5. A red spinner is designed so that the score R is given by the following probability distribution.

r	2	3	4	5	6
$P(R = r)$	0.25	0.3	0.15	0.1	0.2

(a) Show that $E(R^2) = 15.8$

(1)

Given also that $E(R) = 3.7$

(b) find the standard deviation of R, giving your answer to 2 decimal places.

(2)

A yellow spinner is designed so that the score Y is given by the probability distribution in the table below. The cumulative distribution function $F(y)$ is also given.

y	2	3	4	5	6
$P(Y = y)$	0.1	0.2	0.1	a	b
$F(y)$	0.1	0.3	0.4	c	d

(c) Write down the value of d

(1)

Given that $E(Y) = 4.55$

(d) find the value of c

(5)

Pabel and Jessie play a game with these two spinners.
Pabel uses the red spinner.
Jessie uses the yellow spinner.
They take turns to spin their spinner.
The winner is the first person whose spinner lands on the number 2 and the game ends.
Jessie spins her spinner first.

(e) Find the probability that Jessie wins on her second spin.

(2)

(f) Calculate the probability that, in a game, the score on Pabel's first spin is the same as the score on Jessie's first spin.

(3)

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3. The probability distribution of the discrete random variable X is given by

x	2	3	4
$P(X = x)$	a	0.4	$0.6 - a$

where a is a constant.

(a) Find, in terms of a, $E(X)$

(2)

(b) Find the range of the possible values of $E(X)$

(3)

Given that $\text{Var}(X) = 0.56$

(c) find the possible values of a

(6)

Leave blank

6. The random variable A represents the score when a spinner is spun. The probability distribution for A is given in the following table.

a	1	4	5	7
$P(A = a)$	0.40	0.20	0.25	0.15

(a) Show that $E(A) = 3.5$

(2)

(b) Find $\text{Var}(A)$

(3)

The random variable B represents the score on a 4-sided die. The probability distribution for B is given in the following table where k is a positive integer.

b	1	3	4	k
$P(B = b)$	0.25	0.25	0.25	0.25

(c) Write down the name of the probability distribution of B.

(1)

(d) Given that $E(B) = E(A)$ state, giving a reason, the value of k.

(1)

The random variable $X \sim N(\mu, \sigma^2)$

Sam and Tim are playing a game with the spinner and the die.

They each spin the spinner once to obtain their value of A and each roll the die once to obtain their value of B.
Their value of A is taken as their value of μ and their value of B is taken as their value of σ.
The person with the larger value of $P(X > 3.5)$ is the winner.

(e) Given that Sam obtained values of $a = 4$ and $b = 3$ and Tim obtained $b = 4$ find, giving a reason, the probability that Tim wins.

(2)

(f) Find the largest value of $P(X > 3.5)$ achievable in this game.

(4)

(g) Find the probability of achieving this value.

(2)

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4. The discrete random variable X has probability distribution

x	–4	–3	1	2	5
$P(X = x)$	a	b	a	b	0.2

(a) Find $E(X)$ in terms of a and b

(1)

For this probability distribution, $Var(X) = E(X^2)$

(b) (i) Write down the value of $E(X)$

(ii) Find the value of a and the value of b

(5)

(c) Find $Var(1 - 3X)$

(3)

Given that $Y = 1 - X$, find

(d) (i) $P(Y < 0)$

(ii) the largest possible value of k such that $P(Y < k) = 0.2$

(4)

4. In a game, the number of points scored by a player in the first round is given by the random variable X with probability distribution

x	5	6	7	8
$P(X = x)$	0.13	0.21	0.29	0.37

Find

(a) $E(X)$

(2)

(b) $Var(X)$

(3)

(c) $Var(3 - 2X)$

(2)

The number of points scored by a player in the second round is given by the random variable Y and is independent of the number of points scored in the first round.

The random variable Y has probability function

$$P(Y = y) = \frac{1}{4} \qquad \text{for } y = 5, 6, 7, 8$$

(d) Write down the value of $E(Y)$

(1)

(e) Find $P(X = Y)$

(2)

(f) Find the probability that the number of points scored by a player in the first round is greater than the number of points scored by the player in the second round.

(3)

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4. The discrete random variable X has the following probability distribution.

x	1	2	3	4
$P(X = x)$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

(a) Show that $E\left(\frac{1}{X}\right) = \frac{2}{5}$

(1)

(b) Find $\text{Var}\left(\frac{1}{X}\right)$

(3)

The random variable $Y = \frac{30}{X}$

(c) Find

(i) $E(Y)$

(ii) $\text{Var}(Y)$

(3)

(d) Find $P(X < 3 \mid Y < 20)$

(5)

Leave blank

5. The discrete random variable X has the following probability distribution

x	-2	-1	0	1	4
$P(X = x)$	a	b	c	b	a

Given that $E(X) = 0.5$

(a) find the value of a.

(2)

Given also that $\text{Var}(X) = 5.01$

(b) find the value of b and the value of c.

(5)

The random variable $Y = 5 - 8X$

(c) Find (i) $E(Y)$

(ii) $\text{Var}(Y)$

(3)

(d) Find $P(4X^2 > Y)$

(5)

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