6 In a game, Jim throws three darts at a board. This is called a 'turn'. The centre of the board is called the bull's-eye.

The random variable X is the number of darts in a turn that hit the bull's-eye. The probability distribution of X is given in the following table.

x	0	1	2	3
$P(X = x)$	0.6	p	q	0.05

It is given that $E(X) = 0.55$.

(a) Find the values of p and q. [4]

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(b) Find $\text{Var}(X)$. [2]

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Jim is practising for a competition and he repeatedly throws three darts at the board.

(c) Find the probability that $X = 1$ in at least 3 of 12 randomly chosen turns. [3]

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(d) Find the probability that Jim first succeeds in hitting the bull's-eye with all three darts on his 9th turn. [1]

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2 The random variable X can take only the values -2, -1, 0, 1, 2. The probability distribution of X is given in the following table.

x	-2	-1	0	1	2
$P(X = x)$	p	p	0.1	q	q

Given that $P(X \geqslant 0) = 3P(X < 0)$, find the values of p and q. [4]

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4 A fair red spinner has 4 sides, numbered 1, 2, 3, 4. A fair blue spinner has 4 sides, numbered 0, 1, 2, 3. When a spinner is spun, the score is the number on the side on which it lands. The two spinners are spun at the same time.

The random variable X denotes the higher of the two scores obtained. If the two scores are equal, then the value of X is 0.

(a) Draw up the probability distribution table for X. [3]

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(b) Find Var(X). [3]

The red spinner, with sides numbered 1, 2, 3, 4, is spun repeatedly.

(c) Find the probability that it lands on 4 for the first time before the 8th spin. [2]

3 The random variable X takes the values 1, 2, 3, 4. It is given that $P(X = x) = kx(x + a)$, where k and a are constants.

(a) Given that $P(X = 4) = 3P(X = 2)$, find the value of a and the value of k. [4]

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(b) Draw up the probability distribution table for X, giving the probabilities as numerical fractions. [1]

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(c) Given that $E(X) = 3.2$, find $\text{Var}(X)$. [2]

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2 A red fair six-sided dice has faces labelled 1, 1, **1**, 2, 2, 2. A blue fair six-sided dice has faces labelled 1, 1, 2, 2, 3, 3. Both dice are thrown. The random variable X is the product of the scores on the two dice.

(a) Draw up the probability distribution table for X. [3]

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(b) Find E(X). [1]

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1 Becky sometimes works in an office and sometimes works at home. The random variable X denotes the number of days that she works at home in any given week. It is given that

$$P(X = x) = kx(x + 1),$$

where k is a constant and $x = 1, 2, 3$ or 4 only.

(a) Draw up the probability distribution table for X, giving the probabilities as numerical fractions. [3]

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(b) Find $E(X)$ and $Var(X)$. [3]

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4 A fair four-sided spinner has edges numbered 1, 2, 2, 3. A fair three-sided spinner has edges numbered −2, −1, 1. Each spinner is spun and the number on the edge on which it comes to rest is noted. The random variable X is the sum of the two numbers that have been noted.

(a) Draw up the probability distribution table for X. [3]

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(b) Find Var(X). [3]

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6 Three coins A, B and C are each thrown once.

- Coins A and B are each biased so that the probability of obtaining a head is $\frac{2}{3}$.
- Coin C is biased so that the probability of obtaining a head is $\frac{4}{5}$.

(a) Show that the probability of obtaining exactly 2 heads and 1 tail is $\frac{4}{9}$. [3]

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The random variable X is the number of heads obtained when the three coins are thrown.

(b) Draw up the probability distribution table for X. [3]

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(c) Given that $E(X) = \frac{32}{15}$, find $Var(X)$. [2]

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