LESSON 10-5 Practice A
Experimental Probability

Identify the sample space and the outcome shown for each experiment.

1. rolling a number cube



sample space: {1, 2, 3, 4, 5, 6};
outcome {5}

2. spinning a spinner



sample space: {A, B, C, D};
outcome {A}

Write *impossible, unlikely, as likely as not, likely*, or *certain* to describe each event.

3. Selecting a green marble from a bag of white marbles — impossible

4. Choosing a vowel from the letters A, M, O, F, P, I — as likely as not

5. Correctly guessing a number from 1 to 3 when you have 2 tries — likely

An experiment consists of randomly choosing a colored card from a box. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
red	7
yellow	12
orange	8
white	13

6. choosing a yellow card — $\frac{3}{10}$

7. choosing an orange card — $\frac{1}{5}$

8. not choosing a white card — $\frac{27}{40}$

9. not choosing a red card — $\frac{33}{40}$

10. A cook inspects 20 hamburgers and finds 3 of them are missing a pickle.

a. What is the experimental probability that a hamburger will be missing a pickle? — 15%

b. The restaurant makes 300 hamburgers. Predict the number of hamburgers that are likely to be missing a pickle. — 45

11. An inspector checks 150 children with bike helmets and found that 21 children are not wearing them properly.

a. What is the experimental probability that a child will not be wearing a bike helmet properly? — 14%

b. The inspector checks 500 more children with bike helmets. Predict the number of those children that will not be wearing their bike helmet properly. — 70

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-5 Practice B
Experimental Probability

Identify the sample space and the outcome shown for each experiment.

1. spinning a spinner



sample space: {1, 2, 3, 4, 5};
outcome {2}

2. tossing two coins



sample space: (HH, HT, TH, TT);
outcome (HT)

Write *impossible, unlikely, as likely as not, likely*, or *certain* to describe each event.

3. The mail was delivered before noon on 4 of the last 5 days. The mail will be delivered before noon today. — likely

4. Sean rolls a number cube and gets an even number. — as likely as not

5. The pages of a book are numbered 1 – 350. Amelia begins reading on page 400. — impossible

An experiment consists of rolling a standard number cube. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
1	6
2	7
3	4
4	10
5	8
6	5

6. rolling a 1 — $\frac{3}{20}$

7. rolling a 5 — $\frac{1}{5}$

8. not rolling a 3 — $\frac{9}{10}$

9. not rolling a number less than 5 — $\frac{13}{40}$

10. A tire manufacturer checks 80 tires and finds 6 of them to be defective.

a. What is the experimental probability that a tire chosen at random will be defective? — 7.5%

b. The factory makes 200 tires. Predict the number of tires that are likely to be defective. — 15

11. A safety commission tested 1500 electric scooters and found that 15 of them had defective handles.

a. What is the experimental probability that a scooter will have a defective handle? — 1%

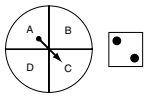
b. The factory makes 40,000 scooters. Predict the number of scooters that are likely to have defective handles. — 400

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-5 Practice C
Experimental Probability

Identify the sample space and the outcome shown for each experiment.

1. rolling a die and spinning the spinner



sample space: {A1, B1, C1, D1, A2, B2, C2, D2, A3, B3, C3, D3, A4, B4, C4, D4, A5, B5, C5, D5, A6, B6, C6, D6,}; outcome {C2}

2. tossing three coins



sample space: (HHH, HHT, HTH, HTT, THH, THT, TTH, TTT);
outcome (HHH)

Describe the likelihood of each event.

3. Doug has already flipped a coin 9 times and it lands heads each time. Doug flips a coin the tenth time and it lands heads. — as likely as not

4. Shannon rolls a 17 on a number cube that shows the first six prime numbers. — impossible

5. Three people in a class of 20 have the same birthday. — unlikely

An experiment consists of spinning a spinner and tossing a coin. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
Red, H	3
Blue, H	5
Yellow, H	4
Red, T	4
Blue, T	7
Yellow, T	2

6. spinning red and tossing tails — $\frac{4}{25}$

7. spinning blue and tossing heads or tails — $\frac{12}{25}$

8. not tossing heads — $\frac{13}{25}$

9. A computer repair person tried to shut down a program 80 times and found it closed properly 55 times.

a. What is the experimental probability that the program will close properly? — 68.75%

b. An analyst closes the program 32 times. Predict the number of times the program will close properly. — 22

10. A teacher tested 80 calculators and found 5 not working.

a. What is the experimental probability that a calculator does not work? — 6.25%

b. The classroom has 32 calculators. Predict the number of calculators that will not work. — 2

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-5 Reteach
Experimental Probability

An **experiment** is an activity involving chance. The **sample space** of an experiment is the set of all possible outcomes.

Identify the sample space for tossing one coin and rolling one number cube.
List each possible number with heads and then each possible number with tails.

(1, H) (2, H) (3, H) (4, H) (5, H) (6, H)
(1, T) (2, T) (3, T) (4, T) (5, T) (6, T)

Probability is the measure of how likely an event is to occur. You can estimate the probability of an event by performing an experiment. The more trials you perform, the more accurate the estimate will be.

$$\text{experimental probability} = \frac{\text{number of times the event occurs}}{\text{number of trials}}$$

An experiment consists of randomly selecting marbles from a bag. Use the results in the table to find the experimental probability of each event.

Outcome	Frequency
Red	12
Green	8
White	15
Blue	5

A. selecting a green marble

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{8}{12+8+15+5} = \frac{8}{40} = \frac{1}{5}$$

B. not selecting a white marble

$$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{12+8+5}{12+8+15+5} = \frac{25}{40} = \frac{5}{8}$$

The sum of frequencies equals the number of trials.

Identify the sample space for each experiment.

1. rolling a 6 sided number cube — {1, 2, 3, 4, 5, 6}

2. spinning a spinner labeled A – E — {A, B, C, D, E}

3. An experiment consists of selecting letters from a bag. Use the results in the table to find the experimental probability of each event.

Outcome	M	A	R	B	L	E
Frequency	8	4	7	10	14	2

a. selecting the letter M — $\frac{8}{45}$

b. not selecting the letter B — $\frac{7}{9}$

c. selecting a vowel — $\frac{2}{15}$

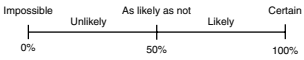
d. not selecting L or E — $\frac{29}{45}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-5 Reteach
Experimental Probability (continued)

Many people give probabilities as a word or phrase. These phrases correspond to the probabilities shown in the spectrum below.



You can use experimental probability to make predictions. A **prediction** is an estimate or guess about something that has not yet happened.

Inspectors tested 500 cars for smog emissions. Thirteen of them failed the test.

A. What is the experimental probability that a car chosen at random will fail the test?

$\frac{\text{number of times the event occurs}}{\text{number of trials}} = \frac{13}{500} = 2.6\%$

B. Is this event *impossible, unlikely, as likely as not, likely* or certain to occur?

Because the probability is 2.6%, this event is unlikely to occur.

C. 125 cars are scheduled to take the smog emissions test. Predict the number of cars that are likely to fail the test.

Find 2.6% of 125.
$0.026(125) = 3.25$

About 3 cars will fail the test.

4. A machine assembled 600 boxes. An inspector notices that 594 of the boxes have no defects.

a. What is the experimental probability that a box chosen at random will have no defects? 99%

b. Is this event impossible, unlikely, as likely as not, likely or certain to occur? likely

c. The machine assembles 800 boxes. Predict the number of boxes that will have no defects. 792

5. The owner of a vending machine kept track of the number of times the machine dispensed change incorrectly. He found that the change was incorrect in 13 out of 325 purchases.

a. What is the experimental probability that the machine will dispense incorrect change? 4%

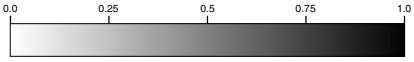
b. Is this event impossible, unlikely, as likely as not, likely or certain to occur? unlikely

c. 25 purchases are made at the vending machine. Predict the number of times the change will be incorrect. 1

Copyright © by Holt, Rinehart and Winston. All rights reserved.

LESSON 10-5 Challenge
Exploring Solution Likelihoods

A probability bar extends from 0 to 1. These numbers represent impossibility and certainty, respectively.



In Exercises 1–3, use the ratio. $\frac{\text{number of favorable outcomes}}{\text{number of total outcomes}}$

1. Explain why a probability must be a nonnegative number.

Neither the number of favorable outcomes nor the number of total outcomes can be negative.

2. How does the ratio above tell you that a probability must be between 0 and 1 inclusive?

because the numerator is always less than or equal to the denominator

3. Explain how 0.25, 0.5, and 0.75 divide the probability bar into sections.

Possible answer: A probability between 0.0 and 0.25 is a very low probability. A probability between 0.25 and 0.5 is a low probability. A probability between 0.5 and 0.75 is a probability that is better than 50-50 but not close to certainty. A probability between 0.75 and 1.0 is a probability that is considerably better than 50-50.

Rather than use a problem-solving strategy, Debbie tried to guess at a solution to an inequality that was given to her. Her guesses are −4, −3, −2, −1, 0, 1, 2, 3, 4, 5, 6, 7, and 8. Find the probability that a number selected at random from the list will be a solution to the given inequality. Describe her probability of success.

4. $4n - 3 \geq 25$

$\frac{2}{13}$; very poor

5. $4n - 3 \geq 17$

$\frac{4}{13}$, about 0.31; not very good

6. $4n - 3 \geq 5$

$\frac{7}{13}$, about 0.54; better than 50-50, but still not very good

7. $4n - 3 \geq -11$

$\frac{11}{13}$, about 0.85; very high

8. $4n - 3 \geq 45$

0; as low as it can get

9. $4n - 3 \geq -27$

1; as high as it can get.

10. Write an inequality for which Debbie's probability of success will be at least 50%.

Possible answer: $2n - 6 \geq -5$

Copyright © by Holt, Rinehart and Winston. All rights reserved.

LESSON 10-5 Problem Solving
Experimental Probability

Write the correct answer.

1. A manufacturer of bottled juices has a contest where prizes are printed on the inside of the bottle caps. 2 million caps are printed with "Sorry"; 1.5 million say "Free Bottle"; 0.4 million say "T-Shirt"; and 0.1 million say "CD."

a. Identify the sample space.

{Sorry, Free Bottle, T-Shirt, CD}

b. If Tammy buys one bottle, is it impossible, unlikely, as likely as not, likely, or certain that she will get a cap that says "Sorry"?

as likely as not

c. If Eagle buys one bottle, is it impossible, unlikely, as likely as not, likely, or certain that he will get a cap that says "CD"?

unlikely

2. At the end of the 2005 season, Major League Baseball player Andruw Jones had 1408 hits out of 5271 times at bat during his entire career.

a. What is the experimental probability that Andruw Jones will have a hit during any time at bat? (This statistic is called his *batting average* and is usually stated as a decimal rounded to the thousandths.)

0.267 or 26.7%

b. If Andruw has 570 at-bats during a season, predict the number of hits he will have during the season.

152 hits

A pharmaceutical company tests the effectiveness of a diabetes screening test by administering it to several volunteers who actually know whether or not they have diabetes. The results are summarized in the table below. Select the best answer.

3. What is the experimental probability that this screening test will *not* identify someone who actually does have diabetes? (This type of result is called a false negative.)

A 2.9 %
B 16.6%
C 20%
D 28.6%

4. If this test is used on 1000 patients who do not know whether or not they have diabetes, about how many patients would the test predict *do* have diabetes?

F 66
G 79
H 92
J 101

Volunteer _____ have diabetes.

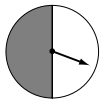
Test predicts that the person _____ have diabetes.	does	does not
does	10	4
does not	2	136

Copyright © by Holt, Rinehart and Winston. All rights reserved.

LESSON 10-5 Reading Strategies
Focus on Vocabulary

There are many vocabulary terms related to probability and experiments. Study the example below as a guide to sorting out all the terms.

An **experiment** is an activity involving chance. Kathleen is going to conduct an experiment of spinning this spinner twice.



Each possible result is an **outcome**. There are 4 possible outcomes for Kathleen's experiment.

The set of all possible outcomes is called the **sample space**. If B is black and W is white, the sample space for Kathleen's experiment is {BW, BB, WB, WW}.

Kathleen can perform her experiment several times. Each observation is called a **trial**.

An **event** is an outcome (or set of outcomes) in an experiment. **Probability** is used to measure the likelihood of events. For instance, Kathleen may be interested in the probability of the event of spinning white twice.

Experimental probability $= \frac{\text{number of times the event occurs}}{\text{number of trials}}$

Kathleen performs 12 trials. The outcomes are:

BB, WB, BW, WB, WB, BB, WW, WB, WW, BB, WB, BW.

To find the experimental probability of spinning white twice, write the number of times WW occurred in the numerator and the number of trials in the denominator: $\frac{2}{12} = \frac{1}{6}$.

Use the information above to complete the following.

1. What would be the sample space if Kathleen's experiment consisted of spinning the spinner just once? {B, W}

2. Look at the outcomes of Kathleen's experiment. Find the following experimental probabilities.

a. spinning black twice $\frac{1}{4}$

b. spinning white then black $\frac{5}{12}$

c. spinning the same color twice in a row $\frac{5}{12}$

d. not spinning black twice $\frac{3}{4}$

e. not spinning the same color twice $\frac{7}{12}$

Copyright © by Holt, Rinehart and Winston. All rights reserved.

Copyright © by Holt, Rinehart and Winston. All rights reserved.