

Exercises for Section 1.3

1. One card is drawn from a standard deck of 52 cards. Find the probability of drawing:

- (a) a 6 or a 7. $\frac{4}{52} + \frac{4}{52}$
- (b) a black card or a 4. $\frac{26}{52} + \frac{4}{52} - \frac{2}{52}$
- (c) an 8 or a black 5. $\frac{4}{52} + \frac{4}{52}$
- (d) a club or a red card. $\frac{13}{52} + \frac{26}{52}$
- (e) a heart or a 6. $\frac{13}{52} + \frac{4}{52} - \frac{2}{52}$
- (f) a red card or a king. $\frac{26}{52} + \frac{4}{52} - \frac{2}{52}$
- (g) a diamond or a jack. $\frac{13}{52} + \frac{4}{52} - \frac{1}{52}$

2. Which parts of question 1 contain events that are mutually exclusive? **a c d**

3. Mrs. Gamble invited 10 relatives to dinner: her father, 3 aunts, 2 uncles, 1 sister, 2 male cousins, and 1 female cousin. If the chances of any one guest arriving last are equally likely, find the probability that the last guest to arrive is:

- (a) a sister or an aunt. $\frac{1}{10} + \frac{3}{10}$
- (b) a sister or a cousin. $\frac{1}{10} + \frac{3}{10}$
- (c) a sister or her father. $\frac{1}{10} + \frac{1}{10}$
- (d) an aunt or a cousin. $\frac{3}{10} + \frac{3}{10}$
- (e) a female or a cousin. $\frac{5}{10} + \frac{3}{10} - \frac{1}{10}$
- (f) a male or a cousin. $\frac{5}{10} + \frac{3}{10} - \frac{2}{10}$

4. Which parts of question 3 contain events that are mutually exclusive? **a b c d**

5. A red and a green die are rolled. Graph the sample space and determine the probability of rolling:

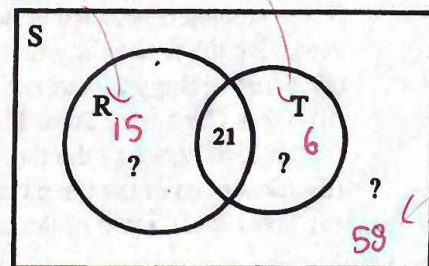
- (a) a sum of 7 or a sum of 8. $\frac{6}{36} + \frac{5}{36}$
- (b) a sum of 2 or a sum of 12. $\frac{1}{36} + \frac{1}{36}$
- (c) a sum that is greater than 9 or is even. $\frac{6}{36} + \frac{18}{36} - \frac{4}{36}$
- (d) a sum that is even or odd. $\frac{36}{36}$
- (e) a sum that is prime or is less than 9. $\frac{15}{36} + \frac{26}{36} - \frac{13}{36}$

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

6. If a coin is tossed 3 times find the probability of tossing:

- (a) exactly one head or exactly two heads.
- (b) exactly one head or exactly one tail.
- (c) at least one head or at least one tail.
- (d) at least two heads or no tails.
- (e) a head on the first toss or a tail on the last toss.
- (f) a head on the second toss or a tail on the first and third tosses.

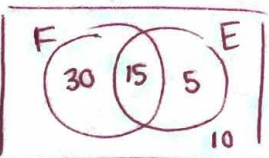
7. A survey of how 100 people spent money on music revealed that: 36 bought rock music, 27 were teenagers, and 21 were teenagers who bought rock music. If T represents those who are teenagers and R represents those who buy rock music, complete the following Venn diagram replacing the question marks with the appropriate numbers. Then find the probability that a person selected at random from among the 100 people surveyed:



- (a) is a teenager who does not buy rock music. $\frac{6}{100}$
- (b) buys rock music or is a teenager. $\frac{15+21+6}{100}$
- (c) is not a teenager $\frac{15+58}{100}$
- (d) does not buy rock music. $\frac{6+58}{100}$
- (e) is not a teenager but buys rock music. $\frac{15}{100}$
- (f) is not a teenager and does not buy rock music. $\frac{58}{100}$

8. Sixty people were interviewed in a predominantly French speaking community and were asked to indicate in which language(s) they were fluent. The results showed that 45 spoke French, 20 spoke English, and 15 spoke French and English. A person is randomly selected from the group that was interviewed. Draw a Venn diagram illustrating the relationships of the events and the sample space, and find the probability that the person:

- (a) speaks French or English. $\frac{50}{60}$
- (b) speaks both French and English. $\frac{15}{60}$
- (c) speaks neither language. $\frac{10}{60}$
- (d) speaks only one of the two languages. $\frac{30+5}{60}$



Chapter 1 Probability And The Binomial Theorem

$$\frac{{}^3C_3 + {}^9C_3 - 5C_3}{15C_3}$$

$$\frac{{}^3C_3 + 11C_3 - 4C_3}{15C_3}$$

$$\frac{{}^3C_3 + 5C_3 - 2C_3}{15C_3}$$

9. Marbles numbered from 1 to 15 are placed in a bag. If a set of three marbles is drawn from the bag, find the probability that:

- (a) all three marbles are odd numbered or all three marbles show numbers greater than 6.
- (b) all three marbles show numbers greater than 7 or all three marbles show numbers less than 12.
- (c) all three marbles show odd numbers or all three marbles show numbers that are divisible by 3.

10. All possible 3-digit numbers are made from the digits {0, 1, 2, 3, 6}, repetition of digits being allowed. Suppose these numbers are written on identical slips of paper and placed in a hat. If one number is selected from the hat, find the probability that it:

- (a) is odd or starts with 3. $\frac{4 \cdot 5 \cdot 2 + 1 \cdot 5 \cdot 5 - 1 \cdot 5 \cdot 2}{100}$
- (b) is even or a multiple of 5. $\frac{4 \cdot 5 \cdot 3 + 4 \cdot 5 \cdot 1 - 4 \cdot 5 \cdot 1}{100}$
- (c) ends in 3 or starts with 3. $\frac{4 \cdot 5 \cdot 1 + 1 \cdot 5 \cdot 5 + 1 \cdot 5 \cdot 1}{100}$

4 · 5 · 5 = 100 outcomes

11. A set of 2 cards is chosen from a standard deck of 52 cards. Find the probability that both cards are:

- (a) black or red. $\frac{{}^{26}C_2 + {}^{26}C_2}{52C_2}$
- (b) black or hearts. $\frac{{}^{26}C_2 + {}^{13}C_2}{52C_2}$
- (c) black or face cards. $\frac{{}^{26}C_2 + {}^{12}C_2 - 6C_2}{52C_2}$
- (d) black or aces. $\frac{{}^{26}C_2 + 4C_2 - 2C_2}{52C_2}$

For Discussion

- 12. In a probability experiment a set of three dice is rolled.
 - (a) Create two events that are mutually exclusive. Explain.
 - (b) Create two events that are not mutually exclusive. Explain.

Digging Deeper

- 13. In a certain high school there are 200 students in grade eleven. 100 of these students are taking Biology 20, 110 are taking Chemistry 20, and 90 are taking Physics 20. 51 students are taking both Biology 20 and Physics 20, 54 students are taking Chemistry 20 and Physics 20, and 60 students are taking Biology 20 and Chemistry 20. 21 students are taking all three of these classes. If a grade eleven student is selected at random to represent the school at a conference on environmental issues, determine the probability that the student: (Hint: use a Venn diagram for 3 events.)
 - (a) takes Biology 20 but not Physics 20 nor Chemistry 20.
 - (b) takes Chemistry 20 or Physics 20 but not Biology 20.
 - (c) takes only one of the three classes.
 - (d) takes none of the three classes.
 - (e) takes exactly two of the three classes.

- 14. Complete the following Or Probability Formula for three events.
 $P(A \cup B \cup C) = P(A) + P(B) + P(C) - \dots$