Statistics 1 : Chapter 3 Probability

Answers

3.1

1 (i) $\frac{1}{2}$ (ii) 1 (iii) $\frac{2}{3}$ (iv) $\frac{1}{2}$
(v) $\frac{5}{6}$

2 (i) $\frac{3}{8}$ (ii) $\frac{5}{8}$ (iii) 0 (iv) $\frac{4}{5}$

3 (i) $\frac{3}{10}$ (ii) $\frac{3}{4}$

4 (i) (a) $\frac{1}{13}$ (b) $\frac{1}{2}$ (c) $\frac{3}{52}$
(ii) $\frac{7}{25}$

5 (i) 0.4 (ii) 0.5 (iii) 0.25

6 (i) $a = 18, b = 14$
(ii) (a) 0.29 (b) 0.1 (c) 0.75

7 $\frac{4}{15}$

8 $\frac{4}{15}$

9 (i) $\frac{2}{7}$ (ii) $\frac{3}{7}$

10 (i) 0.26 (ii) 0.06 (iii) 0.46 (iv) 0

11 (i) $\frac{1}{4}$ (ii) $\frac{3}{4}$ (iii) $\frac{3}{8}$

12 (i) $\frac{1}{2}$ (ii) $\frac{3}{4}$

13 (i) $\frac{1}{18}$ (ii) $\frac{1}{6}$ (iii) $\frac{1}{6}$ (iv) $\frac{1}{3}$

14 (i) (a) $\frac{1}{36}$ (b) $\frac{1}{12}$ (c) 0 (d) 0
(ii) 6, 12

15 (i) HHH, HHT, HTH, THH, HTT, THT, TTH, TTT
(ii) $\frac{3}{8}$

3.2

1 (i) $\frac{1}{2}$ (ii) $\frac{1}{2}$ (iii) $\frac{5}{6}$ (iv) $\frac{1}{6}$

2 (i) $\frac{11}{30}$ (ii) $\frac{9}{30}$

3 (i) $\frac{4}{17}$ (ii) $\frac{4}{51}$ (iii) $\frac{5}{17}$ (iv) $\frac{5}{17}$
(v) 0

4 (i) 0.41 (ii) 0.005 (iii) 0.98

5 (i) $\frac{7}{20}$ (ii) $\frac{11}{20}$ (iii) $\frac{3}{20}$ (iv) $\frac{3}{4}$

6 $\frac{7}{30}$

7 0.8

8 0.6

9 (i) 0.4 (ii) 0.1 (iii) 0.5

10 (i) 0.75 (ii) 0

11 (i) 0.2 (ii) 0.7 (iii) 0.3

12 (i) $\frac{7}{36}$ (ii) $\frac{1}{6}$ (iii) $\frac{5}{18}$ (iv) $\frac{1}{12}$

13 (i) A and D; B and C (ii) 1 (iii) $\frac{1}{3}$

14 (i) 'no heads are obtained'
(ii) 'at least one head is obtained'; 'fewer than two heads are obtained'

15 (i) No; (3, 3), (6, 6) in both A and B so $P(A \text{ and } B) \neq 0$
(ii) Yes; if scores are the same then sums are 2, 4, 6, 8, 10, 12, so sum cannot be 7
(iii) No; (1, 6), (6, 1), (3, 4), (4, 3) are in both B and C so $P(B \text{ and } C) \neq 0$

3.3

1 (i) $\frac{1}{3}$ (ii) 0

2 (i) $\frac{9}{38}$ (ii) $\frac{21}{380}$ (iii) $\frac{10}{19}$ (iv) $\frac{39}{95}$

3 (i) $\frac{1}{36}$ (ii) $\frac{5}{18}$ (iii) $\frac{11}{36}$ (iv) $\frac{1}{9}$

4 (i) 0.05 (ii) 0.5

5 (i) $\frac{1}{2704}$ (ii) $\frac{1}{16}$ (iii) $\frac{25}{169}$

6 (i) $\frac{3}{7}$ (ii) $\frac{3}{8}$

7 (i) $\frac{5}{8}$ (ii) $\frac{3}{13}$ (iii) $\frac{1}{20}$

8 (i) No; $P(A) = 0.48 \neq P(A \mid B)$ or
$P(B) = 0.3 \neq P(B \mid A)$ or
$P(A) \times P(B) \neq P(A \text{ and } B)$

(ii) 0.66

9 (i) 0.1 (ii) $P(A) \times P(B) \neq P(A \text{ and } B)$

(iii) $\frac{2}{7}$

10 (i) B and C as total cannot be 7 and 8 at the same time

(ii) $P(A) \times P(B) = \frac{1}{3} \times \frac{1}{6} = \frac{1}{18} = P(A \text{ and } B)$

11 (i)

	C	C'	Total
Full-time teacher	45	25	70
Part-time teacher	12	18	30
Total	57	43	**100**

(ii) (a) 0.12 (b) 0.25 (c) 0.82 (d) $\frac{12}{57}$

(iii) No, $P(C) \times P(F) \neq P(C \text{ and } F)$

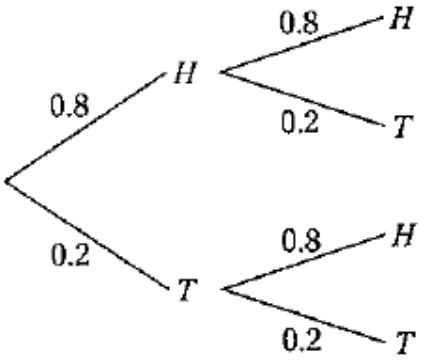
(iv) Full-time teacher, Part-time teacher;
Drove a car, Did not drive a car

12 (i) $30 \leqslant \text{age} < 35$ (ii) 24

(iii) 110 (iv) $\frac{3}{11}$

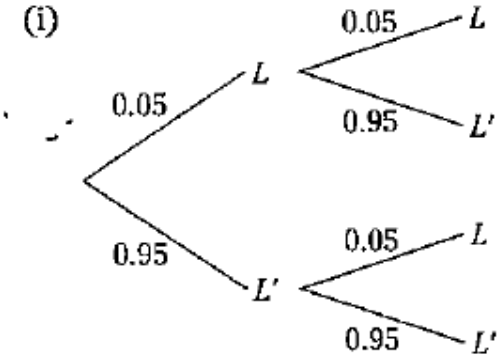
3.4

1 (i) **First toss** **Second toss**



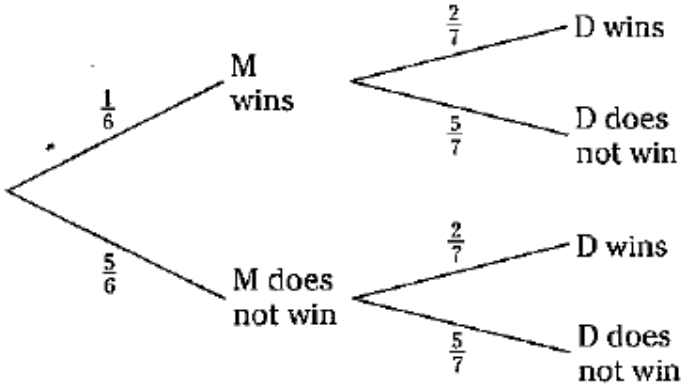
(ii) 0.64 (iii) 0.96

2 (i)



(ii) (a) 0.0025 (b) 0.095 (c) 0.5

3 (i)



(ii) (a) $\frac{5}{14}$ (b) $\frac{1}{3}$ (c) $\frac{17}{42}$

4 (i) 0.000625 (ii) 0.04875

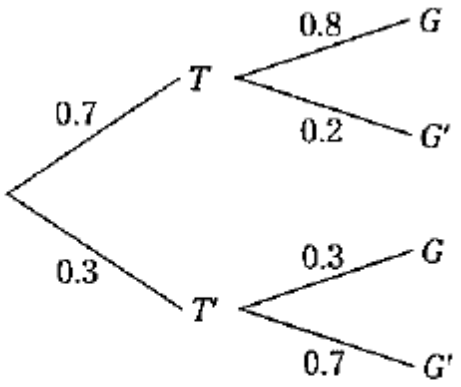
5 (i) 0.75 (ii) 0.35 (iii) $\frac{3}{7}$

6 (i) $\frac{5}{12}$ (ii) $\frac{3}{5}$

7 (i) $\frac{15}{38}$ (ii) $\frac{1}{2}$

8 (i) $\frac{5}{8}$ (ii) $\frac{8}{25}$

9 (i)



(ii) 0.65 (iii) $\frac{56}{65}$

10 (i) $\frac{5}{18}$ (ii) $\frac{25}{72}$

11 (a) (i) $\frac{8}{27}$ (ii) $\frac{19}{27}$

(b) (i) $\frac{5}{21}$ (ii) $\frac{16}{21}$

12 (a) $\frac{1}{4}$

(b) (i) $\frac{1}{16}$ (ii) $\frac{3}{8}$

(c) (i) $\frac{27}{64}$ (ii) $\frac{9}{64}$

(iii) $\frac{5}{32}$ (iv) $\frac{27}{32}$

(d) $\frac{1}{256}$

13 (i) $\frac{3}{10}$ (ii) $\frac{1}{3}$

14 (a) (i) 0.36 (ii) 0.48

(b) 0.01024

15 (i) (a) 0.28 (b) 0.54

(ii) $\frac{47}{110}$

3.5

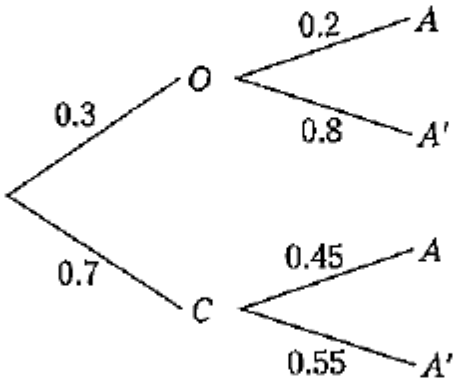
Mixed Exercise 3

1 (i) (a) $\frac{3}{8}$ (b) 0.5

(ii) $\frac{37}{64}$

2 (i) 0.84 (ii) $\frac{4}{7}$

3 (i)



(ii) 0.375 (iii) 0.16

4 (i) (a) $\frac{1}{816}$ (b) $\frac{5}{68}$ (c) $\frac{55}{272}$

(ii) $\frac{4}{33}$

5 $\frac{1}{15}$

6 $\frac{135}{181} = 0.746$ (3 s.f.)

7 (i) $\frac{14}{23}$ (ii) 0.226

8 (i) $\frac{7}{9}$ (ii) $\frac{7}{10}$

(iii) $\frac{2}{9}$

9 (i) 0.364 (ii) 0.086

(iii) $\frac{18}{43}$

10 (i) $\frac{8}{11}$ (ii) $\frac{3}{11}$

11 (i) $p - 0.3$ (ii) $\frac{0.2}{p - 0.3}$

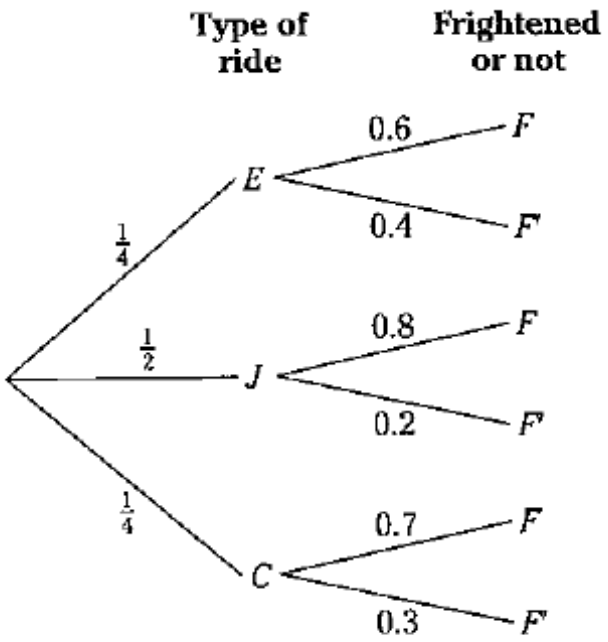
(iii) 0.7

12 (i) $\frac{3}{44}$ (ii) $\frac{1}{15}$

(iii) $\frac{3}{11}$

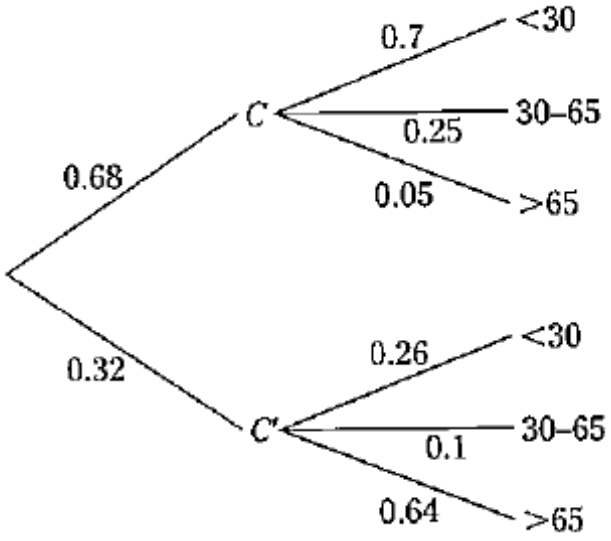
13 (i) $P(E) = \frac{1}{4}$, $P(J) = \frac{1}{2}$, $P(C) = \frac{1}{4}$

(ii)



(iii) $\frac{29}{40}$ (iv) $\frac{3}{11}$

14 (i)



(ii) $\frac{85}{101}$

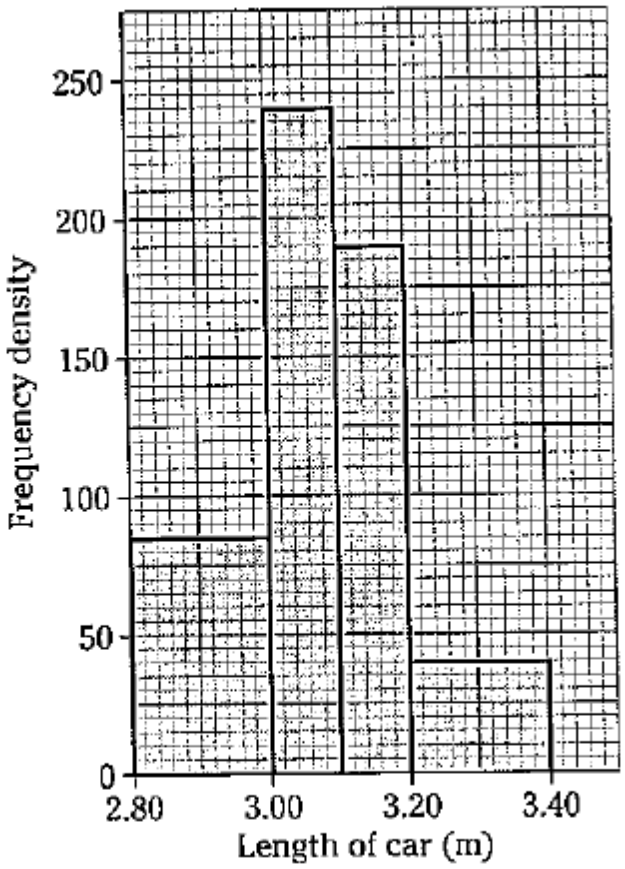
15 (i)

Time (t minutes)	$2 < t \leqslant 4$	$4 < t \leqslant 6$	$6 < t \leqslant 7$	$7 < t \leqslant 8$	$8 < t \leqslant 10$	$10 < t \leqslant 16$
Frequency	20	44	34	30	30	36

(ii) 7.55 (iii) $\frac{8040}{18721} = 0.429$ (3 s.f.)

16 (i) 40

(ii)



(iii) $\frac{15}{17}$

17 (i) $\frac{1}{24}$ (ii) $\frac{1}{9}$

(iii) Yes, $P(R \text{ and } Q) = 0$

(iv) No, $P(R \text{ and } Q) \neq P(R) \times P(Q)$, or $P(R \mid Q) = 0 \neq P(R)$.