Name Date Time

STUDY LINK 6•13

Unit 7: Family Letter

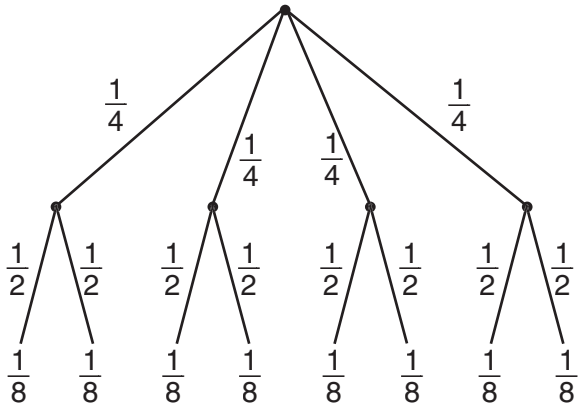
Probability and Discrete Mathematics

All of us are aware that the world is filled with uncertainties. As Ben Franklin wrote, "Nothing is certain except death and taxes!" Of course, there are some things we can be sure of: The sun will rise tomorrow, for example. We also know that there are degrees of uncertainty—some things are more likely to happen than others. There are occurrences that, although uncertain, can be predicted with reasonable accuracy.

While predictions are usually most reliable when they deal with general trends, it is possible and often helpful to predict the outcomes of specific situations. In Unit 7, your child will learn how to simulate a situation with random outcomes and how to determine the likelihood of various outcomes. Additionally, the class will analyze games of chance to determine whether or not they are fair; that is, whether or not all players have the same chance of winning.

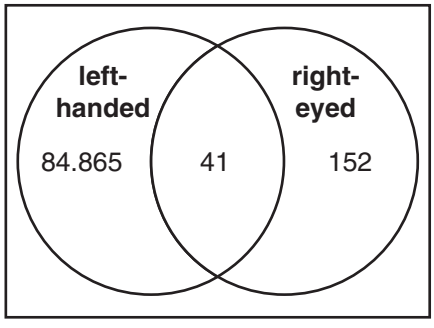
We will be looking at two tools for analyzing probability situations: tree diagrams (familiar from single-elimination sports tournaments) and Venn diagrams (circle diagrams that show relationships between overlapping groups).

One lesson concerns strategies for taking multiple-choice tests based on probability. Should test-takers guess at answers they don't know? Your child will learn some of the advantages and disadvantages of guessing on this type of test.



Tree diagram

Venn diagram



Please keep this Family Letter for reference as your child works through Unit 7.

Vocabulary

Important terms in Unit 7:

equally likely outcomes *Outcomes* of a chance experiment or situation that have the same probability of happening. If all the possible outcomes are equally likely, then the probability of an event is equal to:

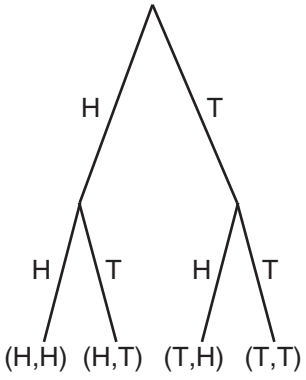
$$\frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$$

expected outcome The average outcome over a large number of repetitions of a random experiment. For example, the expected outcome of rolling one die is the average number of dots showing over a large number of rolls.

outcome A possible result of a chance experiment or situation. For example, heads and tails are the two possible outcomes of tossing a coin.

probability A number from 0 through 1, giving the likelihood that an event will happen. The closer a probability is to 1, the more likely the event is to happen.

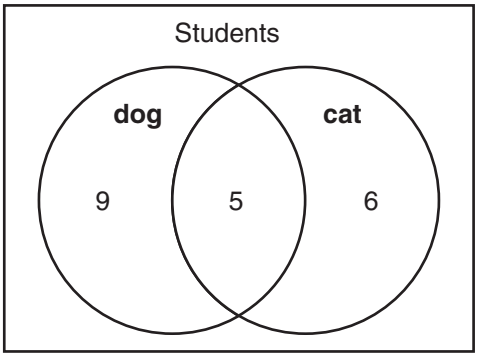
probability tree diagram A drawing used to analyze a *probability* situation that consists of two or more choices or stages. For example, the branches of the probability tree diagram below represent the four *equally likely outcomes* when one coin is flipped two times.



random number A number produced by a random experiment, such as rolling a die or spinning a spinner. For example, rolling a fair die produces random numbers because each of the six possible numbers 1, 2, 3, 4, 5, and 6 has the same chance of coming up.

simulation A model of a real situation. For example, a fair coin can be used to simulate a series of games between two equally matched teams.

Venn diagram A picture that uses circles or rings to show relationships among sets. The Venn diagram below shows the number of students who have a dog, a cat, or both.



Do-Anytime Activities

To work with your child on the concepts taught in this unit and in previous units, try these interesting and rewarding activities:

1. While playing a game that uses a die, keep a tally sheet of how many times a certain number lands. For example, try to find out how many times during the game the number 5 comes up. Have your child write the probability for the chosen number. ($\frac{1}{6}$ is the probability that any given number on a six-sided die will land.) The tally sheet should show how many times the die was rolled during the game and how many times the chosen number came up.
2. Have your child listen to the weather forecast on television and pick out the language of probability. Have him or her listen for such terms as *likely, probability, (percent) chance, unlikely,* and so on.
3. Watch with your child for events that occur without dependence on any other event. In human relationships, truly independent events may be difficult to isolate, but this observation alone helps to define the randomness of events. Guide your child to see the difference between dependent events and independent events. For example, "Will Uncle Mike come for dinner?" depends on whether or not he got his car fixed. However, "Will I get heads or tails when I flip this coin?" depends on no other event.

Building Skills through Games

In Unit 7, your child will continue to review concepts from previous units and prepare for topics in upcoming units by playing games such as:

***2–4–8 and 3–6–9 Frac–Tac–Toe* (Percent Versions)** See *Student Reference Book*, pages 314–316
The two versions, *2-4-8 Frac-Tac-Toe* and *3-6-9 Frac-Tac-Toe,* help students practice conversions between fractions and percents. Two players need a deck of number cards with four each of the numbers 0–10; a gameboard, a 5 × 5 grid that resembles a bingo card; a *Frac-Tac-Toe* Number-Card Board; markers or counters in two different colors, and a calculator.

Angle Tangle See *Student Reference Book,* page 306
Two players need a protractor, straightedge, and blank sheets of paper to play this game. Mastering the estimation and measurement of angles is the goal of *Angle Tangle.*

Name That Number See *Student Reference Book,* page 329
This game provides practice in using order of operations to write number sentences. Two or three players need a complete deck of number cards.

Solution Search See *Student Reference Book*, page 332
This game provides practice solving open number sentences. Players use a complete deck of number cards as well as *Solution Search* cards to solve inequalities.

As You Help Your Child with Homework

As your child brings assignments home, you may want to go over the instructions together, clarifying them as necessary. The answers listed below will guide you through some of the Unit 7 Study Links.

Study Link 7•1

1. Quarter, nickel, dime; No. There is an unequal number of each type of coin.

2. 1, 2, 4, 5, 10, and 20

Yes. Each number card is a factor of 20.

3. 37.5% **4.** 100% **5.** 25%, 50%, 75%

6. 27.12

Study Link 7•2

1. No. Sample answer: Teams should be evenly matched. A team selected at random might not have a balance of skilled and unskilled players.

2. Yes and no. Sample answer: In an elementary school, preference for the better seats should go to the youngest children so they can see the game. However, in Grades 3–6, the principal should choose seat assignments randomly.

3. Disagree. Sample answer: There is always an even chance of this spinner landing on black or white. Previous spins do not affect the outcome.

4. Agree. Sample answer: There is always a better chance that this spinner will land on white because the white area is larger. The outcome does not depend on previous spins.

Study Link 7•3

1. 6 ways **2.** 30, 26, 23, 22, 19, 18, 16, 15, 12, 9

3a. 25% **3b.** 33.33%

Study Link 7•4

3. 12 **4.** 15 **5.** 15

Study Link 7•5

1. Tree diagram probabilities (from top, left to right)
$\frac{1}{2}, \frac{1}{2}$

Box 1: $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}, \frac{1}{3}, \frac{1}{3}, \frac{1}{3}$

Box 2: $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$

Box 3: $\frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}$

2. 12

3. a. $\frac{1}{6}$ **b.** $\frac{3}{3}$, or 100% **c.** $\frac{1}{3}$ **d.** 0%

4. 36.5 **5.** 22.6 **6.** 12.6

Study Link 7•6

1. a. Track **b.** Basketball **c.** 22 **d.** 8

e. 30 **f.** 52 **g.** 22

3. $\frac{17}{40}$ **4.** $2\frac{11}{12}$ **5.** $8\frac{3}{20}$

Study Link 7•7

1. Tree diagram probabilities (from top, left to right)
$\frac{1}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{4}$

R1: $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$; **R2:** $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$; **R3:** $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$; **G:** $\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$

Bottom row probabilities:

$\frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}, \frac{1}{12}$

a. 50 **b.** 25

2. a. HHT; HTH; HTT; THH; THT; TTH

b. 37.5 **c.** 87.5

Study Link 7•8

1. C, D, A, B

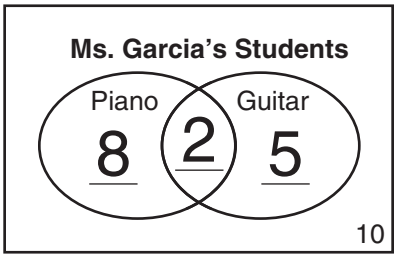
2. Tree diagram with branches labeled as follows (from left to right):

Swimsuits: red, white, blue

Sandals: red, white; red, white; red, white

a. 6 **b.** $\frac{2}{6}$, or $\frac{1}{3}$

3. a.



b. 25

Sample answer: 8 students play the piano, 5 students play the guitar, 2 students play both instruments, and 10 students play neither instrument. 8 + 2 + 5 + 10 = 25