

Practice questions 11.3

6. The random variable X has probability distribution as shown in the table below.

x	1	2	3
$P(X=x)$	0.4	0.3	0.3

Find the probability that the sum of two independent observations of X is 4.

7. Seven students are randomly arranged in a line. Find the probability that Anne and Beth are standing next to each other.

8. A bag contains seven caramels and one chocolate. Three children, Peng, Quinn and Raul, take turns to pick a sweet out of the bag at random. If the sweet is a chocolate, they take it; if it is a caramel, they put it back and pass the bag around.

- (a) Find the probability that Raul gets the chocolate on his second turn.
(b) Find the probability that the chocolate is still in the bag when it gets to Quinn for the fifth time.

Practice questions 11.4

9. Given that $P(B) = 0.5$, $P(A' \cap B') = 0.2$ and $P(B|A) = 0.4$, find $P(A)$.
10. All of the 100 students at a college take part in at least one of three activities: chess, basketball and singing. 10 play both chess and basketball, 12 play chess and sing, and 7 take part in both singing and basketball. 40 students play basketball, 62 play chess and 22 sing.
- (a) How many students take part in all three activities?
(b) A student is chosen at random. Given that this student plays basketball and sings, what is the probability that she also plays chess?

2. A discrete random variable X is given by $P(X = n) = kn^2$ for $n = 1, 2, 3, 4$.

Find the expected value and variance of X .

3. If $P(A) = 0.3$, $P(B|A') = 0.5$ and $P(A|B) = \frac{7}{16}$, find $P(B|A)$.

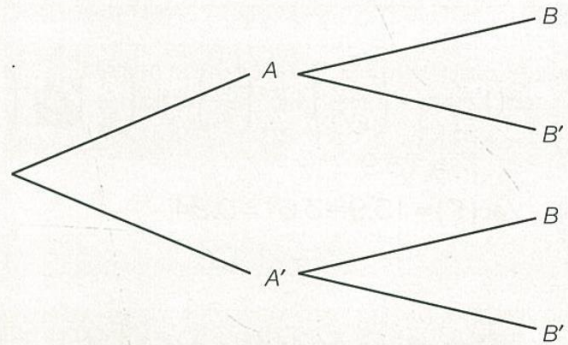
4. The discrete random variable Y has probability distribution as shown in the table below.

y	1	2	3	4
$P(Y=y)$	0.1	0.2	p	q

Given that $E(Y) = 3.1$, find the values of p and q .

Practice questions 11.5

11. The events A and B are such that $P(B|A) = 0.2$, $P(B'|A') = 0.3$, $P(A|B) = 0.4$ and $P(A) = x$.
- Complete the following tree diagram.
 - Find the value of x .
 - State, with a reason, whether the events A and B are independent.



12. Given that $P(B) = 0.3$, $P(A|B) = 0.6$ and $P(A|B') = 0.4$, find $P(B|A)$.
13. Every morning I either walk or cycle to school, with equal probability. If I walk, the probability that I am late is 0.2. If I cycle, the probability that I am late is 0.4. Given that I was late for school yesterday, what is the probability that I walked?
14. A large box contains three different types of toys. One third of the toys are cars, one quarter are yo-yos and the rest are balloons. 20% of the cars, 30% of the yo-yos and 40% of the balloons are pink. A toy is selected at random from the box. Given that the toy is pink, find the probability that it is a balloon.

Practice questions 11.6

15. Find the expected value and the variance of the following discrete random variable.

z	11	13	17	19	23
$P(Z = z)$	0.2	0.1	0.1	0.2	0.4

16. The random variable X has probability distribution as shown in the table below.

x	1	2	3	4
$P(X = x)$	c	p	0.4	0.2

Given that $E(X) = 2.6$, find the values of c and p .

EXAM-STYLE QUESTIONS

- 3** In the mass production of light bulbs the probability that one bulb is defective is 1%. Bulbs are selected at random and put in packs of eight.
- a** If a pack is selected at random, what is the probability that it will contain:
 - i** at least one defective bulb
 - ii** not more than two defective bulbs?
 - b** Given that a pack selected at random contains at least one defective bulb, what is the probability that it contains exactly two defective bulbs?
- 4** Let $X \sim B(6, 0.35)$. Find
- a** The mode a of X
 - b** The median b of X
 - c** $P(X < 2a | X > b)$

EXAM-STYLE QUESTION

- 5** A random variable R follows a binomial distribution $B(n, p)$ with mean 2 and variance 1.5. Find the values of n and p .

EXAM-STYLE QUESTIONS

- 6** In a multiple choice test there are 20 questions. For each question there is a choice of four answers and only one of these is correct.
- a** If a student guesses each answer find the probability that he gets
 - i** none correct
 - ii** more than ten correct
 - iii** not more than five correct.
 - b** Calculate the mean and standard deviation of the number of correct answers.
 - c** Suppose that five students guess the answers to the test. What is the probability that at least two of them get more than ten answers correct?
- 10** Consider two independent random variables X and Y such that $X \sim B(2, a)$ and $Y \sim B(2, b)$. Let W be the random variable that represents the product of each value of X with each value of Y .
- a** Construct a table showing the probability distribution of W .
 - b** Hence find an expression for $E(W)$ in terms of a and b .