

Binomial Distribution

Question Paper 5

Level	A Level
Subject	Maths
Exam Board	OCR
Module	Statistics 1
Topic	Discrete Random Variables
Sub Topic	Binomial Distribution
Booklet	Question Paper - 5

Time Allowed: 52 minutes

Score: /43

Percentage: /100

Grade Boundaries:

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

- 1 Each time Ben attempts to complete a crossword in his daily newspaper, the probability that he succeeds is $\frac{2}{3}$. The random variable X denotes the number of times that Ben succeeds in 9 attempts.

(i) Find

- (a) $P(X = 6)$, [3]
(b) $P(X < 6)$, [1]
(c) $E(X)$ and $\text{Var}(X)$. [2]

Ben notes three values, X_1 , X_2 and X_3 , of X .

- (ii) State the total number of attempts to complete a crossword that are needed to obtain three values of X . Hence find $P(X_1 + X_2 + X_3 = 18)$. [4]

- 2 Froox sweets are packed into tubes of 10 sweets, chosen at random. 25% of Froox sweets are yellow.

(i) Find the probability that in a randomly selected tube of Froox sweets there are

- (a) exactly 3 yellow sweets, [3]
(b) at least 3 yellow sweets. [2]

- (ii) Find the probability that in a box containing 6 tubes of Froox sweets, there is at least 1 tube that contains at least 3 yellow sweets. [3]

- 3 Andrea practises shots at goal. For each shot the probability of her scoring a goal is $\frac{2}{5}$. Each shot is independent of other shots.

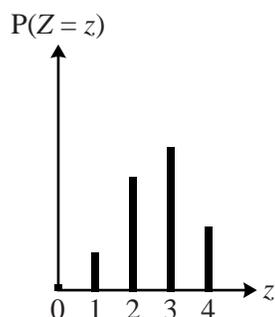
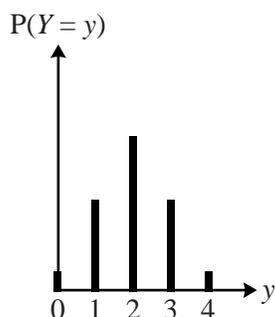
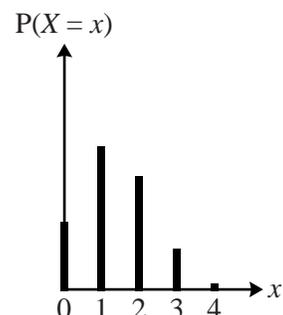
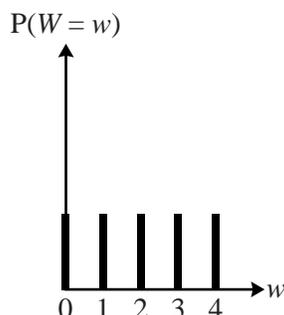
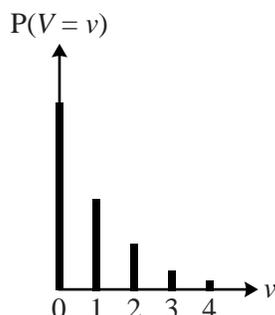
(i) Find the probability that she scores her first goal

- (a) on her 5th shot, [2]
(b) before her 5th shot. [3]

- (ii) (a) Find the probability that she scores exactly 1 goal in her first 5 shots. [3]

- (b) Hence find the probability that she scores her **second** goal on her 6th shot. [2]

- 4 The diagrams illustrate all or part of the probability distributions of the discrete random variables V , W , X , Y and Z .



- (i) One of these variables has the distribution $\text{Geo}(\frac{1}{2})$. State, with a reason, which variable this is. [2]
- (ii) One of these variables has the distribution $B(4, \frac{1}{2})$. State, with reasons, which variable this is. [3]
- 5 Each year Jack enters a ballot for a concert ticket. The probability that Jack will win a ticket in any particular year is 0.27.
- (i) Find the probability that the first time Jack wins a ticket is
- (a) on his 8th attempt, [2]
- (b) after his 8th attempt. [2]
- (ii) Write down an expression for the probability that Jack wins a ticket on exactly 2 of his first 8 attempts, and evaluate this expression. [3]
- (iii) Find the probability that Jack wins his 3rd ticket on his 9th attempt and his 4th ticket on his 12th attempt. [3]