## Discrete Probability Distribution

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

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

(a) Write down $\mathrm{P}(X=2)$. (Hint: Create a table.)
(b) Show that $k=3$.
2. Two fair 4-sided dice, one red and one green, are thrown. For each die, the faces are labelled 1, 2, 3, 4. The score for each die is the number which lands face down.
(a) List the pairs of scores that give a sum of 6 .

The probability distribution for the sum of the scores on the two dice is shown below.

| Sum | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Probability | $p$ | $q$ | $\frac{3}{16}$ | $\frac{4}{16}$ | $\frac{3}{16}$ | $r$ | $\frac{1}{16}$ |

(b) Find the value of $p$, of $q$, and of $r$.

Fred plays a game. He throws two fair 4 -sided dice four times. He wins a prize if the sum is 5 on three or more throws.
(c) Find the probability that Fred wins a prize.
3. The following table shows the probability distribution of a discrete random variable $X$.

| $x$ | -1 | 0 | 2 | 3 |
| :---: | :---: | :---: | :---: | :---: |
| $\mathrm{P}(X=x)$ | 0.2 | $10 k^{2}$ | 0.4 | $3 k$ |

Find the value of $k$.
4. 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 $x$.
(b) The die is rolled twice. Find the probability of obtaining two scores of 3 .
(Total 4 marks)
5. Two fair four-sided dice, one red and one green, are thrown. For each die, the faces are labelled 1, 2, 3, 4. The score for each die is the number which lands face down.
(a) Write down
(i) the sample space;
(ii) the probability that two scores of 4 are obtained.

Let $X$ be the number of 4 s that land face down.
(b) Copy and complete the following probability distribution for $X$.

| $x$ | 0 | 1 | 2 |
| :---: | :--- | :--- | :--- |
| $\mathrm{P}(X=x)$ |  |  |  |

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

Bag B contains 4 red balls and 2 green balls. Two balls are chosen at random from bag B without replacement.
(a) (i) Draw a tree diagram in the space below to represent bag B, including the probability of each event.
(ii) Hence find the probability distribution for $Y$, where $Y$ is the number of red balls chosen.

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 .
(b) Calculate the probability that two red balls are chosen.
(c) Given that two red balls are obtained, find the conditional probability that a 1 or 6 was rolled on the die.

