1 Data, shown in the table, is collected on the number of students nationally who like two given brands of fast food.

		Brand B	
		Like	Dislike
Brand A	Like	11713	19981
	Dislike	9061	15457

a How many students are polled in total? **[1 mark]**

b What is the probability a randomly chosen student likes

i Brand A, **ii** Brand B, **iii** Both brands? **[9]**

c Are opinions of the two brands independent? **[2]**

2 On any given day, the probability that a commuter misses their bus to work is $\frac{1}{10}$ and the probability that they miss the bus home is $\frac{1}{12}$. The probability that they accidentally overcook their dinner is $\frac{1}{7}$. These events are independent.

a What does it mean for events to be independent? **[2]**

b Calculate the probability that the commuter misses their bus home and accidentally overcooks their dinner. **[2]**

c Calculate the probability that the commuter misses both buses but doesn't overcook their dinner. **[3]**

3 Two bags contain balls of various colours. A ball is drawn at random from a bag. The probabilities of drawing a specific colour from each bag are given in the table.

Event	Probability for first bag	Probability for second bag
White	$3k$	?
Blue	$6k$	0.15
Black	$4k$	0.1
Red	$2k$	0.25
Green	$5k$	0.15

a Calculate the value of k **[3]**

b Calculate the probability of drawing a white ball from the second bag. **[2]**

c Tia wants to maximise the probability of drawing a white or a blue ball. Which bag should she choose? **[5]**

4 A satsuma must meet a minimum size requirement in order to be suitable for packaging. Each packet contains 8 satsumas. The grower finds that the probability of a randomly chosen satsuma not being large enough is 0.01

a Find the probability that a random set of 8 satsumas contains at least one that is not suitable for packaging. **[4]**

b Find the probability that a random set of 8 satsumas contains at most one that is not suitable for packaging. **[2]**

A batch is accidentally sent out without being checked for the minimum size.
A supermarket receives 60 packets.

c Find the probability that the supermarket has received at least one packet that contains at least one undersized satsuma. **[5]**

5 At a factory, sweets are automatically discarded if they are misshapen. An inspector picks five discarded sweets at random to check that the right decisions are being made. If at least four of the discarded sweets are misshapen, then the inspector is satisfied.

a What conditions must be true for the binomial distribution to be a suitable model for this situation? [2]

On average, 84 out of 360 discarded sweets are not misshapen.

b Find the probability that the first four inspected sweets are misshapen but then the fifth is fine. [2]

c Find the probability that exactly one sweet is not misshapen. [2]

d Find the probability that the inspector is satisfied. [4]

6 In a football tournament, only two teams have a chance of winning. Team B will only win the tournament if they win all three of their remaining matches *and* Team A fails to win any of its four remaining matches to win the league. All match results are independent. The probability that Team A wins any of their matches is 0.56 per match and the probability that Team B wins any of their matches is 0.61 per match. Find the probability that Team A wins the tournament. [4]

7 Data is collected on the number of days between May and October 2015 in which the daily maximum temperature and relative humidity are each above or below the average in Hurn.

		Daily maximum relative humidity	
		Above average	Below average
Daily maximum temperature	Above average	25	61
	Below average	40	58

a How many days are included in the data? [1]

b What is the probability a randomly chosen day has

i Above-average daily maximum temperature,

ii Above-average daily maximum relative humidity,

iii Both measures above average? [3]

c Are daily maximum temperature and relative humidity independent in this sample? Justify your answer. [2]

8 An outdoor park has to be closed if it is raining too much. The probability it rains too much on any day is 0.09

Assuming that the probability it rains on any day is independent of rain on any other day

a Find the probability that the park is closed at least once in a week, [4]

b Find the probability that the park is closed at most once in a week. [4]

Over a year, the weather is tracked to see how often the park has to be closed.

c Find the probability that the park is closed in at least 20 weeks over the year. [2]

d What is the expected number of weeks that the park is closed for at least one day? [2]

9 Three weather stations in a town measure the daily total sunshine. The probability that stations A, B and C measure the most sunshine are 0.41, 0.36 and 0.23 respectively. Find the probability that over a five-day period, station A records the most sunshine on more days than the other stations. [5]