

Probability distribution table

Question Paper 5

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Discrete random variables
Sub Topic	Probability distribution table
Booklet	Question Paper 5

Time Allowed: 54 minutes

Score: / 45

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- 1 A spinner has 5 sides, numbered 1, 2, 3, 4 and 5. When the spinner is spun, the score is the number of the side on which it lands. The score is denoted by the random variable X , which has the probability distribution shown in the table.

x	1	2	3	4	5
$P(X = x)$	0.3	0.15	$3p$	$2p$	0.05

- (i) Find the value of p . [1]

A second spinner has 3 sides, numbered 1, 2 and 3. The score when this spinner is spun is denoted by the random variable Y . It is given that $P(Y = 1) = 0.3$, $P(Y = 2) = 0.5$ and $P(Y = 3) = 0.2$.

- (ii) Find the probability that, when both spinners are spun together,
- (a) the sum of the scores is 4, [3]
- (b) the product of the scores is less than 8. [3]

- 2 The random variable X has the probability distribution shown in the table.

x	2	4	6
$P(X = x)$	0.5	0.4	0.1

Two independent values of X are chosen at random. The random variable Y takes the value 0 if the two values of X are the same. Otherwise the value of Y is the larger value of X minus the smaller value of X .

- (i) Draw up the probability distribution table for Y . [4]
- (ii) Find the expected value of Y . [1]

- 3 The six faces of a fair die are numbered 1, 1, 1, 2, 3, 3. The score for a throw of the die, denoted by the random variable W , is the number on the top face after the die has landed.

- (i) Find the mean and standard deviation of W . [3]
- (ii) The die is thrown twice and the random variable X is the sum of the two scores. Draw up a probability distribution table for X . [4]
- (iii) The die is thrown n times. The random variable Y is the number of times that the score is 3. Given that $E(Y) = 8$, find $\text{Var}(Y)$. [3]

- 4 Judy and Steve play a game using five cards numbered 3, 4, 5, 8, 9. Judy chooses a card at random, looks at the number on it and replaces the card. Then Steve chooses a card at random, looks at the number on it and replaces the card. If their two numbers are equal the score is 0. Otherwise, the smaller number is subtracted from the larger number to give the score.

(i) Show that the probability that the score is 6 is 0.08. [1]

(ii) Draw up a probability distribution table for the score. [2]

(iii) Calculate the mean score. [1]

If the score is 0 they play again. If the score is 4 or more Judy wins. Otherwise Steve wins. They continue playing until one of the players wins.

(iv) Find the probability that Judy wins with the second choice of cards. [3]

(v) Find an expression for the probability that Judy wins with the n th choice of cards. [2]

- 5 The probability distribution of the discrete random variable X is shown in the table below.

x	-3	-1	0	4
$P(X = x)$	a	b	0.15	0.4

Given that $E(X) = 0.75$, find the values of a and b . [4]

- 6 A small farm has 5 ducks and 2 geese. Four of these birds are to be chosen at random. The random variable X represents the number of geese chosen.

(i) Draw up the probability distribution of X . [3]

(ii) Show that $E(X) = \frac{8}{7}$ and calculate $\text{Var}(X)$. [3]

(iii) When the farmer's dog is let loose, it chases either the ducks with probability $\frac{3}{5}$ or the geese with probability $\frac{2}{5}$. If the dog chases the ducks there is a probability of $\frac{1}{10}$ that they will attack the dog. If the dog chases the geese there is a probability of $\frac{3}{4}$ that they will attack the dog. Given that the dog is not attacked, find the probability that it was chasing the geese. [4]