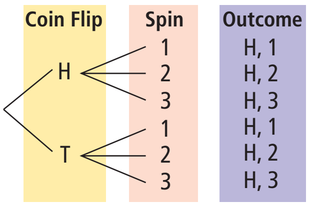
Chapter 11

11.1 Determining Probabilities Using Tree Diagrams and Tables, pages 416–418

3. a)



b) (H, 1), (H, 2), (H, 3), (T, 1), (T, 2), (T, 3)

c) $P(\text{H}, 2) = \frac{1}{6}$ or $0.1\overline{6}$ or $16.\overline{6}\%$

4. a) (T, T), (T, W), (T, O), (W, T), (W, W), (W, O), (O, T), (O, W), (O, O) **b)** $P(\text{T, W}) = \frac{1}{9}$ or $0.\overline{1}$ or $11.\overline{1}\%$

c) $P(\text{that both letters are identical}) = \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$

5. a)

		Blue Die			
		1	**2**	**3**	**4**
Green Die	**1**	1, 1	1, 2	1, 3	1, 4
	2	2, 1	2, 2	2, 3	2, 4
	3	3, 1	3, 2	3, 3	3, 4
	4	4, 1	4, 2	4, 3	4, 4

b) $P(\text{sum} > 5) = \frac{3}{8}$ or 0.375 or 37.5%

c) $P(\text{both numbers are identical}) = \frac{1}{4}$ or 0.25 or 25%

6. a)

		Die					
		1	**2**	**3**	**4**	**5**	**6**
Cards	**3**	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
	4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
	5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
	6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6
	7	7, 1	7, 2	7, 3	7, 4	7, 5	7, 6

b) $P(\text{both numbers are identical}) = \frac{2}{15}$ or $0.1\overline{3}$ or $13.\overline{3}\%$

c) $P(\text{sum of the two numbers is even}) = \frac{1}{2}$ or 0.5 or 50%

d) $P(\text{number on die} \geq \text{number on card}) = \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$

7. a)

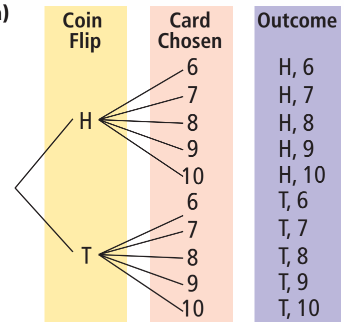
		Second Catch			
		W	**T**	**C**	**Lost**
First Catch	**W**	W, W	W, T	W, C	W, Lost
	T	T, W	T, T	T, C	T, Lost
	C	C, W	C, T	C, C	C, Lost
	Lost	Lost, W	Lost, T	Lost, C	Lost, Lost

b) $P(\text{whitefish, char}) = \frac{1}{8}$ or 0.125 or 12.5%

c) $P(\text{char, char}) = \frac{1}{16}$ or 0.0625 or 6.25%

d) $P(\text{she will catch nothing at all}) = \frac{1}{16}$ or 0.0625 or 6.25%

8. a)



b)

		Card Chosen				
		6	**7**	**8**	**9**	**10**
Coin Flipped	**H**	H, 6	H, 7	H, 8	H, 9	H, 10
	T	T, 6	T, 7	T, 8	T, 9	T, 10

c) $P(\text{outcome includes an even-numbered card}) = \frac{3}{5}$ or 0.6 or 60%

9. a)

		Second Baby	
		B	**G**
First Baby	**B**	B, B	B, G
	G	G, B	G, G

b) $P(\text{one boy and one girl}) = \frac{1}{2}$ or 0.5 or 50%

c) Assume that it is equally likely that a boy or girl is born for any birth.

10. a)

		Second Spin			
		T	**E**	**E**	**N**
First Spin	**T**	T, T	T, E	T, E	T, N
	E	E, T	E, E	E, E	E, N
	E	E, T	E, E	E, E	E, N
	N	N, T	N, E	N, E	N, N

b) $P(\text{T then E}) = \frac{1}{8}$ or 0.125 or 12.5%

c) $P(\text{E, E}) = \frac{1}{4}$ or 0.25 or 25%

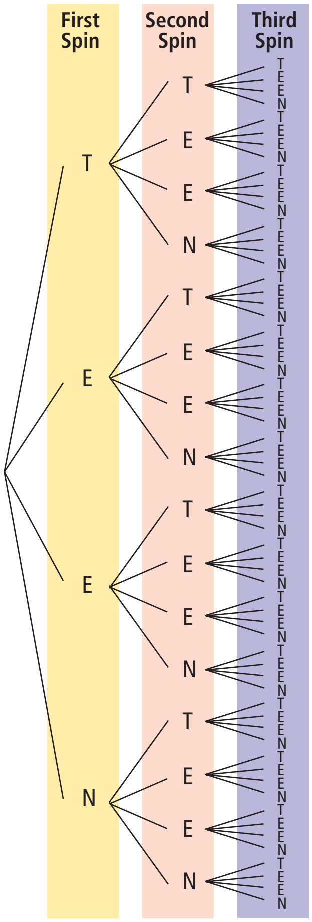
d) $P(\text{same letter on both spins}) = \frac{3}{8}$ or 0.375 or 37.5%

11. a) $P(\text{Thunder Road}) = \frac{1}{2}$ or 0.5 or 50%

b) $P(\text{skiing on a run containing the name "Bowl"}) = \frac{1}{4}$ or 0.25 or 25%

c) $P(\text{skiing on Thunder Road and Quick Break}) = \frac{1}{8}$; or 0.125 or 12.5%

12. a)



b) $P(\text{E, E, E}) = \frac{1}{8}$ or 0.125 or 12.5% **c)** P(spinning three different letters in alphabetical order) $= \frac{1}{32}$ or 0.03125 or 3.125% **d)** P(one letter appears exactly twice) $= \frac{21}{32}$ or 0.65625 or 65.625%

13. a) P(difference between the two numbers is two) $= \frac{2}{9}$ or $0.\overline{2}$ or $22.\overline{2}\%$
b) P(the sum is a multiple of three) $= \frac{1}{3}$ or $0.\overline{3}$ or $33.\overline{3}\%$
c) P(the product is a multiple of four) $= \frac{5}{12}$ or $0.41\overline{6}$ or $41.\overline{6}\%$

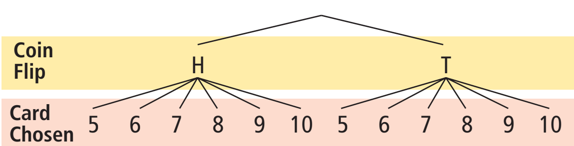
11.2 Outcomes of Independent Events, pages 423–425

3. a)

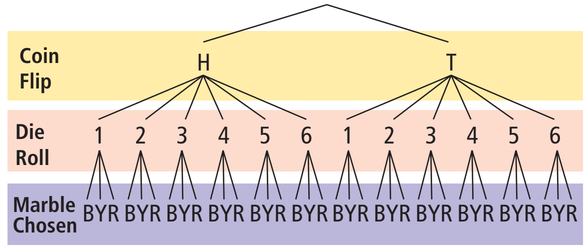
		Spinner		
		1	**2**	**3**
Marble	**G**	G, 1	G, 2	G, 3
	R	R, 1	R, 2	R, 3
	B	B, 1	B, 2	B, 3
	Y	Y, 1	Y, 2	Y, 3

b) Possible outcomes: 12 **c)** Using the multiplication method, the number of possible outcomes is $4 \times 3 = 12$.

4. a) Answers may vary. Example: Using the multiplication method, the number of possible outcomes is $2 \times 6 = 12$ **b)** Answers may vary. Example: Using a tree diagram, the number of possible outcomes is 12.

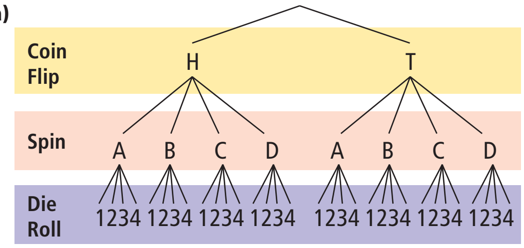


5. a)



b) Total number of possible outcomes: 36 **c)** Using multiplication, the total number of possible outcomes is $2 \times 6 \times 3 = 36$.

6. a)



b) Total number of possible outcomes: 32 **c)** Using multiplication, the total number of possible outcomes is $2 \times 4 \times 4 = 32$.

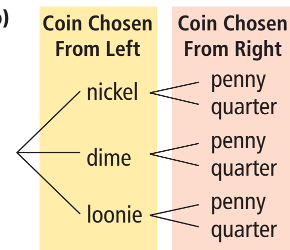
7. Shirt-pant combinations: 24

8. Possible routes: 12

9. Possible different combinations: 60

10. a) Using the multiplication method, the number of combinations of coins she could get is $3 \times 2 = 6$.

b)



Answers may vary. Example: Using a tree diagram, the number of combinations of coins is six. **c)** Largest possible sum: $1.25 **d)** Smallest possible sum: $0.06

11. Answers may vary. Example: Jim has two pairs of shoes, four pairs of pants, and five dress shirts from which to choose. If he selects one item from each of the three types of clothing, how many combinations of clothing are possible?

12. a) Number of possible single-scoop ice-cream cones: 93 **b)** Number of possible two-scoop ice-cream cones: 2883 **c)** Number of possible two-scoop ice-cream cones with both flavours different: 2790. The number of double cones could be subtracted from the answer to part b): $2883 - (3 \times 31) = 2790$.

13. There are three drink choices and three main dish choices. Divide the total number of possible meal combinations, 36, by the number of desserts, 4. The quotient, 9, is equal to the product of the choices for the drink and main menu. The factor pairs of 9 are 3×3 and 1×9. Since there must be more than one choice in each category, the only choice of factor pairs is 3×3.

14. a) Possible colour-shape combinations: 30
b) Using a table

		Shapes					
		Square (SQ)	Circle (C)	Star (S)	Triangle (T)	Rectangle (RE)	Heart (H)
Beads	Red (R)	R, SQ	R, C	R, S	R, T	R, RE	R, H
	Blue (BL)	BL, SQ	BL, C	BL, S	BL, T	BL, RE	BL, H
	Black (BLK)	BLK, SQ	BLK, C	BLK, S	BLK, T	BLK, RE	BLK, H
	White (W)	W, SQ	W, C	W, S	W, T	W, RE	W, H
	Yellow (Y)	Y, SQ	Y, C	Y, S	Y, T	Y, RE	Y, H

the number of possible colour-shape combinations is 30.
c) Possible colour-shape combinations: 120
15. 256
16. 8 998 912

11.3 Determining Probabilities Using Fractions, pages 432–434

4. a)

		Die					
		1	2	3	4	5	6
Spinner	A	A, 1	A, 2	A, 3	A, 4	A, 5	A, 6
	A	A, 1	A, 2	A, 3	A, 4	A, 5	A, 6
	B	B, 1	B, 2	B, 3	B, 4	B, 5	B, 6
	B	B, 1	B, 2	B, 3	B, 4	B, 5	B, 6

b) $P(\text{spinning an A and rolling a two}) = \frac{1}{12}$

c) $P(\text{A}, 2) = \frac{1}{2} \times \frac{1}{6} = \frac{1}{12}$

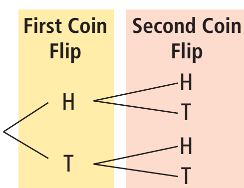
5. a) Total number of possible outcomes: $4 \times 5 = 20$
b) Answers may vary. Example:
Method 1: Using multiplication,
$P(\text{blue, red}) = \frac{3}{4} \times \frac{3}{5} = \frac{9}{20}$
Method 2: Using a table,

		Bag 2				
		Yellow	Yellow	Red	Red	Red
Bag 1	Blue	B, Y	B, Y	B, R	B, R	B, R
	Blue	B, Y	B, Y	B, R	B, R	B, R
	Blue	B, Y	B, Y	B, R	B, R	B, R
	Green	G, Y	G, Y	G, R	G, R	G, R

$P(\text{blue, red}) = \frac{9}{20}$

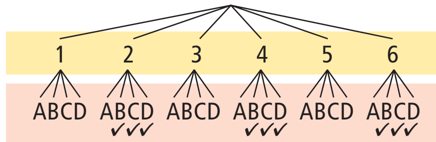
6. a) $P(\text{H}) = \frac{1}{2}$ **b)** $P(\text{H, H}) = \frac{1}{4}$

c) Using a tree diagram,
$P(\text{H, H}) = \frac{1}{4}$



7. a) $P(2, \text{B}) = \frac{1}{24}$ **b)** $P(\text{even number, consonant}) = \frac{3}{8}$

c) Use a tree diagram to determine that $P(2, \text{B}) = \frac{1}{24}$ and $P(\text{even number, consonant}) = \frac{9}{24} = \frac{3}{8}$.



8. a) Answers may vary. Example: Use two 4-sided dice to simulate the type of seed chosen and the location. Roll the two dice ten times and record the seed type and location in a tally chart. A possible experimental probability is $P(\text{marigold, flower pot}) = \frac{1}{10}$.

b) $P(\text{marigold, flower pot}) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$

c) Answers may vary. Example: The experimental probability of $\frac{1}{10}$ is larger than the theoretical probability of $\frac{1}{16}$.

9. a) Red was the car colour that was spun last. There is only one tally mark for red and Trevor has to have at least one car of each colour.

b) Experimental probability $P(\text{blue}) = \frac{4}{13} = 0.\overline{307692}$

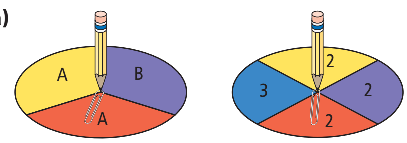
c) Theoretical probability $P(\text{blue}) = 20\% = 0.2$

d) Theoretical probability $P(\text{blue, blue}) = \frac{1}{25} = 0.04$

10. $P(\text{rain in Victoria, rain in Calgary}) = \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$

11. $P(\text{red, blue}) = \frac{3}{7} = 0.\overline{428571} = 42.\overline{857142}\%$

12. a)



b) $P(\text{A}) = \frac{2}{3}$ **c)** $P(2) = \frac{3}{4}$

13. a) Different pathways: 4 **b)** Answers may vary. Example: Numbers 1, 2, 3, and 4 on the die simulate the pump is working, and numbers 5 and 6 simulate the pump is not working. Roll the die ten times and determine the experimental probability that a specific pumping station is working.
c) $P(\text{at least one pathway is available to carry water between the two towns}) = \frac{7}{10} = 0.7$

14. a) $P(\text{happy with appetizer, happy with main course}) = \frac{3}{8}$ **b)** $P(\text{unhappy with appetizer, unhappy with main course}) = \frac{1}{8}$ **c)** The outcome where Jeremy is happy with only one of his food items has not been considered.

15. a) $P(\text{both players with hit a fair ball and get on base}) = 0.090$ **b)** $P(\text{first player gets a hit and the second player does not}) = 0.223$

16. a) $P(4, 7) = 0.006$ **b)** $P(4, \text{not } 4) = 0.071$
c) $P(4, \text{number less than } 4) = 0.018$

17. $P(\text{C}) = \frac{3}{5}$. The probability of $P(\text{A, B}) = \frac{3}{14}$. Divide the probability of the three events occurring, $P(\text{A, B, C}) = \frac{9}{70}$, by the value of $P(\text{A, B}) = \frac{3}{14}$ as follows: $\frac{9}{70} \div \frac{3}{14} = \frac{9}{70} \times \frac{14}{3} = \frac{3}{5}$.

Chapter Review, pages 436–437

1. independent events **2.** sample space
3. simulation **4.** probability
5. favourable outcome

6. a)

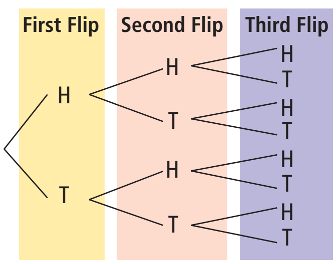
		Red Die					
		1	2	3	4	5	6
Blue Die	1	1, 1	1, 2	1, 3	1, 4	1, 5	1, 6
	2	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6
	3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
	4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
	5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
	6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6

b) $P(\text{the sum of the two numbers is 10}) = \frac{1}{12}$

c) $P(\text{the two numbers are identical}) = \frac{1}{6}$

d) $P(\text{the product of the two numbers is a multiple of 10}) = \frac{1}{6}$

7. a)



b) $P(\text{H, H, H}) = \frac{1}{8}$

c) $P(\text{two heads and one tail in any order}) = \frac{3}{8}$

8. a)

		Die					
		1	2	3	4	5	6
Card	3	3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
	4	4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
	5	5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
	6	6, 1	6, 2	6, 3	6, 4	6, 5	6, 6
	7	7, 1	7, 2	7, 3	7, 4	7, 5	7, 6
	8	8, 1	8, 2	8, 3	8, 4	8, 5	8, 6
	9	9, 1	9, 2	9, 3	9, 4	9, 5	9, 6

b) $P(\text{number on the card matches number on the die}) = \frac{2}{21}$ **c)** $P(\text{number on the card is larger than number on the die}) = \frac{16}{21}$ **d)** $P(\text{both numbers are even}) = \frac{3}{14}$

9. a) (H, 1), (H, 2), (H, 3), (T, 1), (T, 2), (T, 3)
b) Total number of outcomes: 6
c) Total number of outcomes $= 2 \times 3 = 6$

10. Combinations of choices: 48

11. Number of restaurants: 7. Multiply the number of hotel choices, 3, by the number of ski pass choices, 2. Then divide the total number of combinations by the product that was calculated: $42 \div 6 = 7$.

12. a) $P(\text{red marble}) = \frac{3}{5}$ **b)** $P(\text{green marble}) = \frac{4}{5}$
c) $P(\text{red marble, green marble}) = \frac{12}{25}$

13. a) $P(\text{A, E}) = 0.05$ **b)** $P(\text{A, L, E}) = 0.02$
c) The probability that it will snow in Abbotsford, Lethbridge, and Estevan today.

14. $P(1 \text{ or } 2, 3, \text{odd number}) = \frac{1}{36}$

15. a) Theoretical probability, $P(\text{blue}) = 25\%$
b) Experimental probability, $P(\text{blue}) = 15\%$
c) Answers may vary. Example: The experimental probability is often different from the theoretical probability. **d)** Yes, the two probabilities would become closer to each other in value.