

1. The probability distribution of the discrete random variable X is given by the following table.

x	1	2	3	4	5
$P(X = x)$	0.4	p	0.2	0.07	0.02

- (a) Find the value of p .
(b) Calculate the expected value of X .

(Total 6 marks)

2. The probability distribution of a discrete random variable X is given by

$$P(X = x) = \frac{x^2}{14}, x \in \{1, 2, k\}, \text{ where } k > 0.$$

- (a) Write down $P(X = 2)$.

(1)

- (b) Show that $k = 3$.

(4)

- (c) Find $E(X)$.

(2)

(Total 7 marks)

3. Bag A contains 2 red balls and 3 green balls. Two balls are chosen at random from the bag without replacement. Let X denote the number of red balls chosen. The following table shows the probability distribution for X

X	0	1	2
$P(X = x)$	$\frac{3}{10}$	$\frac{6}{10}$	$\frac{1}{10}$

- (a) Calculate $E(X)$, the mean number of red balls chosen.

(3)

Bag B contains 4 red balls and 2 green balls. Two balls are chosen at random from bag B.

- (b) (i) Draw a tree diagram to represent the above information, including the probability of each event.
- (ii) Hence find the probability distribution for Y , where Y is the number of red balls chosen.

(8)

A standard die with six faces is rolled. If a 1 or 6 is obtained, two balls are chosen from bag A, otherwise two balls are chosen from bag B.

- (c) Calculate the probability that two red balls are chosen.

(5)

- (d) Given that two red balls are obtained, find the conditional probability that a 1 or 6 was rolled on the die.

(3)

(Total 19 marks)

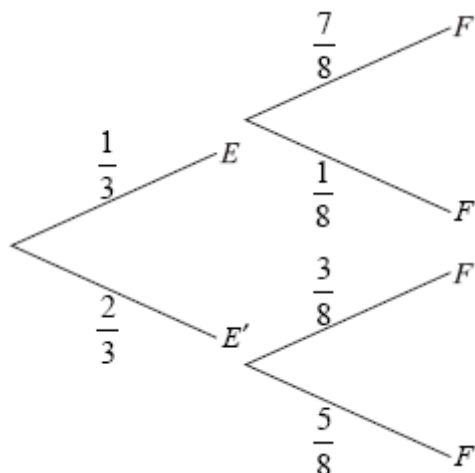
4. José travels to school on a bus. On any day, the probability that José will miss the bus is $\frac{1}{3}$.

If he misses his bus, the probability that he will be late for school is $\frac{7}{8}$.

If he does not miss his bus, the probability that he will be late is $\frac{3}{8}$.

Let E be the event “he misses his bus” and F the event “he is late for school”.

The information above is shown on the following tree diagram.



(a) Find

(i) $P(E \cap F)$;

(ii) $P(F)$.

(4)

(b) Find the probability that

(i) José misses his bus and is not late for school;

(ii) José missed his bus, given that he is late for school.

(5)

The cost for each day that José catches the bus is 3 euros. José goes to school on Monday and Tuesday.

(c) **Copy** and complete the probability distribution table.

X (cost in euros)	0	3	6
$P(X)$	$\frac{1}{9}$		

(3)

(d) Find the expected cost for José for both days.

(2)

(Total 14 marks)

5. A test has five questions. To pass the test, at least three of the questions must be answered correctly.

The probability that Mark answers a question correctly is $\frac{1}{5}$. Let X be the number of questions that Mark answers correctly.

- (a) (i) Find $E(X)$.
(ii) Find the probability that Mark passes the test.

(6)

Bill also takes the test. Let Y be the number of questions that Bill answers correctly. The following table is the probability distribution for Y .

y	0	1	2	3	4	5
$P(Y=y)$	0.67	0.05	$a+2b$	$a-b$	$2a+b$	0.04

- (b) (i) Show that $4a + 2b = 0.24$.
(ii) Given that $E(Y) = 1$, find a and b .

(8)

- (c) Find which student is more likely to pass the test.

(3)

(Total 17 marks)