1. In a game a player rolls a biased four-faced die. The probability of each possible score is shown below.

Score	1	2	3	4
Probability	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{1}{10}$	x

(a) Find the value of x.

(2)

(b) Find E(X).

(3)

(c) The die is rolled twice. Find the probability of obtaining two scores of 3.

(2)
(Total 7 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. Three students, Kim, Ching Li and Jonathan each have a pack of cards, from which they select a card at random. Each card has a 0, 3, 4, or 9 printed on it.

(a) Kim states that the probability distribution for her pack of cards is as follows.

x	0	3	4	9
$P(X = x)$	0.3	0.45	0.2	0.35

Explain why Kim is incorrect.

(2)

(b) Ching Li correctly states that the probability distribution for her pack of cards is as follows.

x	0	3	4	9
$P(X = x)$	0.4	k	$2k$	0.3

Find the value of k.

(2)

(c) Jonathan correctly states that the probability distribution for his pack of cards is given by $P(X = x) = \dfrac{x+1}{20}$. One card is drawn at random from his pack.

(i) Calculate the probability that the number on the card drawn is 0.

(ii) Calculate the probability that the number on the card drawn is greater than 0.

(4)
(Total 8 marks)

4. A **four-sided** die has three blue faces and one red face. The die is rolled.

Let B be the event a blue face lands down, and R be the event a red face lands down.

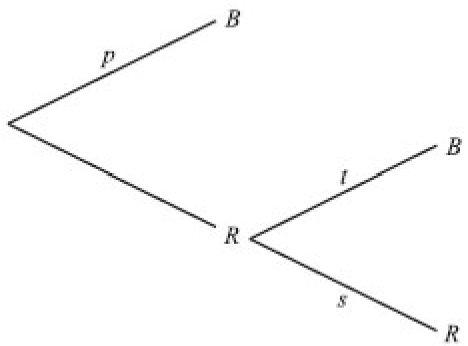
(a) Write down

(i) P (B);

(ii) P (R).

(2)

(b) If the blue face lands down, the die is not rolled again. If the red face lands down, the die is rolled once again. This is represented by the following tree diagram, where p, s, t are probabilities.



Find the value of p, of s and of t.

(2)

Guiseppi plays a game where he rolls the die. If a blue face lands down, he scores 2 and is finished. If the red face lands down, he scores 1 and rolls one more time. Let X be the total score obtained.

(c) (i) Show that P (X = 3) = $\frac{3}{16}$.

(ii) Find P (X = 2).

(3)

(d) (i) Construct a probability distribution table for X.

(ii) Calculate the expected value of X.

(5)

(e) If the total score is 3, Guiseppi wins \$10. If the total score is 2, Guiseppi gets nothing.

Guiseppi plays the game twice. Find the probability that he wins exactly \$10.

(4)
(Total 16 marks)

5. 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
$\mathrm{P}(X = x)$	$\frac{3}{10}$	$\frac{6}{10}$	$\frac{1}{10}$

(a) Calculate $\mathrm{E}(X)$, 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)