). What is the same about each graph? (Title, axes labels, possibly scale) How are many graphs different? (Possibly scale, value of bars) Ask students to explain why the graphs may be different. (Their experimental results varied.) Discuss the results for parts c) and d) before moving to question 3.

Before starting question 3, use two different coloured dice to demonstrate the information in the two bullets preceding the question. If dice of two different colours are not available, refer to the die on the left and the die on the right. Discuss the results to question 3 to ensure students understand the concept prior to moving to the rest of the section. Make sure that students have all possible combinations.

Have students compare their graphs for question 3b). Since these graphs show theoretical probability, they should show the same values.

Students can use their chart in question 3a) to do question 4, or try to give the totals using two dice as manipulatives.

Question 5a) uses the data from question 3a) in a different way. Students show the number of combinations for each total as a fraction and as a percent rounded to the closest whole percent. Review the marginal Tech Tip on using the [%] key on a standard calculator. Have students try the sequence on their calculator to make sure that it works, then use the sequence to calculate the percents for the fourth column of the chart.

You may wish to discuss why the total for the percent column adds up to more than 100% (due to rounding). It may be beneficial to discuss question 5b)–d) as a whole group. Question 5d) is closely related to question 4.

In question 6, students compile a large sample of results from an experimental probability experiment and graph the data.

Conclude the section by having students complete the Check Your Understanding. Discuss question 2 in detail. Have the class compare the class results (question 6) to those for the individual students (question 2). It is likely that the class results will more closely relate to the theoretical results (question 3) than the results for individual students. You may wish to discuss why this happened. (The sample size is larger.)

Accommodations

- Some students may benefit from working in pairs or in a group of three. This may help to ensure that the correct number of experimental trials are conducted.
- Some students may benefit from using two different coloured dice.

Speed Bump

- Some students may write an impossible combination of rolls, such as (1, 7), which adds to 8.

R_x Give students two different coloured dice and have them use these dice to demonstrate the possible rolls.

Literacy Link

Continue to reinforce the vocabulary associated with probability. Differentiate between experimental probability and theoretical probability whenever appropriate. As students work on each question, ask whether they are working with theoretical probability or experimental probability. Reinforce that experimental probability means that they are manipulating something such as coins, dice, or a spinner.

Answers to Activity Questions (pages 18–23)

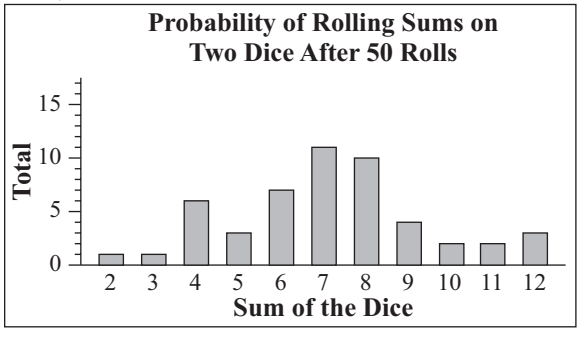
1. a) 2
b) 12
c) 11
d) Answers will vary. You may wish to check that students know how many different ways there are to get a total of 7 using two dice. [(1, 6), (6, 1), (2, 5), (5, 2), (3, 4), (4, 3)]

2. Answers will vary based on individual student results. Students may wish to work with a partner while they roll the dice to ensure results are added correctly. Examples are provided.

a)

Sum of the Dice	Total Times Rolled
2	1
3	1
4	6
5	3
6	7
7	11
8	10
9	4
10	2
11	2
12	3

b)

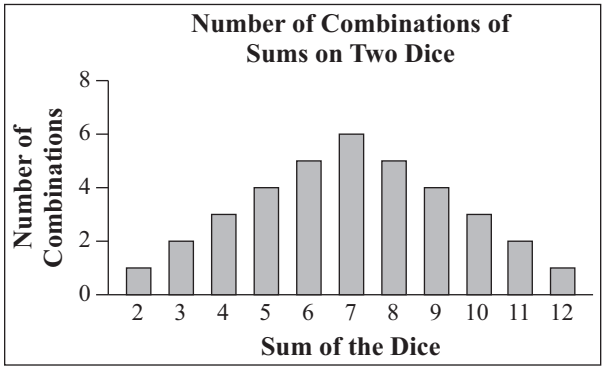


c) No.
d) The roll is random. Also, there are multiple ways to roll some of the sums.

3. a)

Sum of the Dice	Possible Combinations	Number of Combinations
2	(1, 1)	1
3	(1, 2) (2, 1)	2
4	(1, 3) (2, 2) (3, 1)	3
5	(1, 4) (2, 3) (3, 2) (4, 1)	4
6	(1, 5) (2, 4) (3, 3) (4, 2) (5, 1)	5
7	(1, 6) (2, 5) (3, 4) (4, 3) (5, 2) (6, 1)	6
8	(2, 6) (3, 5) (4, 4) (5, 3) (6, 2)	5
9	(3, 6) (4, 5) (5, 4) (6, 3)	4
10	(4, 6) (5, 5) (6, 4)	3
11	(5, 6) (6, 5)	2
12	(6, 6)	1
Total Number of Combinations		36

b)



c) 7
d) Answers will vary depending on individual student results.

e) Answers will vary. Possible answers include that a large number of experiments are needed to ensure that experimental probability simulates theoretical probability.

4. Look for 21 combinations: (1, 6), (6, 1), (2, 5), (5, 2), (3, 4), (4, 3), (2, 6), (3, 5), (4, 4), (5, 3), (6, 2), (3, 6), (4, 5), (5, 4), (6, 3), (4, 6), (5, 5), (6, 4), (5, 6), (6, 5), (6, 6).

5. a)

Sum of the Dice	Number of Combinations	Fraction of the Total Number of Combinations	Percent of the Total Number of Combinations
2	1	$\frac{1}{36}$	2.777 = 3%
3	2	$\frac{1}{18}$	5.555 = 6%
4	3	$\frac{1}{12}$	8.333 = 8%
5	4	$\frac{1}{9}$	11.111 = 11%
6	5	$\frac{5}{36}$	13.888 = 14%
7	6	$\frac{1}{6}$	16.666 = 17%
8	5	$\frac{5}{36}$	13.888 = 14%
9	4	$\frac{1}{9}$	11.111 = 11%
10	3	$\frac{1}{12}$	8.333 = 8%
11	2	$\frac{1}{18}$	5.555 = 6%
12	1	$\frac{1}{36}$	2.777 = 3%
Total	36	$\frac{36}{36}$	101%

b) 2 and 12, 3 and 11, 4 and 10, 5 and 9, 6 and 8
c) 2 and 12
d) 59%

6. Answers will vary depending on classroom tallies.

Answers to Check Your Understanding (page 23)

1. Answers will vary depending on classroom results. It is more likely for the graph in #6 to resemble the graph in #3.

2. The graph in #6 provides data from a larger sample, so it is more likely to resemble the theoretical probability graph in #3.

Challenge!

Students can repeat what they did in this section using three dice instead of two.

Ongoing Assessment

- Check students' ability to graph accurately and to make correct calculations.
- Check answers to the Check Your Understanding to make sure that students understand the concepts being addressed.

1.4 Heads, Heads, Heads (page 24)

SUGGESTED TIMING
75–150 min

MATERIALS
- coin manipulatives
- cardboard box (optional)
- 3 each of 3 different fruits or pictures of fruits (optional)
- candies (optional)

BLACKLINE MASTERS
Master 1 Budget Tracker
BLM 1–1 Standard Deck of Cards

Specific Expectations

A.1.1 – read and interpret graphs obtained from various sources
A.1.2 – explain the distinction between the terms population and sample, describe the characteristics of a good sample, and explain why sampling is necessary
A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.4 – represent categorical data by constructing graphs using a variety of tools
A.1.5 – make inferences based on the graphical representation of data, and justify conclusions orally or in writing using convincing arguments
A.1.6 – make and justify conclusions about a topic of personal interest by collecting, organizing, representing, and making inferences from categorical data from primary sources or secondary sources
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event
A.2.4 – compare, through investigation, the theoretical probability of an event with the experimental probability, and describe how uncertainty explains why they might differ
A.2.5 – determine, through investigation using class-generated data and technology-based simulation models, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases
C.3.2 – identify situations in which it is useful to make comparisons using unit rates, and solve problems that involve comparisons of unit rates

Cumulative Review

1. List the different combinations you can roll to get a sum of 8 with two dice.

2. a) What is the theoretical probability of rolling a 12 with two dice?

b) What other total has the same theoretical probability?

3. How many combinations are possible when you roll two dice?

4. What is the theoretical probability of rolling a 7 with one die?

Answers to Cumulative Review

1. (2, 6), (3, 5), (4, 4), (5, 3), (6, 2)

2. a) $\frac{1}{36}$
b) 2

3. 36

4. 0 or impossible

What's the Math?

Students continue to expand their knowledge of theoretical probability and experimental probability by flipping coins. This time, they start with an experiment, then examine the theoretical probability of getting each flip. The concept of sample size is introduced. Students consider how sample size affects results.

Students continue to reinforce the data management skills and the numeracy skills that have dominated the chapter.

Warm Up Notes

Students will be familiar with the answer to question 1. If they hesitate, suggest that they grab a coin and consider how many ways it can land.

Encourage students to use personal strategies for answering question 2. Discuss what strategies they used. Encourage students to consider using proportional reasoning. Their thinking might be as simple as:
- 1 chance in 2 of getting tails
- so that would make 5 chances in 10
- or 10 chances in 20
- or 15 chances in 30
- or 20 chances in 40

Make sure that the probability number line discussed in Section 1.1 notes on TR page 8 is displayed prominently so that students can readily answer question 3.

Questions 4 to 6 use the same skills. Encourage students to transfer their knowledge of money to help them quickly develop decimals for $\frac{3}{4}$ and $\frac{1}{4}$. They can then change these to percents. Provide students with **BLM 1–1 Standard Deck of Cards** if they are struggling with question 5. Encourage students to report the strategies they used to develop the percent for question 6. As in question 2, they may use proportional reasoning such as
- 8 chances in 25 of getting heads
- which would make 16 chances in 50
- or 32 chances in 100
- so it's 32%

Answers to Warm Up (page 24)

1. $\frac{1}{2}$

2. approximately 20

3. not likely

4. 0.75, 75%

5. $\frac{1}{4}$, 25%

6. $\frac{8}{25}$, 32%

Accommodations

- Some students may benefit from working in pairs or in a group of three. This may help to ensure that students conduct the correct number of experimental trials.
- Students who need further practice with probability using three events might do the following:
  - Construct a slot machine by cutting three holes in a cardboard box. Sit one student behind each hole. Each student in the box receives three things: an actual pear, apple, and orange; or pictures of these.
  - Give five candies to each student player.
  - Each student pays one candy to *play* the slot machine. After the player has paid, the students in the slots raise one fruit each. The player wins one candy for getting matching fruits in the first two slots and five candies for getting three matching fruits.
  - Encourage all students to record how much they win or lose.
  - At the end of the game, discuss the experimental probability of winning five candies.
  - Compare this experimental probability to the theoretical probability in questions 3 and 4. Discuss how a smaller or larger sample might influence the results.

Activity Planning Notes

Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

Read the information in the bullets preceding question 1 to set up the experiment. Ensure that each student flips the three coins exactly 40 times. Students may benefit from working in pairs. Emphasize that question 1 asks students to predict the results of an experiment they will do. This is not the theoretical probability, but a prediction.

Once students have made their prediction, have them do the actual experiment in question 2. For each pair, have one person do the flipping and the other do the recording. Partners can change roles at the end of the first set of 40 flips. Discuss the results obtained in question 2. Did the results confirm students' predictions or make them rethink?

Question 3 can be done individually, in small groups, or as a whole class discussion. Emphasize that students worked with experimental probability in question 2. In question 3, they are analysing theoretical probability.

Have students attempt question 4 individually. As question 5 parallels the previous section, have students work independently wherever possible.

The Check Your Understanding for this section is extensive and will allow you to assess student learning of how sample size affects results. Encourage students to use proportional reasoning and their answer to question 4 in the section to answer question 5 in the Check Your Understanding.

Literacy Link

When the word *sample* is first introduced, discuss this term with students. Have them write a definition in the Probability Glossary that starts on page 1. During the section, model how to use the word appropriately. For example, the individual results in question 2 provide a sample of the overall class results. The overall class results provide a sample of what you might find if you flipped three coins 8 million times. Discuss the advantages and disadvantages of large samples (closer to theoretical probability, but very time-consuming) and small samples (easy to do, but may vary greatly and can be very different from theoretical probability).

Answers to Activity Questions (pages 24–26)

1. Answers will vary.

2. Answers will vary depending on experimental results. Examples:
a) Successful: 8; Unsuccessful: 32
b) 8, $\frac{1}{5}$
c) 20%

3.

First Coin	Second Coin	Third Coin
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

4. a) $\frac{1}{8}$, 12.5%
b) $\frac{7}{8}$, 87.5%

5. Answers will vary depending on the number of students in the class. It may be helpful to have each student write their individual results on the board or to use technology to track results.

Answers to Check Your Understanding (page 27)

1. Answers will vary. Examples:
a) No.
b) A sample of 1 is not large enough to determine experimental probability.

2. Answers will vary depending on individual student results.

3. Answers will vary depending on individual student results.

4. The more trials there are, the closer the experimental probability will be to the theoretical probability.

5. 1 000 000

6. The theoretical probability is 12.5% or $\frac{1}{8}$. I would expect the number to be close to 1 000 000 because the sample size is very large.

Challenge!

- Students can extend the experiment to using four or five coins. What is the theoretical probability of getting all heads? What experimental results do they get when they flip that number of coins 40 times?
- If students have not done the alternative activity in the Accommodations section, consider having them do that as an extension.

Ongoing Assessment

- Check students' ability to make correct calculations.
- Check answers to the Check Your Understanding to make sure that students understand the concepts being addressed.

1.5 Free Coffee (page 28)

SUGGESTED TIMING
75–150 min

MATERIALS
- standard dice
- possible materials for a simulation, such as a cup or a small box
- paper clips
- graphing calculators

BLACKLINE MASTERS
Master 1 Budget Tracker
BLM 1–2 Free Coffee Spinner

Specific Expectations

A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.4 – represent categorical data by constructing graphs using a variety of tools
A.1.5 – make inferences based on the graphical representation of data, and justify conclusions orally or in writing using convincing arguments
A.1.6 – make and justify conclusions about a topic of personal interest by collecting, organizing, representing, and making inferences from categorical data from primary sources or secondary sources
A.1.7 – explain how the media, the advertising industry, and others use and misuse statistics to promote a certain point of view
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.2 – identify examples of the use of probability in the media and various ways in which probability is represented
A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event
A.2.4 – compare, through investigation, the theoretical probability of an event with the experimental probability, and describe how uncertainty explains why they might differ
A.2.5 – determine, through investigation using class-generated data and technology-based simulation models, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases
C.3.2 – identify situations in which it is useful to make comparisons using unit rates, and solve problems that involve comparisons of unit rates

Cumulative Review

1. What is the probability of selecting an ace from a deck of cards?

2. Write a probability question in which the probability is 0 or impossible.

3. Write a probability question in which the probability is 100% or certain.

4. What is the largest number that can be rolled with three dice?

Answers to Cumulative Review Questions

1. $\frac{1}{13}$ or $\frac{4}{52}$

2. Answers will vary.

3. Answers will vary.

4. 18

What's the Math?

Students are introduced to simulations. Since the theoretical probability of certain games and contests is known, students use games and/or technology to simulate the actual playing of a game or contest. Students compare how the results generated by larger sample sizes (i.e., experimental probability) approach the theoretical probability of an event.

Warm Up Notes

Students have done many questions similar to questions 1 and 2, so should be able to do these readily. Praise them for their facility with this type of question.

Some students may answer "likely" for question 3, and then explain in question 4 that they are more likely to roll a 7 than to roll any other sum with 2 dice. Refer these students to the probability number line you posted in Section 1.1 and to their work on page 20. Ask:

- What is the probability of rolling a 7 with two dice? $\left(\frac{6}{36} \text{ or } \frac{1}{6}\right)$
- Where does this fraction fit on the probability number line? (less than 50% and more than 0%; that's unlikely)

Once students have done and discussed question 3, you might ask them the probability of rolling a 7 with one die. (impossible)

Question 5 is related to questions 3 and 4. Students may need to check their work on page 20.

Questions 6 to 8 work with the difference between theoretical and experimental probability. Listen to students as they discuss their answers to these questions and phrase their answer to question 8.

When discussing question 7, you may wish to average the experimental probabilities for the entire class. How does this affect the final result? Review how sample size relates to experimental probability.

Answers to Warm Up (page 28)

1. $\frac{1}{5}$, 20%

2. 0.7, $\frac{7}{10}$

3. not likely

4. Example: The theoretical probability of rolling a 7 is 1 in 6 rolls, $16.\overline{6}\%$, or approximately 17%. There is approximately an 83% probability of *not* getting a 7.

5. $\frac{1}{9}$, approximately 11%

6. $\frac{5}{10}$, 50%

7. Answers will vary depending on the experimental results.

8. Example: Theoretical probability is the chance something will happen. Experimental probability is the ratio of the number of times an event occurs compared to the total number of trials.

Accommodations

- Some students may benefit from working in pairs or in a group of three. This may help to ensure that students will conduct the correct number of experimental trials.
- Students who need a simple simulation for question 2 may wish to use **BLM 1–2 Free Coffee Spinner**. Spinners are a fast and effective means of simulating an activity such as this. To work the spinner, have students thread a paper clip through the tip of a pen or pencil, as shown on the spinner. They spin the paper clip and record where it lands.

Activity Planning Notes

Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

This activity is modelled after the Tim Hortons® Roll Up The Rim To Win promotion. If you are teaching this section during the promotion, you may wish to relate the exercise to the contest. Make sure students recognize that the theoretical probability provided on page 29 may not be exactly the same as the theoretical probability of winning something in the Tim Hortons® contest.

As with the earlier sections in this chapter, it may be necessary to do the introduction to the experiment (questions 1 and 2) as a class activity. For question 2, encourage students to develop their own simulations using materials at hand. They could use dice. Other materials are just as effective. For example, they could put nine pieces of paper in a cup or small box. Eight of the pieces of paper could say *Try again*; the ninth could say *Winner*. Students could shake the container, choose one piece of paper, record the word, put the piece of paper back in, and repeat this process for the number of times outlined in the simulation.

Once students have developed their simulation, have them predict what number of winners they will get and explain their thinking (questions 2b) and c)).

Have students work in pairs to complete question 2d)–h), and then discuss the results as a class.

Technology Link

To access a Web site with a random number generator, go to **www.mcgrawhill.ca/books/workplace12** and follow the links.

Students worked with random number generators in Section 1.2. Having them use the random number generator after doing the simulation with dice or other manipulatives reinforces the concept and triples the amount of data collected. Continue to emphasize accurate collection of data by conducting the exact number of trials requested.

In question 5, students collect results from the entire class. Discuss how large the sample then is and how this can affect the experimental probability.

Conclude the section by having students complete the Check Your Understanding. They may then wish to discuss their chances of winning something in such a contest. You may wish to refer them back to the cartoon on page 3. How might the activity in this section influence the way they now read the cartoon?

Literacy Link

This section introduces the word *simulate*, which is a verb. You may wish to add the noun, *simulation*. Discuss the meanings of these words. Have students provide examples. Ask students to define the term(s) in their own words in the Probability Glossary that starts on page 1.

Students also work with a *random number generator*. This term can also be defined in the Probability Glossary. You may wish to discuss with students how a random number generator can be used to simulate an event in order to determine experimental probability.

Answers to Activity Questions (pages 29–33)

1. a) Example: For every 9 cups I buy, I will win once.
b) probability, likelihood
c) rolling a 5 or a 9 with 2 dice

2. a) Answers will vary. Students may decide to use dice, a spinner, or another form of simulation.
b) approximately 11
c) Example: The probability is $\frac{1}{9}$ or 11%. Percent means "out of 100," so there would be 11 winners in 100 rolls.
d) Answers will vary. Make sure that winners + non-winners = 100.
e)–h) Answers will vary.

3.–4. Answers will vary.

5. Answers will vary depending on the number of students in the class and their individual results. It is likely that the class's winning percent will be closer to theoretical probability than most of the individual winning percents.

Answers to Check Your Understanding (page 33)

1. Answers will vary depending on the number of students but should approximate 11% of the total number of events.

2. Example: The sample size for my experiment is smaller, so my results are not as close to 11%.

3. Example: No, because it implies that each coffee wins.

Challenge!

- If the promotion is going on, students can collect actual promotional coffee cups for two months and analyse the data.
- Students can test the probability in another promotion for a product that interests them or that they, their family, or their friends frequently use. For example, if there is a breakfast program in the school, they might check which cereals used in the breakfast program have associated figurines or other things inside, and check the probability of receiving each of the various figures.
- Students can test the probability of winning a prize in a draw by comparing the number of prizes to the number of tickets sold.

Ongoing Assessment

- Check students' ability to collect data correctly and to make correct calculations.
- Check students' ability to use technology appropriately for the simulation.
- Check answers to the Check Your Understanding to make sure that students understand the concepts being addressed.

1.6 What Are the Odds? (page 34)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
150–225 min	• data about the population of your school	Master 1 Budget Tracker BLM 1–1 Standard Deck of Cards

Specific Expectations

A.1.2 – explain the distinction between the terms population and sample, describe the characteristics of a good sample, and explain why sampling is necessary
A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.6 – make and justify conclusions about a topic of personal interest by collecting, organizing, representing, and making inferences from categorical data from primary sources or secondary sources
A.1.7 – explain how the media, the advertising industry, and others use and misuse statistics to promote a certain point of view
A.2.2 – identify examples of the use of probability in the media and various ways in which probability is represented
A.2.6 – interpret information involving the use of probability and statistics in the media, and describe how probability and statistics can help in making informed decisions in a variety of situations
C.3.1 – identify and describe applications of ratio and rate, and recognize and represent equivalent ratios and equivalent rates, using a variety of tools

Cumulative Review

1. List the combinations that total 10 when you roll two dice.

2. What is the probability of flipping "heads, heads" with two coins?

3. What is the probability of drawing a spade from a deck of cards?

4. You flip a coin 10 times and get 8 heads. What type of probability are you working with?

Answers to Cumulative Review Questions

1. (4, 6), (5, 5), (6, 4)

2. $\frac{1}{4}$

3. $\frac{1}{4}$ or 25%

4. experimental probability

What's the Math?

This section deals with a number of practical applications of probability.
- Students make the connection between theoretical probability and odds.
- Students look at samples and populations.
- Students use ratios and proportional reasoning to determine whether a sample reflects the population.
- Students consider how probability used by the media can aid in personal decision making.

Encourage students to connect each of these practical uses of probability to their own lives. How do they use probability from day to day?

Warm Up Notes

By this time in Chapter 1, students should be familiar with the contents of a deck of cards. If they aren't and you have not already handed out **BLM 1–1 Standard Deck of Cards**, you may wish to do so now to remind them of:

- the number of cards in a deck
- the number of 7s of clubs in a deck
- the number of red cards in a deck

Accommodations

- Some students may benefit from working in pairs or in a group of three.

They will need this information in order to answer questions 1 and 2. Discuss how this form of showing probability uses ratios (e.g., 1 in x) rather than fractions, decimals, or percents.

In question 3, some students will have noticed a pattern to these types of questions:

- the probability of tails with one coin is 1 in 2
- the probability of tails with two coins is 1 in 4
- the probability of tails with three coins is 1 in 8

Ask them to look at the pattern and predict the probability of getting "tails, tails, tails, tails" with four coins. (1 in 16) Discuss what strategies they used to determine this answer. (For each coin, the probability doubles, *or* calculate 2 to the power of the number of coins. 4 coins = $2^4 = 16$) Once they see the pattern, ask them the probability of "tails, tails, tails, tails, tails" with five coins. (1 in $2^5 = 32$)

Have students report the strategies they used to answer question 4, and any equivalent fractions they may have developed as they worked toward lowest terms.

Answers to Warm Up (page 34)

1. 2

2. 26

3. $\frac{1}{8}$

4. a) $\frac{1}{2}$

b) $\frac{7}{10}$

Activity Planning Notes

Have students fill in the previous day's spending on **Master 1 Budget Tracker**.

In common language, people often use the term *odds* as a synonym for *probability* or *chance*. The opening part of this section shows how the terms differ. To strengthen the distinction between probability and odds, it may be necessary to do pages 34 and 35 as a class activity. Consider having students

identify the theoretical probability of each part of question 1, and then determine the odds. Ask students to report on the strategies they used to differentiate between odds and probability.

Speed Bump

- Some students may struggle with distinguishing between probability and odds.

R$_x$ Stress the understanding of probability, which is the concept directly tied to the curriculum.

Probabilities for Question 1

1. a) $\frac{26}{52} = \frac{1}{2}$, 1 : 2

b) 1 : 4

c) 4 : 52 or 1 : 13

d) 12 : 52 or 3 : 14

e) 1 : 6

f) 1 : 4

g) 1 : 8

You can use estimated numbers for question 2 if the actual data is unavailable. Complete and display the answers for question 2, so that students can complete questions 3 and 4.

Discuss the introduction to questions 5 and 6 as a class. You may wish to review the meaning of the word *sample*, and discuss what a *survey* is. Reinforce the connection between the two terms. People use a survey to get information from a sample population when they can't get information from the entire population.

To help students understand the difference between good and bad sampling techniques, you may want to suggest some ridiculous scenarios. For example, a cafeteria wants to know the lunch preferences of grade 9 students. The manager surveys grade 12 teachers. Discuss whether or not that was a good sample population to survey. What would have been a better sample population?

Once students are clear about samples and surveys, they can complete questions 6–8 as a class or in small groups.

Technology Link

Various Web sites provide local weather forecasts. **Go to www.mcgrawhill.ca/books/workplace12** and follow the links.

Students can do question 9 individually or in small groups. Ensure that students can interpret the weather forecast properly. It may be beneficial for students to go to a weather Web site and look at current conditions and forecasts. For part d), discuss the weather conditions needed for laying asphalt. (no rain)

Conclude the section by having students complete the Check Your Understanding. You might have students compare Jack's comment to the probability of guessing what numbers will come up when you roll a die six times. How are the two events similar? How do they differ?

Literacy Link

Have students create their own definition of *odds* and explain, orally or in writing, the difference between odds and probability. It may help for them to show the difference visually as well.

Discuss the meaning of the term *population*. Relate population as used in this section to the population of a town, province, or country. Students who have taken *Science Essentials 10* may wish to differentiate this common use of population from the scientific definition, which refers to a group of individuals of the same species living together in the same place. The population of a school is related to this definition, but differs slightly because the students are attending the school and the staff members are working there.

You may wish to have students add P.O.P. and its definition to the end of the Probability Glossary.

Answers to Activity Questions (pages 35–39)

1. a) $\frac{26}{26}$, 1 : 1
b) 1 : 3
c) 4 : 48 or 1 : 12
d) 12 : 40 or 3 : 10
e) 1 : 5
f) 1 : 3
g) 1 : 7

2. Answers will vary depending on the size of the school. Suggest resources, such as school or school board Web sites, where students can research this information.

3. Answers will vary. For example, if there were 12 male teachers and 16 female teachers, the odds would be 12:16 or 3:4.

4. Answers will vary.

5. a) Answers will vary from school to school, but should be the same in each classroom.
b) Example: It may take too long to ask the entire school population because it is large or some people may be off sick.

6. a) bad sample
b) bad sample
c) good sample
d) bad sample
e) bad sample
f) good sample
g) bad sample

7. Answers will vary. Example: Part g) is a bad sample because not all students have an equal chance of being in the cafeteria at the time of the survey.

8. a) Answers will vary. Example: students from all grades, teachers, and other staff members, in the proportion of the school's population that they represent
b) Answers will vary. Encourage a discussion about how best to represent the school with a survey. Ensure that students remember to represent the school's population proportionally. For example, if there are more grade 9 students in the population, they should survey more grade 9 students.
c) Answers will vary.
d) Answers will vary.

9. a) probability of precipitation
b) Example: P.O.P. information can help you determine if it is likely to rain or snow on a given day. This will help you decide whether or not outdoor events are practical.
c) Saturday, September 18, has the lowest P.O.P. and the highest temperature, and is a weekend day. Also allow Friday, September 17, if students provide a good reason.
d) Thursday, Friday, Saturday

Answers to Check Your Understanding (page 39)

1. He means that the ratio of being right to being wrong is close to 0 : 6.

Ongoing Assessment

- Check students' ability to distinguish between probability and odds.
- Check that students can differentiate between a population and a sample, and identify a good sample.
- Check students' ability to express ratios correctly.
- Check that students can identify how probability is used in the media and in daily life.
- Use the Check Your Understanding to make sure that students understand the concepts being addressed.

Challenge!

- Students can research other uses of the term *odds* in the media. Students can explain whether *odds* is being used as a synonym for *probability*.
- Students can track the accuracy of the six-day weather forecast for two weeks. They can record how many times the forecast for the next day was accurate, how many times the forecast two days in the future was correct, etc., up to the accuracy of the six-day forecast.

Chapter 1 Review (page 40)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
75 min	• standard decks of playing cards • coin manipulatives (optional) • standard dice (optional)	Master 2 Chapter Summary BLM 1–3 Chapter 1 Word Puzzle

Using the Chapter Review

Encourage students to read through the review before they attempt any of the review questions. Students should be able to work through the review at their own pace. You may wish to suggest that students follow the strategy outlined below when completing the chapter review.

1. First, complete any questions that you can do unassisted.

2. Next, do the questions that you understand but may need to refer back to notes or similar questions earlier in the chapter to complete.

3. Ask a classmate for help.

4. Ask the teacher for help.

Some students may need to do the review in chunks. For example, have students do questions 1–3, and then take up those questions. Then, have them do questions 4 and 5, and take up those questions. This process will eliminate the problem of students rushing through and completing many questions incorrectly.

Re-teach concepts and/or procedures as necessary.

To provide additional reinforcement of the glossary words for this chapter, have students complete **BLM 1–3 Chapter 1 Word Puzzle**.

Accommodations

- Students may benefit from making a chapter summary page that summarizes some of the key ideas/skills from the chapter. **Master 2 Chapter Summary** provides an outline for this work.
- Encourage students to highlight key words and key bits of information contained in each question.
- When students have difficulty on a particular review question, use the Review Guide to identify the section they need to review.
- You may wish to provide students with additional reinforcement of the questions in this section before moving on to the Practice Test.
- Some students can skip the Practice Test and move directly to the Chapter Task.

Study Guide

Question	Section(s)	Refer To
1	1.1	Collecting Data to Calculate Probability (page 11)
2	1.1	Calculating Theoretical Probability (pages 6–8, #1, #3)
3	1.3	Rolling Dice (page 20, #3)
4	1.2	Collecting Data to Calculate Probability (page 11, #3)
5	1.2	Collecting Data to Calculate Probability (page 12, #4)
6	SP 1	Skills Practice 1 (page 5, #3)
7	1.2	Collecting Data to Calculate Probability (page 12, #4)
8	1.6	It's On the Cup (page 35, #1)

Answers to Chapter 1 Review (pages 40–41)

1. Theoretical probability is the chance of something happening.

2. a) $\frac{1}{52}$
b) 0.5
c) 25%
d) $\frac{1}{6}$
e) 0.5
f) 100%

3. a) 36
b) (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)
c) $\frac{6}{36}$ or $\frac{1}{6}$

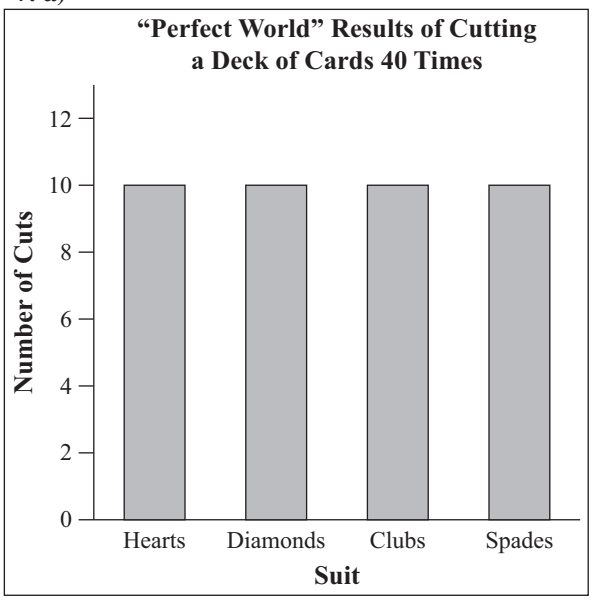
4. Experimental probability is the ratio of the number of times an event occurs compared to the total number of trials.

5. Answers will vary. Examples:
a) 2
b) $\frac{2}{10}$ or $\frac{1}{5}$, 0.2, 20%

6. Answers are in italics.

Fraction	Decimal	Percent
a) $\frac{1}{2}$	*0.5*	*50%*
b) $\frac{1}{10}$	*0.1*	*10%*
c) $\frac{3}{10}$	0.3	*30%*
d) $\frac{7}{10}$	0.7	*70%*
e) $\frac{9}{10}$	*0.9*	90%
f) $\frac{95}{100}$	*0.95*	95%

7. a)



b) theoretical

8. a) $\frac{1}{4}$
b) 2500
c) 1 : 3

Chapter 1 Practice Test (page 42)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
60–75 min	• standard dice • standard decks of playing cards (optional) • coin manipulatives (optional)	Master 2 Chapter Summary BLM 1–4 Chapter 1 Test

Using the Chapter Practice Test

As in the chapter review, encourage students to read through the practice test before they attempt any of the questions. Students should be able to work through the test at their own pace. You may wish to suggest that students follow the same strategy as for the chapter review. Remind them that a test is a time to show what they know. That's why it's important to do the questions they feel confident of first.

Re-teach concepts and/or procedures as necessary.

Study Guide

Question	Section(s)	Refer to
1	1.2	Collecting Data to Calculate Probability (pages 10–11)
2	1.1	Calculating Theoretical Probability (pages 6–8, #1, #3)
3	1.3	Rolling Dice (page 20, #3)
4	1.2	Collecting Data to Calculate Probability (page 11, #3)
5	SP 1	Skills Practice 1 (page 5, #3)
6	1.3	Rolling Dice (pages 20–21, #3)
7	1.4	Flipping Coins (page 25, #3)

Accommodations

- If they have not already done so, students may benefit from making a chapter summary page that summarizes some of the key ideas/skills from the chapter. Use **Master 2 Chapter Summary**.
- Encourage students to highlight key words and key bits of information contained in each question.
- When students have difficulty on a particular review question, use the Study Guide to identify the section they need to review. You may wish to provide them with additional reinforcement of the questions in this section before moving on to the Chapter Task.

Summative Assessment

- Have students complete **BLM 1–4 Chapter 1 Test**. Alternatively, students could be assessed using the Chapter Task.

Answers to Chapter 1 Practice Test (pages 42–43)

1. Theoretical probability is the chance of something happening in a perfect world. Experimental probability is the ratio of the number of times an event occurs compared to the total number of trials.

2. a) $\frac{13}{52}$ or $\frac{1}{4}$
b) $\frac{26}{52}$ or $\frac{1}{2}$
c) 50%
d) 0%
e) 0.5

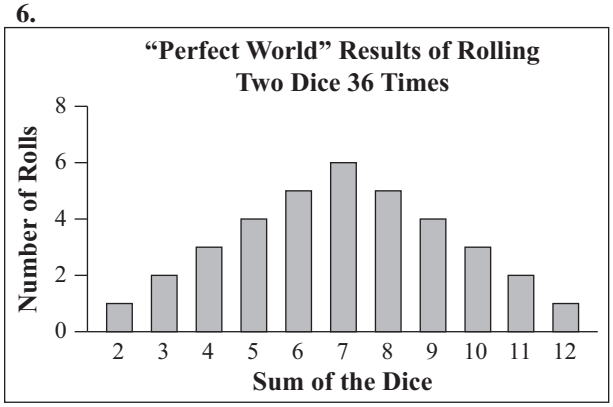
3. a) 36
b) (4, 6), (6, 4), (5, 5), (5, 6), (6, 5), (6, 6)
c) $\frac{6}{36}$ or $\frac{1}{6}$
d) $\frac{1}{6}$

4. Answers will vary. Examples:
a) 2
b) $\frac{2}{20}$ or $\frac{1}{10}$, 0.1, 10%
c) experimental

5. Answers are in italics.

Fraction	Decimal	Percent
a) $\frac{1}{4}$	*0.25*	*25%*
b) $\frac{1}{5}$	*0.2*	*20%*
c) $\frac{4}{10}$	0.4	*40%*
d) $\frac{65}{100}$	0.65	*65%*
e) $\frac{8}{10}$	*0.8*	80%

6.



7. a) The order will vary. There should be 16 (2^4) combinations.
HHHH
HHHT, HHTH, HTHH, THHH
HHTT, HTHT, HTTH, TTHH, THHT, THTH
HTTT, THTT, TTHT, TTTH
TTTT
b) The probability of getting all heads with four coins is 1 in 16 or 6.25% because there are 16 combinations and only one way to get all heads.

Task: Play Klass Kasino (page 44)

SUGGESTED TIMING	MATERIALS	BLACKLINE MASTERS
30–75 min	• calculators • standard decks of playing cards	BLM 1–5 Chapter 1 Task Recording Chart BLM 1–6 Chapter 1 Task BLM 1–7 Chapter 1 Task Rubric BLM 1–8 Chapter 1 BLM Answers

Specific Expectations

A.1.3 – collect categorical data from primary sources, through experimentation involving observation or measurement, or from secondary sources, and organize and store the data using a variety of tools
A.1.5 – make inferences based on the graphical representation of data, and justify conclusions orally or in writing using convincing arguments
A.1.6 – make and justify conclusions about a topic of personal interest by collecting, organizing, representing, and making inferences from categorical data from primary sources or secondary sources
A.1.7 – explain how the media, the advertising industry, and others use and misuse statistics to promote a certain point of view
A.2.1 – determine the theoretical probability of an event, and represent the probability in a variety of ways
A.2.2 – identify examples of the use of probability in the media and various ways in which probability is represented
A.2.3 – perform simple probability experiments, record the results, and determine the experimental probability of an event
A.2.4 – compare, through investigation, the theoretical probability of an event with the experimental probability, and describe how uncertainty explains why they might differ

Activity Planning Notes

The Task on page 44 provides the rules for a game to play as a class. This is an in-class activity that simulates the structure of many games of chance. Before students start this game, make sure they realize that the teacher represents "the house," which is the person sponsoring any gambling game. Basically, "the house" wants a few players to win. In the long run, more players will lose and "the house" will make money.

The structure of the activity is laid out in detail on page 44. You may wish to make an overhead of that page so that students can see the rules and the "payout" without referring to their student resources. Give students **BLM 1–5 Chapter 1 Task Recording Chart** so they can track their wins and losses.

You are the dealer. Your job is to encourage the players to play and to cut the cards after all wagers are placed. Determine the amount won or lost by each participant and then move to the next round of the game.

Accommodations

- Some students may need to refer to their student resource or chapter notes.
- Some students may be able to do this in small groups.
- Some students may feel uncomfortable playing a game of chance. Others may have cultural or religious reasons for wishing to refrain from this activity. You may wish to assess these students using **BLM 1–4 Chapter 1 Test** or another assessment that you agree could be used as an alternative to this Task.

Summative Assessment

- Use **BLM 1–7 Chapter 1 Task Rubric** to assist you in assessing students' work on this Task.

After playing the game for a time, distribute **BLM 1–6 Chapter 1 Task**. This exercise will allow you to assess many of the numeracy skills addressed in the chapter. Have students answer all questions; discuss as necessary.

An alternative to using cards is to use two 10-sided dice. Assign specific numbers, double rolls, or totals to different payouts.

You can also give students a smaller starting total so that some of them will go into debt. Then ask, "How do you keep paying to play? Is this a good idea?"