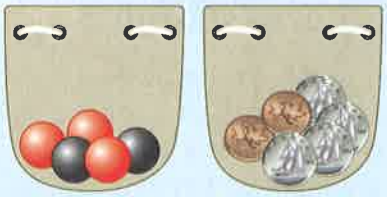
11.3 Probability using Fractions

Pg 432 - 435
Q# 5 - 7, 10 - 12, 14 - 16

Communicate the Ideas

1. A bag contains three red marbles and two black marbles. A second bag contains two pennies and four dimes. A marble and a coin are drawn from each bag at random. Explain to a classmate who missed the lesson how to calculate $P(\text{red, penny})$ using multiplication.



2. Catherine gives the following explanation for how to calculate $P(\text{black, dime})$. She says that there are two choices for marbles (red and black) and two choices for coins (pennies and dimes).

$$P(\text{black, dime}) = \frac{1}{2} \times \frac{1}{2}$$
$$= \frac{1}{4}$$

What mistake did Catherine make?

3. Explain the difference between experimental probability and theoretical probability.

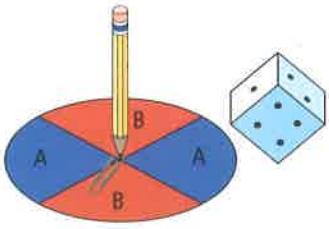
Check Your Understanding

Practise

Express all probabilities as fractions in lowest terms unless otherwise specified.

For help with #4 and #5, refer to Example 1 on pages 427–429.

4. Brittany spins a spinner divided into four equal regions and rolls a standard die once.

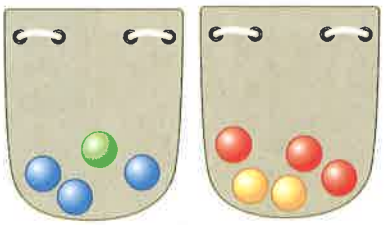


a) Construct a table to organize the sample space.

b) What is the probability of spinning an A and rolling a two?

c) Use a second method to determine $P(\text{A, 2})$.

5. Joe takes one marble from the first bag and Ron takes one marble from the second bag.



a) Use multiplication to calculate the total number of possible outcomes.

b) What is the probability of $P(\text{blue, red})$? Show two different strategies for determining the answer.

For help with #6 and #7 refer to Example 2 on page 429.

6. A coin is flipped twice.

a) What is the probability that a head is flipped on the first flip, $P(\text{H})$?

b) What is the probability that a head is flipped on both flips, $P(\text{H, H})$?

c) Check both answers by using another method.

7. Levi rolls two dice, a six-sided one numbered from 1 to 6 and a four-sided one labelled A, B, C, and D.

a) Calculate $P(2, \text{B})$.

b) Calculate $P(\text{even number, consonant})$.

c) Check your answers by using another method.

For help with #8 and #9 refer to Example 3 on pages 430–431.

8. Students in grade 8 are each given one flower seed from a package of mixed flower seeds. The package contains an equal number of daisy, marigold, poppy, and snapdragon seeds. The students roll a four-sided die to find out where each will plant the seed. On the die, 1 means in the front garden at the school, 2 means by the back fence, 3 means in the garden of the senior citizens' home near the school, and 4 means in a flower pot to take home.

a) Design a simulation to find the probability that Bianca will plant a marigold in a flower pot. Perform ten trials of the simulation. What is the experimental probability of $P(\text{marigold, flower pot})$?

b) Use multiplication to determine the theoretical probability of $P(\text{marigold, flower pot})$.

c) Compare your experimental probability with your theoretical probability.

9. Boxes of Oatie Smacks cereal contain a toy racing car in one of five colours: green, purple, black, blue, and red. The likelihood of each colour car is the same, 20%. Trevor uses a five-section spinner to simulate the minimum number of boxes of cereal he will have to buy to make sure he gets at least one car of each colour. The tally chart shows his results.

Green	Purple	Black	Blue	Red
III	III	II	IIII	I

a) Which car colour was spun last? How do you know?

b) What is the experimental probability of the spinner landing on blue? Express your answer as a decimal.

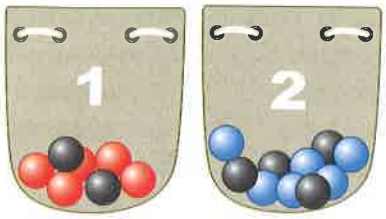
c) What is the theoretical probability of the spinner landing on blue? Express your answer as a decimal.

d) What is the theoretical probability of getting two blue cars in two consecutive boxes?

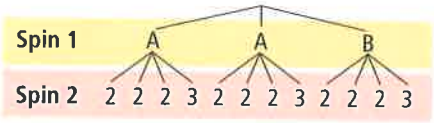
Apply

10. The weather forecaster predicts that the chance of rain today is 75% in Victoria and 20% in Calgary. What is the probability that it will rain in both cities today?

11. What is P(red, blue) if one marble is randomly selected from each bag? Express the answer as a fraction, a decimal, and a percent.



12. The following tree diagram represents the outcomes when two spinners are each spun once.

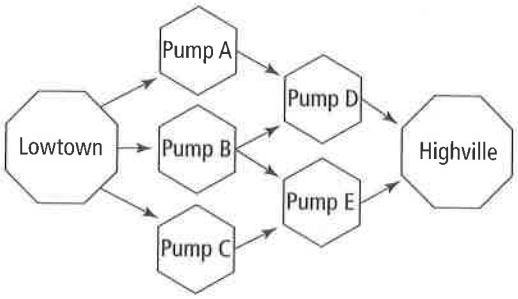


a) Draw a picture of both spinners.

b) What is the probability that the first spinner will land on an A?

c) What is the probability that the second spinner will land on two?

13. The following diagram shows five water pumping stations between Lowtown and Highville. Water is pumped from Lowtown to Highville through pipes that are connected to the pumping stations as illustrated. With the pumps getting old, the likelihood that a specific pumping station is working at any given time is $\frac{2}{3}$.



a) In how many different pathways can water be transported from Lowtown to Highville?

b) How can you use a standard six-sided die to simulate whether a specific pumping station is working?

c) From the data collected in the table below and the diagram of pumping stations, determine the experimental probability that at least one pathway is available to carry water between the two towns.

Trial #	Pump A	Pump B	Pump C	Pump D	Pump E
1	working	no	working	working	no
2	working	working	working	working	no
3	no	working	no	no	working
4	working	working	no	no	no
5	no	no	working	working	no
6	working	working	no	working	working
7	working	no	working	no	working
8	no	no	no	working	working
9	working	working	working	no	working
10	no	working	no	working	no

Extend

14. It is Random Menu night at the Guess Grill restaurant. You do not order your own meal! For $3.99 you are given one of four possible appetizers and one of six possible main courses. Jeremy figures that he would be happy with three of the appetizers and three of the main courses.

a) What is the probability that Jeremy will be happy with both his appetizer and main course?

b) What is the probability that he will be unhappy with both his appetizer and main course?

c) Explain why the answers to parts a) and b) do not add to one.

15. The next two batters for the Okotoks Wanderers have batting averages of .313 and .289, respectively. For the first batter, this means that for every 1000 at-bats in the past, he hit the ball and got on base 313 times.

a) What is the probability that both players will hit a fair ball and get on base? Express your answer as a decimal to the nearest thousandth.

b) What is the probability that the first player gets a hit and the second player does not? Express your answer as a decimal to the nearest thousandth.

16. From a deck of 52 playing cards, a card is drawn at random. Then the card is placed back in the deck, the deck is shuffled, and a second card is drawn at random. Determine the following probabilities and express each one as a decimal to the nearest thousandth. Consider an ace to be the number one.

a) $P(4, 7)$?

b) $P(4, \text{not } 4)$?

c) $P(4, \text{number less than } 4)$?

17. A probability experiment consists of three independent events, A, B, and C. Two of these events have the probabilities $P(\text{A}) = \frac{1}{2}$ and $P(\text{B}) = \frac{3}{7}$. The probability of all three events occurring is $\frac{9}{70}$. What is the probability of event C, $P(\text{C})$? Express your answer as a fraction and explain your reasoning.

WWW Web Link

Computers are often used to conduct simulations. To try an on-line simulation, go to www.mathlinks8.ca and follow the links.

MATH LINK

a) The four sticks are tossed. Two of them land on the table with the decorated side up. The other two fall under the table. What is the theoretical probability that both sticks under the table are decorated side up?

b) What if three sticks fall under the table? What is the theoretical probability that all three sticks land decorated side up?

c) Set up a simulation to show the experimental probability for part b).