

Statistical Distributions - Questions

June 2017 Mathematics Advanced Paper 1: Statistics and Mechanics 1

1.

4. The discrete random variable X has probability distribution

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

The cumulative distribution function of X is given by

x	-1	0	1	2
$F(x)$	$\frac{1}{3}$	d	$\frac{5}{6}$	e

(a) Find the values of a , b , c , d and e .

(5)

(b) Write down the value of $P(X^2 = 1)$.

(1)

2.

6. The score, X , for a biased spinner is given by the probability distribution

x	0	3	6
$P(X=x)$	$\frac{1}{12}$	$\frac{2}{3}$	$\frac{1}{4}$

Find

(a) $E(X)$ (2)

(b) $\text{Var}(X)$ (3)

A biased coin has one face labelled 2 and the other face labelled 5
The score, Y , when the coin is spun has

$$P(Y=5) = p \quad \text{and} \quad E(Y) = 3$$

(c) Form a linear equation in p and show that $p = \frac{1}{3}$ (3)

(d) Write down the probability distribution of Y . (1)

Sam plays a game with the spinner and the coin.
Each is spun once and Sam calculates his score, S , as follows

$$\begin{aligned} \text{if } X=0 \text{ then } S &= Y^2 \\ \text{if } X \neq 0 \text{ then } S &= XY \end{aligned}$$

(e) Show that $P(S=30) = \frac{1}{12}$ (2)

(f) Find the probability distribution of S . (3)

(g) Find $E(S)$. (2)

Charlotte also plays the game with the spinner and the coin.
Each is spun once and Charlotte ignores the score on the coin and just uses X^2 as her score.
Sam and Charlotte each play the game a large number of times.

(h) State, giving a reason, which of Sam and Charlotte should achieve the higher total score. (2)