Mathematics

Edexcel IAL

S1

Worksheet Answers

Probability

Eng. Nagy Elraheb

Probability

Exercise 1:

1 $\frac{1}{2}$

2 a

		Second roll					
		1	**2**	**3**	**4**	**5**	**6**
First roll	**1**	1	2	3	4	5	6
	2	2	4	6	8	10	12
	3	3	6	9	12	15	18
	4	4	8	12	16	20	24
	5	5	10	15	20	25	30
	6	6	12	18	24	30	36

b i $\frac{1}{18}$ **ii** $\frac{2}{9}$ **iii** $\frac{3}{4}$

3 a $\frac{2}{5}$

b $\frac{5}{7}$

c Less likely; frequency uniformly distributed throughout the class.

4 a $\frac{19}{40}$ **b** $\frac{109}{240}$ **c** $\frac{71}{240}$

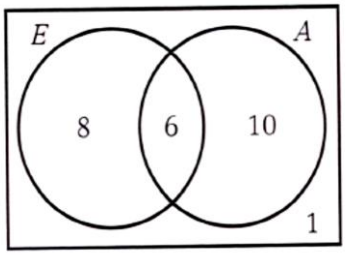
d $\frac{2}{15}$; distribution of lengths of koalas between 70 and 75 cm is uniform.

5 a $\frac{16}{35}$

b $\frac{32}{35}$

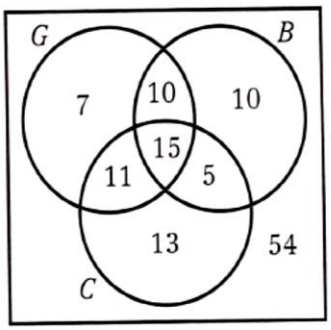
Exercise 2:

1 a



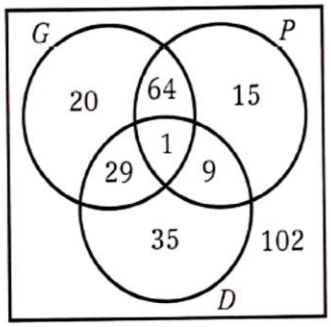
i $\frac{14}{25}$ **ii** $\frac{6}{25}$ **iii** $\frac{8}{25}$ **iv** $\frac{1}{25}$

2 a



b **i** $\frac{3}{25}$ **ii** $\frac{2}{25}$ **iii** $\frac{2}{25}$ **iv** $\frac{54}{125}$

3 a **i**



b **i** $\frac{89}{275}$ **ii** $\frac{103}{275}$ **iii** $\frac{14}{55}$ **iv** $\frac{102}{275}$

4 a 0.17
b 0.18
c 0.55

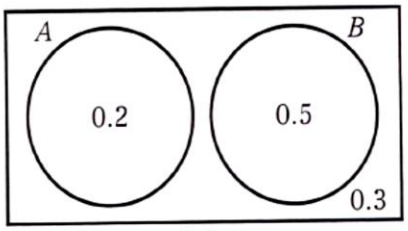
5 a 0.3
b 0.3

6 a 0.15
b 0.15

7 $p = 0.13$, $q = 0.25$

Exercise 3:

1 a



b 0.7 **c** 0.3

2 P(sum of 4) + P(same number) ≠ P(sum of 4 or same number), so the events are not mutually exclusive.

3 0.15

4 0.3

5 a Bricks and trains: their curves do not overlap.
b Not independent.

6 a 0.25 **b** Not independent

7 a $P(S \text{ and } T) = 0.3 - 0.18 = 0.12$
$P(S) \times P(T) = 0.3 \times 0.4 = 0.12 = P(S \text{ and } T)$
So S and T are independent.
b i 0.12 **ii** 0.42

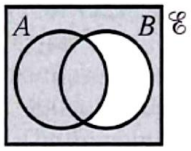
8 $P(W) \times P(X) = 0.5 \times 0.45 = 0.225$
$P(W \text{ and } X) = 0.25$, so W and X are **not** independent.

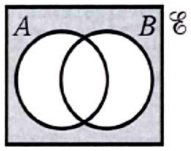
9 a $x = 0.15, y = 0.3$
b $P(F \text{ and } R) = 0.15 \neq P(F) \times P(R) = 0.45 \times 0.4 = 0.18$

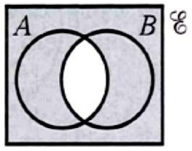
10 $p = 0.14$ and $q = 0.33$ or $p = 0.33$ and $q = 0.14$

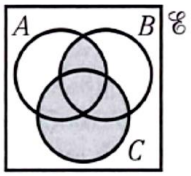
Exercise 4:

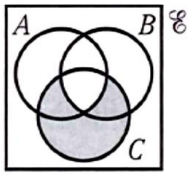
1 a $A \cap B'$ **b** $A' \cup B$
c $(A \cap B) \cup (A' \cap B')$ **d** $A \cap B \cap C$
e $A \cup B \cup C$ **f** $(A \cup B) \cap C'$

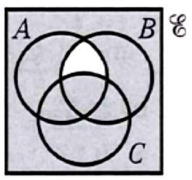
2 a


b


c


3 a


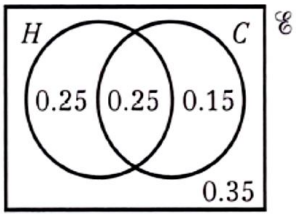
b


c


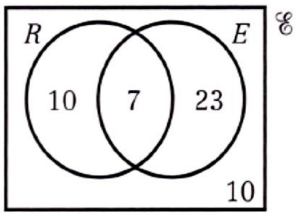
4 a 0.0769 **b** 0.25 **c** 0.0192
d 0.308 **e** 0.75 **f** 0.231

5 a 0.6 **b** 0.8 **c** 0.4 **d** 0.9

6 a 0.25 **b** 0.5 **c** 0.65 **d** 0.1

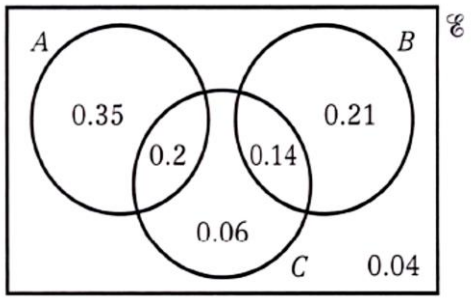
7 a


b i 0.65 **ii** 0.15 **iii** 0.85

8 a


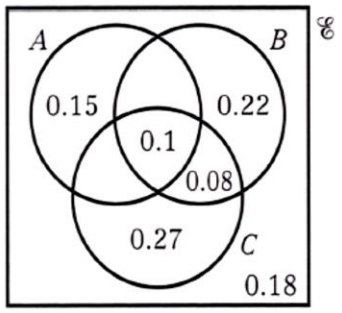
b i 7 **ii** $\frac{1}{5}$ **iii** $\frac{43}{50}$

9 a



b i 0.1 **ii** 0.76 **iii** 1

10 a

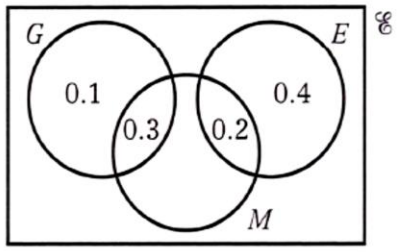


b i 0.53 **ii** 0.18

c Not independent.

$P(A' \cap C) = 0.35$, $P(A') \times P(C) = 0.75 \times 0.45$
$= 0.33765$

11 a



b i 0.6 **ii** 0.5

c Not independent.

$P(G' \cap M) = 0.2$, $P(G') \times P(M) = 0.6 \times 0.5 = 0.3$

12 a xy **b** $x + y + xy$ **c** $1 - y + xy$

Exercise 5:

1 a $\frac{29}{60}$ **b** $\frac{18}{29}$ **c** $\frac{18}{35}$ **d** $\frac{14}{31}$

2 a

	Badminton	Squash	Total
Teenager	21	22	43
Adult	15	17	32
Total	36	39	75

b i $\frac{22}{39}$ **ii** $\frac{15}{36}$ or $\frac{5}{12}$ **iii** $\frac{17}{32}$

3 a

	Girls	Boys	Total
Vanilla	13	2	15
Chocolate	12	10	22
Strawberry	20	23	43
Total	45	35	80

b i $\frac{23}{43}$ **ii** $\frac{13}{15}$ **iii** $\frac{10}{35}$ or $\frac{2}{7}$

4 a

Red spinner \ Blue spinner	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8

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

5 a

Dice 2 \ Dice 1	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

b $\frac{1}{6}$ **c** $\frac{1}{4}$

d All outcomes are equally likely.

6 0.0769 (3 s.f.) or $\frac{1}{13}$

7 a 0.333 **b** 0.667

c Assume that the coins are not biased.

8 a

	D	D'	Total
S	18	38	56
S'	59	5	64
Total	77	43	120

b i $\frac{43}{120}$ **ii** $\frac{5}{120}$ **iii** $\frac{18}{77}$ **iv** $\frac{38}{56}$

9 a

	Women	Men	Total
Stick	26	18	44
No stick	37	29	66
Total	63	47	110

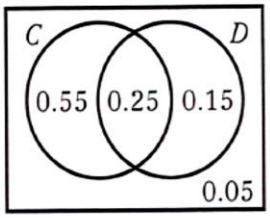
b i $\frac{44}{110}$ or $\frac{2}{5}$ **ii** $\frac{26}{63}$ **iii** $\frac{18}{44}$ or $\frac{9}{22}$

10 a $\frac{6}{25}$ **b** $\frac{13}{30}$ **c** $\frac{29}{64}$ **d** $\frac{31}{90}$

Exercise 6:

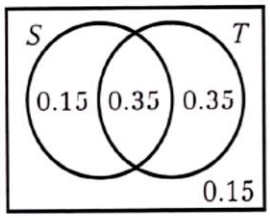
1 a 0.7 **b** 0.3
c 0.483 (3 s.f.) **d** 0.571 (3 s.f.)

2 a



b **i** 0.95 **ii** 0.625 **iii** 0.313 (3 s.f.) **iv** 0.25

3 a



b **i** 0.35 **ii** 0.5 **iii** 0.7 **iv** 0.231 (3 s.f.)

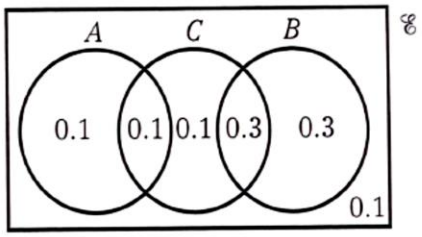
4 a $\frac{3}{8}$ **b** $\frac{2}{5}$ **c** $\frac{6}{11}$ **d** $\frac{13}{19}$

5 a $\frac{9}{80}$ **b** $\frac{9}{32}$ **c** $\frac{1}{5}$ **d** $\frac{12}{35}$

6 a 0.6 **b** 0.4
c 0.299 (3 s.f.) **d** 0.329 (3 s.f.)

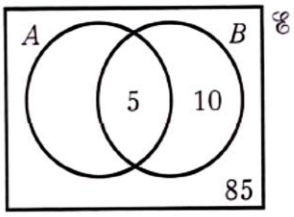
7 a $\frac{9}{23}$ **b** $\frac{3}{23}$
c $P(B|C) = 0.111\ldots \neq P(B) = 0.345\ldots$ So B and C are not independent

8 a



b **i** 0.2 **ii** 0.6 **iii** 0.5

9 a

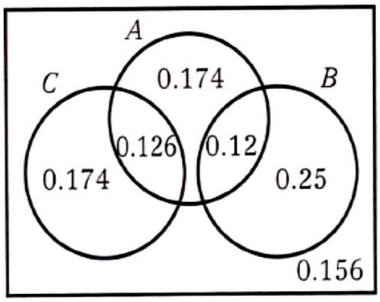


b $\frac{1}{3}$
c No one who doesn't have the disease would be given a false negative result. However, only $\frac{1}{3}$ of the people who have a positive result would have the disease.

10 **a** 0.7 **b** 0.7 **c** They are independent.
11 $x = 0.21, y = 0.49$
12 $c = \frac{7}{30}, d = \frac{4}{15}$

Exercise 7:

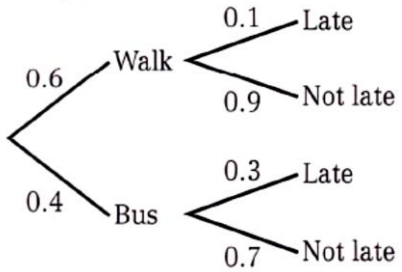
1 **a** 0.3 **b** 0.6 **c** 0.8 **d** 0.9
2 **a** 0.8
b **i** 0.2 **ii** 0.615 (3 s.f.) **iii** 0.429 (3 s.f.)
c $P(C \cap D) \neq P(C) \times P(D)$
3 **a** 0.9
b **i** 0.8 **ii** 0.2 **iii** 0.5
4 **a** 0.15 **b** 0.45 **c** 0.55 **d** 0.25 **e** 0.3
5 0.1
6 **a** 0.5 **b** 0.3 **c** 0.3
7 **a** 0.3 **b** 0.35 **c** 0.4
8 **a** 0.0833 (3 s.f.) **b** 0.15
c 0.233 (3 s.f.) **d** 0.357 (3 s.f.)
e 0.643 (3 s.f.) **f** 0.783 (3 s.f.)
9 **a** 0.67 **b** 0.476 (3 s.f.) **c** 0.126
d



e 0.294
10 **a** 0.28 **b** 0.7
c 0.333 (3 s.f.) **d** 0.467 (3 s.f.)
11 **a** 0.1 **b** 0.143 (3 s.f.)
c $P(A) \times P(B) = 0.3 \times 0.7 = 0.21$, $P(A \cap B) = 0.15$
This suggests that the events are not independent.
If Fatima is late, Gayana is *less* likely to be late and vice versa.
12 **a** 0.5 **b** 0.333 (3 s.f.) **c** 0.833 (3 s.f.)
d $P(C \mid J) = 0.833\ldots \neq P(C) = 0.7$. So J and C are not independent.

Exercise 8:

1 0.46 or $\frac{23}{50}$
2 **a**

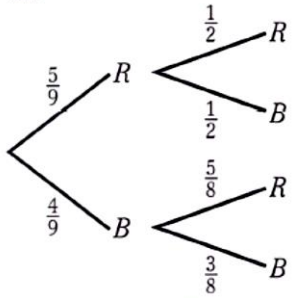


b 0.06
c 0.82

3 **a** $\frac{12}{380}$ or equivalent

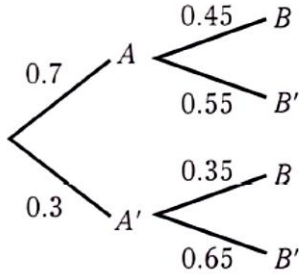
b $\frac{90}{380}$ or equivalent

4 **a**



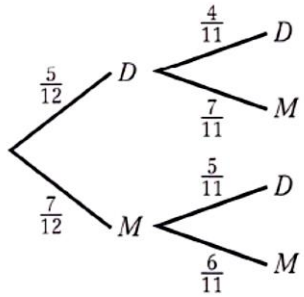
b $\frac{5}{8}$ **c** $\frac{5}{8}$ **d** $\frac{1}{2}$ **e** $\frac{1}{2}$

5 **a**



b **i** 0.315 **ii** 0.195 **iii** 0.75

6 **a**

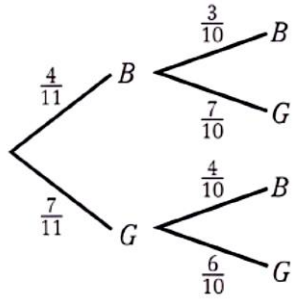


b 0.152 (3 s.f.) **c** 0.530 (3 s.f.) **d** 0.222 (3 s.f.)

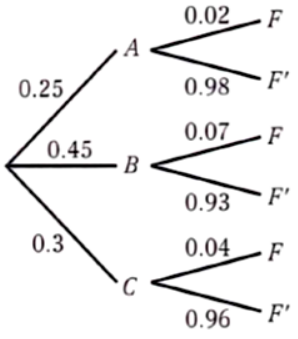
7 0.36

8 **a** 0.25 **b** 0.333

9 **a** **b** $\frac{7}{11}$ **c** $\frac{3}{5}$

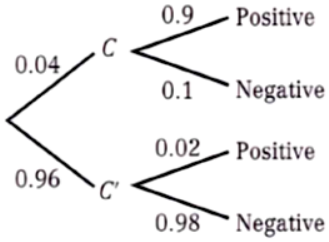


10 a



b i 0.0315 **ii** 0.0485 **c** 0.103 (3 s.f.)

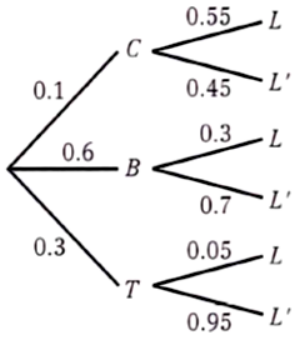
11 a



b 0.945 (3 s.f.) **c** 0.00423

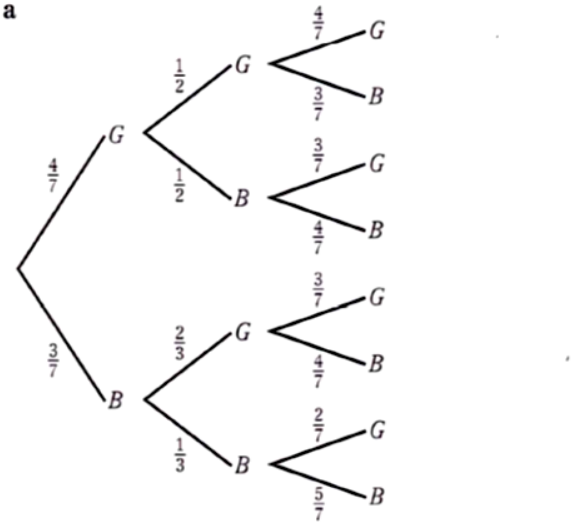
d The probability that a positive result is a false positive (positive result for someone without the condition) is P(−|+) = 0.348. Over one third of positive results are false positives and 10% of people with the condition give negative results.

12 a



b i 0.015 **ii** 0.25 **c** 0.78

13 a



b $\frac{3}{7}$

c Adding together the probabilities on the 4 branches of the tree diagram where the counter from box *B* is blue: $\frac{12}{98} + \frac{16}{98} + \frac{24}{147} + \frac{15}{157} = \frac{27}{49}$

d Adding together the probabilities on the two branches of the tree diagram where events C and D both occur. $\frac{12}{98} + \frac{15}{147} = \frac{11}{49}$

e $\frac{37}{49}$ **f** $\frac{8}{13}$

14 Emilia has not taken into account the fact that the jelly bean is eaten after being selected. The correct answer is 0.5.