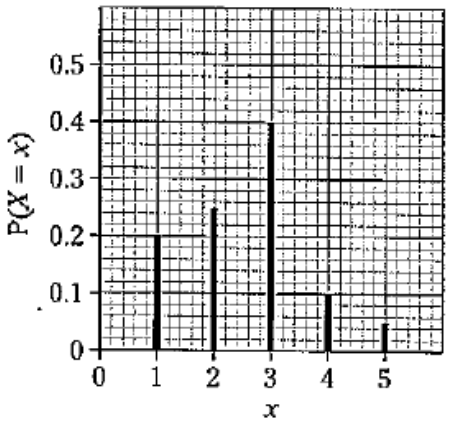
Statistics 1 : Chapter 4 Discrete Random Variables

Answers

4.1

1 (i) 0.1

(ii)



(iii) (a) 0.85 (b) 0.55 (c) 0.5 (d) 0.15

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

3 (i)

r	12	13	14
$P(R = r)$	$12k$	$13k$	$14k$

(ii) $\frac{1}{39}$

4 (i)

x	−1	0	1	3	4	5
$P(X = x)$	0.1	0.1	a	a	0.3	0.1

(ii) 0.2 (iii) 0.6

5 (i) $\frac{1}{20}$ (ii) $\frac{9}{20}$

6 (i) $\frac{1}{2}$

(ii)

x	0	1	2
$P(X = x)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

7 (ii)

b	0	1	2
$P(B = b)$	$\frac{1}{11}$	$\frac{16}{33}$	$\frac{14}{33}$

8 (ii)

x	0	1	2	3
$P(X = x)$	0.216	0.432	0.288	0.064

(iii) 0.352

9 12

10 5

11 (i)

First throw \ Second throw	1	1	2	2	2	3
1	2	2	3	3	3	4
1	2	2	3	3	3	4
2	3	3	4	4	4	5
2	3	3	4	4	4	5
2	3	3	4	4	4	5
3	4	4	5	5	5	6

(ii)

x	2	3	4	5	6
$P(X = x)$	$\frac{1}{9}$	$\frac{1}{3}$	$\frac{13}{36}$	$\frac{1}{6}$	$\frac{1}{36}$

12 (i)

First die \ Second die	1	2	3	4
1	0	1	2	3
2	1	0	1	2
3	2	1	0	1
4	3	2	1	0

(ii)

d	0	1	2	3
$P(D = d)$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{4}$	$\frac{1}{8}$

(iii) $\frac{1}{3}$

13 (ii)

x	0	1	2	3	4	5
$P(X = x)$	$\frac{1}{6}$	$\frac{5}{18}$	$\frac{2}{9}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$

4.2

1 (i) 0.3

(ii) 2.9

(iii) 0.6

2 1.4

3 (i)

x	5	7	8
$P(X = x)$	$5k$	$7k$	$8k$

$k = \frac{1}{20}$

(ii) 6.9

4 (i) $\frac{1}{2}$

(ii)

x	0	1	2
$P(X = x)$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

(iii) 1

5 (i)

x	0	1	2
$P(X = x)$	$\frac{2}{11}$	$\frac{6}{11}$	$\frac{3}{11}$

(ii) $1\frac{1}{11}$

6 (i) $a + b = 0.5, 10a + 30b = 7$

(ii) $a = 0.4, b = 0.1$

7 $\frac{1}{3}$

8

x	10	20
$P(X = x)$	0.4	0.6

9 (i) $\frac{1}{32}$

(ii) 1

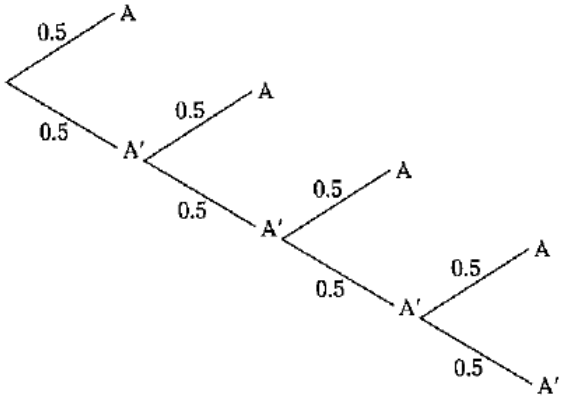
(iii) $1\frac{31}{32}$

10 (i)

x	1	2	3
$P(X = x)$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

(ii) 2

11 (i)



(ii)

x	0	1	2	3	4
$P(X = x)$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$

(iii) $\frac{15}{16}$.

4.3

1 (i) 5.8 (ii) 3.36

2 (i) 0.1 (ii) 0.34, 0.9644

3 (i) 4.2 (ii) $7\frac{1}{3}$ (iii) 3.6696

4 (i) 3, 5, 7, 9, 11, 13; $\frac{1}{9}, \frac{1}{9}, \frac{2}{9}, \frac{2}{9}, \frac{2}{9}, \frac{1}{9}$

(ii) $8\frac{1}{3}$ (iii) $8\frac{8}{9}$ (iv) 2.98 (3 s.f.)

5 (ii) $1\frac{5}{6}$ (iii) $4\frac{5}{36}$

6 (ii)

x	0	1	2	3
$P(X = x)$	$\frac{7}{44}$	$\frac{21}{44}$	$\frac{7}{22}$	$\frac{1}{22}$

(iii) $1\frac{1}{4}$ (iv) $\frac{105}{176}$

7 (i) 0.2 (ii) 8 (iii) 11.6

8 (i) $a + 2b = 0.78$, $2a + 7b = 2.28$; $a = 0.3$, $b = 0.24$

(ii) 5.6016

9 2.56

10 (ii) 7.5 (iii) 185

11 (ii) $\frac{49}{99}$ (iii) $3\frac{58}{99}$ (iv) 1.23 (3 s.f.)

4.4

Mixed Exercise 4

1 (ii)

x	0	1	2
$P(X = x)$	$\frac{7}{15}$	$\frac{7}{15}$	$\frac{1}{15}$

(iii) $\frac{3}{5}$

2 (i)

		Die			
		1	2	3	6
Coin	H	2	4	6	12
	T	1	2	3	6

(iii)

s	1	2	3	4	6	12
$P(S = s)$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$

(v) 11

3 (i) 0.1 (ii) 1 (iii) 1.75
(iv) 0.5 (v) 1.2875

4 (i) 1.47, 1.14 (3 s.f.) (ii) 0.19

5 (i) $\frac{1}{18}$ (ii) $2\frac{7}{9}, 1\frac{14}{81}$ (iii) $\frac{11}{18}$

6 (i) 0.4 (ii) 0.3

(iii)

l	3	4	5
$P(L = l)$	0.1	0.3	0.6

(iv) 4.5, 0.45

7 (i) $\frac{1}{15}$ (ii) $\frac{8}{15}$ (iii) $\frac{34}{45}$

8 (i) 0.15 (ii) 1.56, 1.4064

9 (i) $\frac{32}{243}$ (ii) 0.0729
(iii) 0.0100 (3 s.f.) (iv) $1\frac{2}{3}, 1\frac{1}{9}$

10 (i) $p + q = 0.42, -p + 2q = 0.39; p = 0.15, q = 0.27$
(ii) 2.5875

11 (i) $\frac{7}{60}$ (ii) $\frac{47}{60}$ (iii) $\frac{40}{47}$

(iv)

x	0	1	2
$P(X = x)$	$\frac{1}{20}$	$\frac{17}{60}$	$\frac{2}{3}$

4.5

1 (i) 0.233 (ii) 0.0368
(iii) 0.00000590 (iv) 0.0282

2 (i) 0.0231 (ii) 0.208
(iii) 0.886 (iv) 0.000381

3 (i) 0.102 (ii) 0.143 (iii) 0.000965

4 (i) 0.583 (ii) 0.157

5 (i) 0.452 (ii) 0.414

6 (i) 0.226 (ii) 0.0193 (iii) 0.0193

7 (i) 0.290 (ii) 0.0188
(iii) 0.159 (iv) 0.745

8 (i) 0.146 (ii) 0.0547

9 (i) 0.0081 (ii) 0.947 (iii) 0.267

10 0.307

11 (i) 0.279 (ii) 0.169

12 (i) $\frac{5}{16}$ (ii) 0.5 (iii) $\frac{3}{16}$

4.6

1 (i) 0.297 (ii) 0.466

2 (i) 0.455 (ii) 0.545

3 0.914

4 (i) 0.0425 (ii) 0.167

5 (i) 0.323 (ii) $\frac{1}{36}$

6 0.766

7 (i) 0.6 (ii) 0.346

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

9 (i) 0.925 (ii) 17

10 (ii) 0.329

4.7

1 (i) 5.04 (ii) 3.2256 (iii) 1.80

2 0.180

3 (i) 3

(ii) $P(X = 2) = 0.229$, $P(X = 3) = 0.243$ (highest probability), $P(X = 4) = 0.182$

4 (i) 23 (ii) 1.92

5 (i) 8 (ii) 0.0467 (iii) 1.30

6 (i) 5, 1.58 (ii) 0.01074...

(iii) 0.01074... (iv) 0.0215

7 (i) $\frac{1}{4}$ (ii) 5, 1.94 (iii) 0.561

8 (i) 0.0081 (ii) 1.6 (iii) 0.84

9 (i) 0.3 (ii) 8 (iii) 0.0100

10 (i) 9, 0.4 (ii) 0.232

11 (i) 0.1 (ii) 0.354

(iii) 6 (iv) 25

12 (i) 0.216, 0.288 (ii) 1.2, 0.72 (iii) 1.2, 0.72

Mixed Exercise 5

1	(i) 0.183	(ii) 0.00204	(iii) 0.200
2	(i) 0.0173	(ii) 0.118	
3	(i) 0.0638	(ii) 0.465	(iii) 0.267
4	(i) 0.247	(ii) 0.144	
5	(i) 4.05	(ii) 1.49	
6	(i) 2.4	(ii) 0.439	(iii) 2.04
7	(i) 0.0134	(ii) 14	(iii) 8
8	(i) 0.4	(ii) 4	
9	(i) 0.624	(ii) 2.5	(iii) 1.275
10	(i) 0.0860	(ii) 6	
11	(i) 0.0749	(ii) 6.75	
12	0.737		