# CHAPTER 15 – PROBABILITY
Question Booklet

EXERCISE 15A

1 When a coin is tossed 100 times, it falls heads 47 times. Find the experimental probability that the coin falls:

   a heads   **b** tails.

2 A batch of 145 paper clips was dropped onto 6 cm by 6 cm squared paper. 113 clips fell completely inside squares, and 32 finished up on the grid lines. Estimate, to 2 decimal places, the probability of a clip falling:

   a inside a square   **b** on a line.

3 Connor visits the same bakery each day for lunch. On 13 out of his last 40 visits, the bakery had sold out of pies. Estimate the probability that the bakery will have sold out of pies on his next visit.

4 During one day at a carnival, 247 people played the coconut shy game. 175 people did not win a prize, 64 people won a minor prize, and the remainder won a major prize. Estimate the probability that the next player will win:

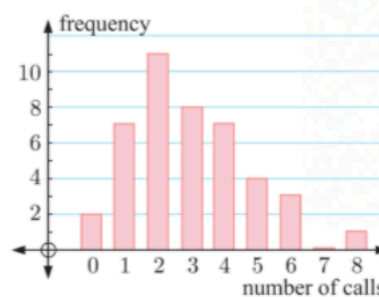   **a** a major prize   **b** any prize.
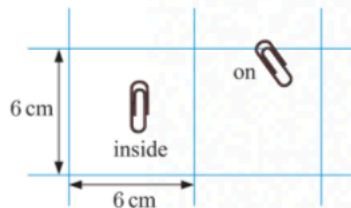
EXERCISE 15B.1

1 Pat does a lot of travelling in her car, so she records how often she fills her car with petrol. The table alongside shows the frequencies of the *number of days between refills*.

Estimate the likelihood that between refills there is:

   a exactly a four day gap

   b at least a four day gap.

Days between refills	Frequency
1	37
2	81
3	48
4	17
5	6
6	1

2 José recorded the length of TV commercials in seconds. His results are summarised in the table.

Estimate, to 3 decimal places, the probability that a randomly chosen TV commercial will last:

   a 20 to 39 seconds

   b more than a minute

   c between 20 and 59 seconds inclusive.

Length	Frequency
$0 \leqslant t < 20$	17
$20 \leqslant t < 40$	38
$40 \leqslant t < 60$	19
$t \geqslant 60$	4

3 Paula records the number of phone calls she receives over a period of consecutive days.

   a For how many days did Paula's survey last?

   b How many calls did Paula receive over this period?

   c Estimate the chance that on a particular day, Paula will receive:

      i no phone calls

      ii 5 or more phone calls

      iii less than 3 phone calls.

EXERCISE 15B.2

1 310 students at a high school in Queensland were surveyed on the question "Do you like watching rugby on TV?". The results are shown in the two-way table alongside.

	Like	Dislike
Junior students	87	38
Senior students	129	56

  a Copy and complete the table to include 'totals'.

  b Estimate the probability that a randomly selected student:

    i likes watching rugby on TV and is a junior student

    ii likes watching rugby on TV and is a senior student

    iii likes watching rugby on TV, given that the student is a senior

    iv is a senior, given that the student likes watching rugby on TV.

2 A random selection of students in a youth club were asked whether they wore glasses, contact lenses, or neither. The results were further categorised by gender.

	Glasses	Contact lenses	Neither
Male	15	6	26
Female	14	8	31

  a How many students were surveyed?

  b Estimate the probability that a randomly chosen student in the club:

    i wears glasses   **ii** is female and wears contact lenses

    iii is male and wears neither   **iv** wears neither, given that they are male

    v is female, given that they wear glasses.

3 The table alongside describes the types of cars advertised for sale in a newspaper.

Estimate the probability that a randomly selected car for sale:

	Manual	Automatic
Hatchback	26	27
Sedan	30	39
4WD	9	16

  a is a sedan   **b** is a manual hatchback

  c is a 4WD, given that it is automatic

  d is manual, given that it is not a sedan.

4 A selection of hotels in Sydney are given a gold star rating for quality, and a green star for environmental friendliness.

Estimate the probability that a randomly selected Sydney hotel is given:

Gold star \ Green star	★	★★	★★★	★★★★
★	5	2	1	1
★★	4	10	4	3
★★★	2	8	13	8
★★★★	1	7	9	4

  a 2 gold stars and 4 green stars

  b 3 gold stars or higher

  c the same number of gold stars as green stars

  d more green stars than gold stars

  e 1 gold star, if it is known that the hotel has been given at least 2 green stars.

EXERCISE 15C

1 **a** How many males out of 100 000 are expected to live to 60 years of age?

    b How many females out of 100 000 are expected to live to 80 years of age?

2 Find the expected age of death of:

    a a male now 15 years old

    b a female now 15 years old

    c a male now 50 years old

    d a female now 50 years old.

3 Find the probability of:

    a a male surviving to the age of 55

    b a female surviving to the age of 90.

4 Find the probability of a 45 year old male living to the age of:

    a 50 years   **b** 65 years   **c** 80 years.

5 Find the probability of a 45 year old female living to the age of:

    a 50 years   **b** 65 years   **c** 80 years.

6 An insurance company offers to insure a 25 year old female against death for the next 10 years. Find the probability that the female will die within the next 10 years.

7 Theodore is currently 85 years old. His wife Mavis is 80 years old. Which of them is more likely to live to 100?

EXERCISE 15D

1 List, in set notation, the sample space for:

    a the genders of a 2-child family

    b the order in which 3 men can be lined up

    c tossing 4 coins simultaneously

    d the order in which 4 different rowing teams A, B, C, and D could finish a race.

2 Draw a two-dimensional grid to illustrate the sample space for:

    a rolling a die and tossing a coin simultaneously

    b rolling a pair of dice

    c twirling a square spinner marked A, B, C, D and a triangular spinner marked 1, 2, 3

    d selecting one even number and one odd number from the integers 1 to 10.

3 Use a tree diagram to illustrate the sample space for the following situations:

    a Tossing a 10-cent coin and a 20-cent coin simultaneously.

    b Rolling a 6-sided die and tossing a coin simultaneously.

    c The genders of a 3-child family.

    d Bag A contains red and white marbles and bag B contains blue and yellow marbles. A bag is selected and one marble is taken from it.

    e Hats A, B, and C each contain pink and white tickets. A hat is selected and then two tickets are taken from it.

EXERCISE 15E

1 A spinner with the numbers 1 to 5 written on equal sectors is spun once. Find the probability of spinning:

    a a 4   **b** a 1 or a 2

    c an odd number.
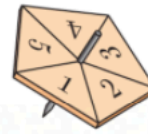
2 A symmetrical octahedral die has numbers 1 to 8 marked on its faces. If it is rolled once, determine the probability of getting:

    a a 4   **b** a number less than 5   **c** a number greater than 8.

3 A bag contains 4 red and 3 green buttons. One button is randomly selected from the bag. Find the probability that the button is:

    a red   **b** green   **c** red or green.

4 A 52 card pack is well shuffled, and then one card is dealt from the top of the pack. Find the probability that the card is:

    a a Jack   **b** a black card

    c a diamond   **d** a diamond or an ace.

5 Find the probability that a person randomly selected in the street has his or her birthday in:

    a May   **b** February.

6 37 people applied for a job at a toy store. 11 were selected for an interview, and from these people 3 were offered a position at the store.

    a Find the probability that a randomly selected applicant was:

        i offered a position

        ii interviewed, but not offered a position

        iii not selected for an interview.

    b Find the sum of the probabilities in **a**. Explain your answer.

    c One of the applicants who was interviewed is selected at random. Find the probability that he or she was offered a position.

7 Amy is invited to select a treat from a bag containing 6 strawberry lollies, 3 mints, and 5 chocolates.

    a If Amy selects a treat at random, find the probability that she selects:

        i a mint   **ii** a mint or a chocolate.

    b Amy selects a chocolate, eats it, then passes the bag to Beth. If Beth selects a treat at random, find the probability that she selects:

        i a mint   **ii** a chocolate.

8 There are 5 different pairs of socks in Vanessa's sock drawer. The light in her room is not working, so she removes 2 socks from her drawer at random. Find the probability that Vanessa has removed a matching pair.

9 Ralph begins a game of 'Battleship' by placing an aircraft carrier on a 10×10 grid. The aircraft carrier must be placed horizontally or vertically, occupying 5 squares. One possible position is shown alongside.
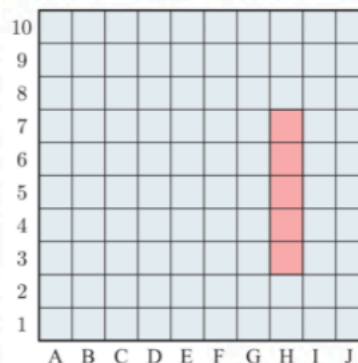
    a In how many different positions can the aircraft carrier be placed?

    b Ralph selects one of these positions at random. Find the probability that the aircraft carrier:

        i is placed horizontally

        ii occupies at least one edge or corner square

        iii occupies the square B3

        iv occupies the square E5.

10 Sean is playing a board game. He needs to roll 10 or more with a pair of dice on his next turn, to win. There are 11 possible outcomes (2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12), and 3 of these outcomes (10, 11, 12) will result in him winning the game. Sean therefore says the probability that he will win the game is $\frac{3}{11}$. Explain the flaw in Sean's reasoning.

4

EXERCISE 15F

1 **a** Draw the grid of the sample space when a $1 and a $2 coin are tossed simultaneously.

   b Hence determine the probability of getting:

     i two heads   **ii** exactly one head   **iii** at least one head.

2 **a** Use a grid to illustrate the sample space when a coin is tossed and a spinner with 3 equal sectors A, B, and C is twirled.

   b **i** List the sample space.

      ii How many outcomes are possible?

   c Use your grid to determine the chance of getting:

     i an A and a head   **ii** a head but *not* an A   **iii** an A

     iv an A or a B, and a tail   **v** an A, or, a B and a tail.

3 Bag A contains one red disc and one blue disc. Bag B contains one red, one blue, and one white disc.
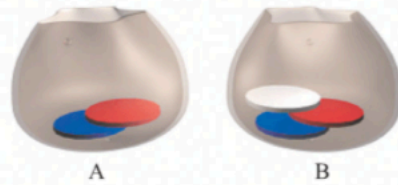
   a Draw a grid of the sample space when one disc is taken at random from each bag.

   b Hence determine the probability of getting:

     i two red discs   **ii** two discs the same colour

     iii a white disc   **iv** two discs which are different in colour.

4 A pair of dice is rolled. The 36 possible outcomes are illustrated on the 2-dimensional grid.
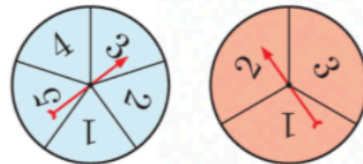
   Use the grid to determine the probability of getting:

   a two 3s   **b** a 5 and a 6

   c a 5 or a 6   **d** at least one 6

   e exactly one 6   **f** no sixes

   g a sum of 7   **h** a sum of 7 or 11

   i a sum of 10 or greater.
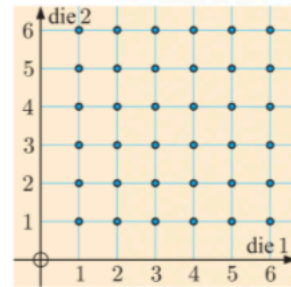
5 The spinners shown are spun once, and the numbers spun are multiplied together.

   a Find the probability that the result is:

     i 9   **ii** 6

     iii greater than 5   **iv** prime.

   b Is the result more likely to be even or odd?

6 In a role-playing game, Melanie and Neil duel by each rolling an eight-sided die. Since Neil's character has a high level, to win the duel Melanie must roll a number at least 2 greater than Neil's roll. Find the probability that Melanie will win the duel.

EXERCISE 15G.1

1 A coin and a pentagonal spinner with edges marked A, B, C, D, and E are tossed and twirled simultaneously. Find the probability of getting:

   a a head and a D   **b** a tail and either an A or a D.

2 A spinner with 6 equal sides has 3 red, 2 blue, and 1 yellow edge. A second spinner with 7 equal sides has 4 purple and 3 green edges. The spinners are twirled simultaneously. Find the probability of getting:

   a a red and a green   **b** a blue and a purple.

3 Janice and Lee take set shots at a netball goal from 3 m. From past experience, Janice throws a goal on average 2 times in every 3 shots, whereas Lee throws a goal 4 times in every 7 shots. If the two girls both shoot for goals, determine the probability that:

   a both score a goal   **b** both miss

   c Janice scores a goal but Lee misses.

4 When a nut was tossed 400 times it finished on its edge 84 times and on its side for the rest.

   a Find the experimental probability that when this nut is tossed, it will finish on its edge.

   b Hence estimate the probability that when two identical nuts are tossed:

     i they both fall on their edges   **ii** they both fall on their sides.

edge   side

5 Tei has probability $\frac{1}{3}$ of hitting a target with an arrow, while See has probability $\frac{2}{5}$. If they both fire at the target, determine the probability that:

   a both hit the target   **b** both miss the target

   c Tei hits the target and See misses   **d** Tei misses the target and See hits.

6 Vicky and Paul are taking their driving test tomorrow. Vicky has 70% chance of passing the test, and Paul has 60% chance of passing the test. Find the probability that:

   a they both pass the test

   b at least one of them fails the test.
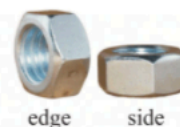
EXERCISE 15G.2

1 A packet contains 8 identically shaped jelly beans. 5 are green and 3 are yellow. Two jelly beans are randomly selected without replacing the first before the second is drawn.

   a Determine the probability of getting:

     i two green jelly beans   **ii** a green then a yellow jelly bean

     iii a yellow then a green jelly bean   **iv** two yellow jelly beans.

   b Explain why your answers in **a** add up to 1.

2 From a squad of 3 male and 5 female players, two are randomly selected to play an exhibition match. Find the probability that both players are female.

3 Tickets numbered 1 to 20 are placed in a hat. Two tickets are drawn out at random, without replacement. Find the probability that:

   a the first number drawn is even and the second number is odd

   b both of the numbers are prime.

4 A container has 4 purple, 3 blue, and 1 gold ticket. Three tickets are selected without replacement. Find the probability that:

   a all of the tickets are purple   **b** all of the tickets are blue

   c the first two are purple and the third is gold   **d** none of the tickets is blue.

EXERCISE 15H

1 Suppose this spinner is spun twice:

  a Draw a tree diagram to illustrate the sample space.

  b Determine the probability that:

    i blue appears on both spins

    ii green appears on both spins

    iii different colours appear on both spins   **iv** blue appears on *either* spin.

2 The probability of the race track being muddy next week is estimated to be $\frac{1}{4}$. If it is muddy, the horse Rising Tide will start favourite with probability $\frac{2}{5}$ of winning. If it is dry, Rising Tide has a $\frac{1}{20}$ chance of winning.

  a Display the sample space of possible results on a tree diagram.

  b Determine the probability that Rising Tide will win next week.

3 Tennis star Boris gets his first serve in 72% of the time. If he gets his first serve in, he wins the point 85% of the time. If not, he only wins the point 50% of the time.
Find the probability that Boris will win the next point he serves.

4 Machine A cans 60% of the fruit at a factory. Machine B cans the rest. Machine A spoils 3% of its product, while Machine B spoils 4%. Determine the probability that the next can inspected at this factory will be spoiled.

5 Box A contains 2 blue and 3 red blocks. Box B contains 5 blue and 1 red block. A box is chosen by the flip of a coin, and one block is taken at random from that box. Determine the probability that the block is red.

6
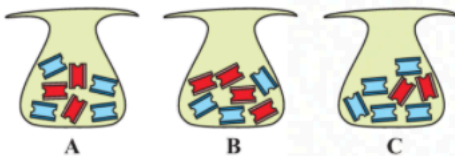
Three bags contain different numbers of blue and red tickets. A bag is selected using a die which has three A, two B, and one C face.
One ticket is selected at random from the chosen bag. Determine the probability that it is:

  a blue   **b** red.

7 Balls numbered 1 to 10 are placed in a bag. Two of the balls are drawn out at random. Find the probability that the numbers on the balls are consecutive.

8 Consider the **Opening Problem** on page **312**.

  a Copy and complete the tree diagram alongside to represent the situation.

  b Find the probability that player A will win the grand final.

  c Who is most likely to win the grand final?

  d Suppose that A played C, and B played D in the semi-finals instead. Who is now most likely to win the grand final?
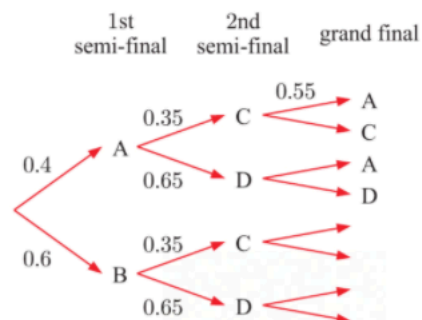
EXERCISE 15I

1 A box contains 6 red and 3 yellow tickets. Two tickets are drawn at random, the first being *replaced* before the second is drawn.

  a Draw a tree diagram to represent the sample space.

  b Hence determine the probability that:

      i both tickets are red   **ii** both tickets are yellow

     iii the first ticket is red and the second is yellow

     iv one ticket is red and the other is yellow.

2 7 tickets numbered 1, 2, 3, 4, 5, 6, and 7 are placed in a hat. Two of the tickets are taken from the hat at random *without replacement*. Determine the probability that:

  a both are odd   **b** both are even

  c the first is even and the second is odd   **d** one is even and the other is odd.

3 Jessica has a bag of 9 acid drops which are identical in shape. 5 are raspberry flavoured and 4 are orange flavoured. She selects one acid drop at random, eats it, and then takes another, also at random.

  a Determine the probability that:

      i both acid drops were orange flavoured   **ii** both were raspberry flavoured

     iii the first was raspberry and the second was orange

     iv the first was orange and the second was raspberry.

  b Explain why the sum of your answers in **a** is 1.

4 A cook selects an egg at random from a carton containing 7 ordinary eggs and 5 double-yolk eggs. She cracks the egg into a bowl and sees whether it has two yolks or not. She then selects another egg at random from the carton and checks it.
Let S represent "a single yolk egg" and D represent "a double yolk egg".

  a Draw a tree diagram to illustrate this process.

  b Find the probability that both eggs had:

      i two yolks   **ii** only one yolk.

5 In a particular board game there are nine tiles: five are green and the remainder are brown. The tiles start face down on the table so they all look the same.

  a A player picks a tile at random. Determine the probability that it is:

      i green   **ii** brown.

  b Suppose a player has to pick two tiles in a row, replacing the first and shuffling them before the second is selected. Use a tree diagram to help determine the probability that:

      i both tiles are green   **ii** both tiles are brown

     iii tile 1 is brown and tile 2 is green

     iv one tile is brown and the other is green.

6 A sporting club runs a raffle in which 200 tickets are sold. There are two winning tickets which are drawn at random, in succession, without replacement.
Adam buys 8 tickets in the raffle. Determine the probability that he:

  a wins first prize   **b** does not win first prize

  c wins both prizes   **d** wins neither prize

  e wins second prize *given that* he does not win first prize.

7 In the manufacturing of transformers for electric lights, there is a 3% chance that any transformer made is faulty. Benny leaves for a job installing 2 new lights. He carries 3 transformers in his van.

  a When selecting a transformer, is this sampling with or without replacement?

  b Draw a tree diagram to illustrate the sampling process.

  c Find the probability that Benny will not be able to finish the job with the transformers in his van.

8
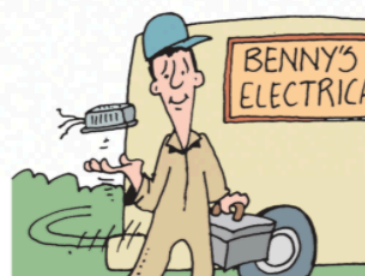
Review set 15

1 A farmer fences his rectangular property into 9 rectangular paddocks as shown. A paddock is selected at random. Find the probability that it has:
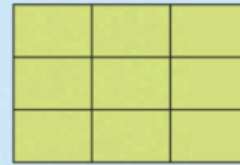
   a no fences on the boundary of the property

   b one fence on the boundary of the property

   c two fences on the boundary of the property.

2 University students were surveyed to find who owns a motor vehicle (MV) and who owns a computer. The results are shown in the two-way table.

Estimate the probability that a randomly selected university student has:

	MV	no MV
computer	124	168
no computer	16	22

   a a computer   **b** a motor vehicle   **c** a computer and a motor vehicle

   d a motor vehicle given that the student does not have a computer.

3 Use the life table on page **318** to determine the probability that:

   a a male will survive to the age of 40

   b a 20 year old female will survive to the age of 80

   c a 35 year old man will die before the age of 70.

4 Over a 35 day period, Lorna records the number of phone calls she receives. The graph of her data is shown alongside.
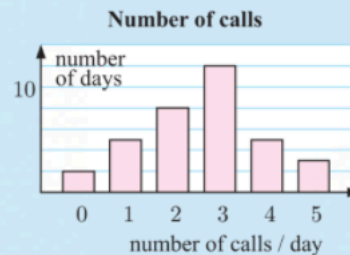
   a Estimate the probability that on any day Lorna will receive:

      i no phone calls

      ii at least 3 phone calls

      iii between 1 and 5 calls inclusive.

   b Comment on the reliability of your answers in **a**.

Number of calls

5 A circle is divided into 5 sectors with equal angles at the centre. It is made into a spinner, and the sectors are numbered 1, 2, 3, 4, and 5. A coin is tossed and the spinner is spun.

   a Use a 2-dimensional grid to show the sample space of possible outcomes.

   b Find the chance of getting:

      i a head and a 5   **ii** a head or a 5.

6 A bag of mixed lollies contains 10 mints and 6 chocolate caramels. A second bag contains 8 mints and 8 chocolate caramels. A bag is randomly chosen by tossing a coin, and a lolly is then taken from it.

   a Construct a tree diagram to show the sample space.

   b Hence determine the probability that the lolly selected will be:

      i a chocolate caramel   **ii** a mint.

7 A bag contains 4 green and 3 red marbles. Two marbles are randomly selected from the bag without replacement. Determine the probability that:

   a both are green   **b** they are different in colour.

8 Alec Smart and Joe Slow sit for an examination in Chemistry. Alec has a 95% chance of passing and Joe has a 25% chance of passing. Determine the probability that:
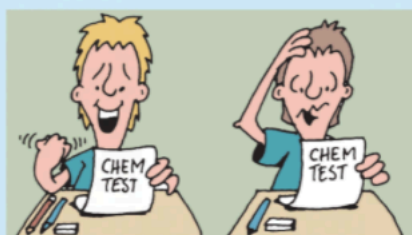
   a both pass   **b** both fail

   c Joe passes *and* Alec fails

   d Alec passes *and* Joe fails.

CHAPTER 15 – PROBABILITY
Solutions

EXERCISE 15A

1 a 0.47   **b** 0.53   **2 a** ≈ 0.78 **b** ≈ 0.22

3 0.325   **4 a** ≈ 0.032 **b** ≈ 0.291

EXERCISE 15B.1

1 a ≈ 0.089 **b** ≈ 0.126

2 a ≈ 0.487 **b** ≈ 0.051 **c** ≈ 0.731

3 a 43 days   **b** 127 calls

   c   **i** ≈ 0.047 **ii** ≈ 0.186 **iii** ≈ 0.465

4 a ≈ 0.957 **b** ≈ 0.089 **c** ≈ 0.144 **d** ≈ 0.094

   e ≈ 0.033

EXERCISE 15B.2

1 a

	Like	Dislike	Total
Junior students	87	38	125
Senior students	129	56	185
Total	216	94	310

   b   **i** ≈ 0.281 **ii** ≈ 0.416 **iii** ≈ 0.697 **iv** ≈ 0.597

2 a 100 students

   b   **i** ≈ 0.29 **ii** ≈ 0.08 **iii** ≈ 0.26 **iv** ≈ 0.553

     v ≈ 0.483

3 a ≈ 0.469 **b** ≈ 0.177 **c** ≈ 0.195 **d** ≈ 0.449

4 a ≈ 0.037 **b** ≈ 0.634 **c** ≈ 0.390 **d** ≈ 0.232

   e ≈ 0.057

EXERCISE 15C

1 a 88 421 males   **b** 64 682 females

2 a ≈ 76.4 years   **b** ≈ 82.0 years   **c** ≈ 78.6 years

   d ≈ 83.1 years

3 a ≈ 0.918 **b** ≈ 0.264

4 a ≈ 0.986 **b** ≈ 0.871 **c** ≈ 0.485

5 a ≈ 0.992 **b** ≈ 0.923 **c** ≈ 0.663

6 $\approx 0.004\,82$ **7** Mavis ≈ 0.0402, Theo ≈ 0.0349 $\therefore$ Mavis

EXERCISE 15D

1 a {BB, BG, GB, GG}

   b {ABC, ACB, BAC, BCA, CAB, CBA}

   c {HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTHT, THHT, HTTH, THTH, TTHH, HTTT, THTT, TTHT, TTTH, TTTT}

   d {ABCD, ABDC, ACBD, ACDB, ADBC, ADCB, BACD, BADC, BCAD, BCDA, BDAC, BDCA, CABD, CADB, CBAD, CBDA, CDAB, CDBA, DABC, DACB, DBAC, DBCA, DCAB, DCBA}
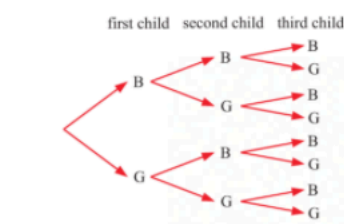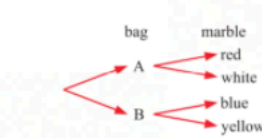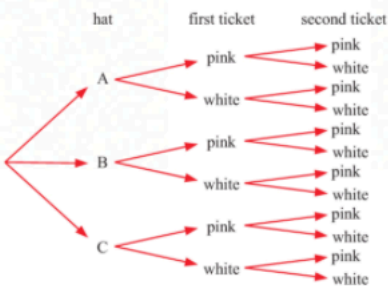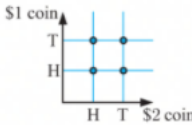
2 a

   b

   c
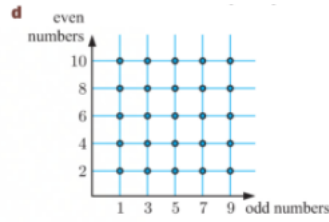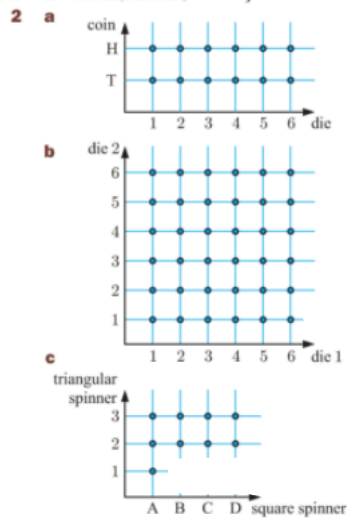
3 a
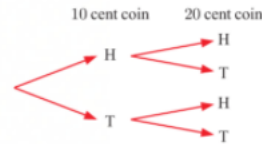
   b

   c

   d

   e
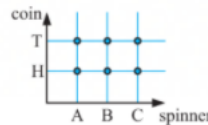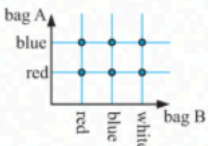
EXERCISE 15E

1 a $\frac{1}{5}$ **b** $\frac{2}{5}$ **c** $\frac{3}{5}$ **2 a** $\frac{1}{8}$ **b** $\frac{1}{2}$ **c** 0

3 a $\frac{4}{7}$ **b** $\frac{3}{7}$ **c** 1

4 a $\frac{1}{13}$ **b** $\frac{1}{2}$ **c** $\frac{1}{4}$ **d** $\frac{16}{52} = \frac{4}{13}$

5 For a 4-year cycle: **a** $\frac{124}{1461}$ **b** $\frac{113}{1461}$

6 a   **i** $\frac{3}{37}$ **ii** $\frac{8}{37}$ **iii** $\frac{26}{37}$

   b 1. This is the sum of all possible outcomes.   **c** $\frac{3}{11}$

7 a   **i** $\frac{3}{14}$ **ii** $\frac{4}{7}$ **b**   **i** $\frac{3}{13}$ **ii** $\frac{4}{13}$ **8** $\frac{1}{9}$

9 a 120   **b**   **i** $\frac{1}{2}$ **ii** $\frac{7}{15}$ **iii** $\frac{1}{24}$ **iv** $\frac{1}{12}$

10 The 11 possible outcomes are **not** equally likely to occur.

$P(10) = \frac{3}{36}$, $P(11) = \frac{2}{36}$, $P(12) = \frac{1}{36}$

$\therefore$ the probability of Sean winning is $\frac{6}{36} = \frac{1}{6}$.

EXERCISE 15F

1 a [grid diagram: $1 coin (T, H) vs $2 coin (H, T)]

b i $\frac{1}{4}$ **ii** $\frac{1}{2}$ **iii** $\frac{3}{4}$

2 a [grid diagram: coin (T, H) vs spinner (A, B, C)]

b i {HA, HB, HC, TA, TB, TC} **ii** 6

c i $\frac{1}{6}$ **ii** $\frac{1}{3}$ **iii** $\frac{1}{3}$ **iv** $\frac{1}{3}$ **v** $\frac{1}{2}$

3 a [grid diagram: bag A (blue, red) vs bag B (red, blue, white)]

b i $\frac{1}{6}$ **ii** $\frac{1}{3}$ **iii** $\frac{1}{3}$ **iv** $\frac{2}{3}$

4 a $\frac{1}{36}$ **b** $\frac{1}{18}$ **c** $\frac{5}{9}$ **d** $\frac{11}{36}$ **e** $\frac{5}{18}$
f $\frac{25}{36}$ **g** $\frac{1}{6}$ **h** $\frac{2}{9}$ **i** $\frac{1}{6}$

5 a i $\frac{1}{15}$ **ii** $\frac{2}{15}$ **iii** $\frac{7}{15}$ **iv** $\frac{1}{3}$ **b** even $\left(\frac{3}{5}\right)$

6 $\frac{21}{64}$

EXERCISE 15G.1

1 a $\frac{1}{10}$ **b** $\frac{1}{5}$ **2 a** $\frac{3}{14}$ **b** $\frac{4}{21}$

3 a $\frac{8}{21}$ **b** $\frac{1}{7}$ **c** $\frac{2}{7}$

4 a 0.21 **b i** 0.0441 **ii** 0.6241

5 a $\frac{2}{15}$ **b** $\frac{2}{5}$ **c** $\frac{1}{5}$ **d** $\frac{4}{15}$
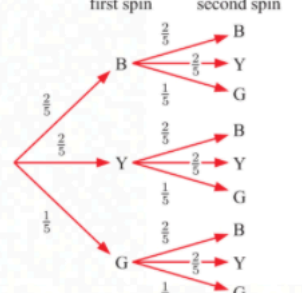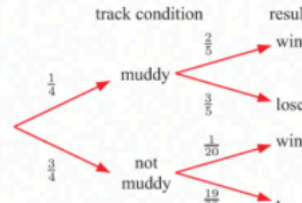
6 a 0.42 **b** 0.58

EXERCISE 15G.2

1 a i $\frac{5}{14}$ **ii** $\frac{15}{56}$ **iii** $\frac{15}{56}$ **iv** $\frac{3}{28}$
b They are all the possible outcomes.

2 $\frac{5}{14}$ **3 a** $\frac{5}{19}$ **b** $\frac{14}{95}$

4 a $\frac{1}{14}$ **b** $\frac{1}{56}$ **c** $\frac{1}{28}$ **d** $\frac{5}{28}$
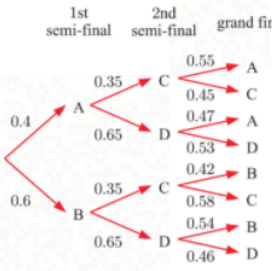
EXERCISE 15H

1 a [tree diagram: first spin → second spin, branches B, Y, G with probabilities $\frac{2}{5}, \frac{2}{5}, \frac{1}{5}$]

b i $\frac{4}{25}$ **ii** $\frac{1}{25}$ **iii** $\frac{16}{25}$ **iv** $\frac{16}{25}$

2 a [tree diagram: track condition → result; muddy $\frac{1}{4}$ (win $\frac{2}{5}$, lose $\frac{3}{5}$), not muddy $\frac{3}{4}$ (win $\frac{1}{20}$, lose $\frac{19}{20}$)] **b** $\frac{11}{80}$
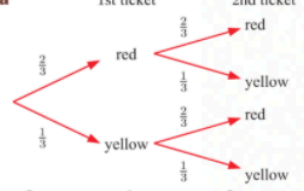
3 0.752 **4** 0.034 **5** $\frac{23}{60}$

6 a $\frac{23}{42}$ **b** $\frac{19}{42}$ **7** $\frac{1}{5}$
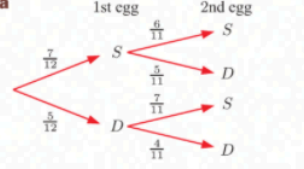
8 a [tree diagram: 1st semi-final → 2nd semi-final → grand final; A 0.4 (C 0.35 → A 0.55, C 0.45; D 0.65 → A 0.47, D 0.53), B 0.6 (C 0.35 → B 0.42, C 0.58; D 0.65 → B 0.54, D 0.46)]

b 0.1992 **c** player D **d** player B

EXERCISE 15I

1 a [tree diagram: 1st ticket → 2nd ticket; red $\frac{2}{3}$ (red $\frac{2}{3}$, yellow $\frac{1}{3}$), yellow $\frac{1}{3}$ (red $\frac{2}{3}$, yellow $\frac{1}{3}$)] **b i** $\frac{4}{9}$ **ii** $\frac{1}{9}$ **iii** $\frac{2}{9}$ **iv** $\frac{4}{9}$
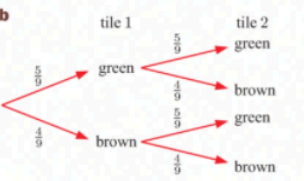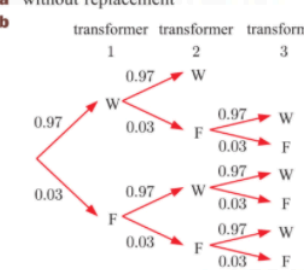
2 a $\frac{2}{7}$ **b** $\frac{1}{7}$ **c** $\frac{2}{7}$ **d** $\frac{4}{7}$

3 a i $\frac{1}{6}$ **ii** $\frac{5}{18}$ **iii** $\frac{5}{18}$ **iv** $\frac{5}{18}$
b These cases cover all possible outcomes, so their probabilities must add up to 1.

4 a [tree diagram: 1st egg → 2nd egg; S $\frac{7}{12}$ (S $\frac{6}{11}$, D $\frac{5}{11}$), D $\frac{5}{12}$ (S $\frac{7}{11}$, D $\frac{4}{11}$)] **b i** $\frac{5}{33}$ **ii** $\frac{7}{22}$

5 a i $\frac{5}{9}$ **ii** $\frac{4}{9}$
b [tree diagram: tile 1 → tile 2; green $\frac{5}{9}$ (green $\frac{5}{9}$, brown $\frac{4}{9}$), brown $\frac{4}{9}$ (green $\frac{5}{9}$, brown $\frac{4}{9}$)] **i** $\frac{25}{81}$ **ii** $\frac{16}{81}$ **iii** $\frac{20}{81}$ **iv** $\frac{40}{81}$

6 a $\frac{1}{25}$ **b** $\frac{24}{25}$ **c** $\frac{7}{4975}$ **d** $\frac{4584}{4975}$ **e** $\frac{8}{199}$
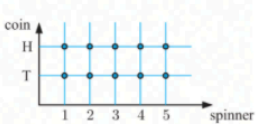
7 a without replacement
b [tree diagram: transformer 1 → transformer 2 → transformer 3; W 0.97 (W 0.97, F 0.03 → W 0.97, F 0.03), F 0.03 (W 0.97 → W 0.97, F 0.03; F 0.03 → W 0.97, F 0.03)]
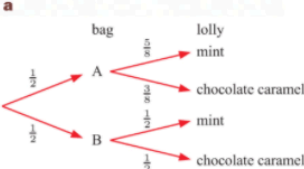**c** ≈ 0.002 65

REVIEW SET 15

1 a $\frac{1}{9}$ **b** $\frac{4}{9}$ **c** $\frac{4}{9}$

2 a ≈ 0.885 **b** ≈ 0.424 **c** ≈ 0.376 **d** ≈ 0.421

3 a ≈ 0.960 **b** ≈ 0.653 **c** ≈ 0.235

4 a i ≈ 0.0571 **ii** ≈ 0.571 **iii** ≈ 0.943
b May be unreliable because the sample size is small.

5 a [grid diagram: coin (H, T) vs spinner (1, 2, 3, 4, 5)] **b i** $\frac{1}{10}$ **ii** $\frac{3}{5}$

6 a [tree diagram: bag → lolly; A $\frac{1}{2}$ (mint $\frac{5}{8}$, chocolate caramel $\frac{3}{8}$), B $\frac{1}{2}$ (mint $\frac{1}{2}$, chocolate caramel $\frac{1}{2}$)] **b i** $\frac{7}{16}$ **ii** $\frac{9}{16}$

7 a $\frac{2}{7}$ **b** $\frac{4}{7}$

8 a 0.2375 **b** 0.0375 **c** 0.0125 **d** 0.7125