

Binomial Distribution

Question Paper 1

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Discrete random variables
Sub Topic	Binomial Distribution
Booklet	Question Paper 1

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 The number of phone calls, X , received per day by Sarah has the following probability distribution.

x	0	1	2	3	4	≥ 5
$P(X = x)$	0.24	0.35	$2k$	k	0.05	0

- (i) Find the value of k . [2]
- (ii) Find the mode of X . [1]
- (iii) Find the probability that the number of phone calls received by Sarah on any particular day is more than the mean number of phone calls received per day. [3]
- 2 Screws are sold in packets of 15. Faulty screws occur randomly. A large number of packets are tested for faulty screws and the mean number of faulty screws per packet is found to be 1.2.
- (i) Show that the variance of the number of faulty screws in a packet is 1.104. [2]
- (ii) Find the probability that a packet contains at most 2 faulty screws. [3]
- Damien buys 8 packets of screws at random.
- (iii) Find the probability that there are exactly 7 packets in which there is at least 1 faulty screw. [4]
- 3 The number of books read by members of a book club each year has the binomial distribution $B(12, 0.7)$.
- (i) State the greatest number of books that could be read by a member of the book club in a particular year and find the probability that a member reads this number of books. [2]
- (ii) Find the probability that a member reads fewer than 10 books in a particular year. [3]

- 4 A company set up a display consisting of 20 f reworks. For each f rework, the probability that it fails to work is 0.05, independently of other f reworks.

(i) Find the probability that more than 1 f rework fails to work. [3]

The 20 f reworks cost the company \$24 each. 450 people pay the company \$10 each to watch the display. If more than 1 f rework fails to work they get their money back.

(ii) Calculate the expected profit for the company. [4]

- 5 There are a large number of students in Lutley College. 60% of the students are boys. Students can choose exactly one of Games, Drama or Music on Friday afternoons. It is found that 75% of the boys choose Games, 10% of the boys choose Drama and the remainder of the boys choose Music. Of the girls, 30% choose Games, 55% choose Drama and the remainder choose Music.

(i) 6 boys are chosen at random. Find the probability that fewer than 3 of them choose Music. [3]

(ii) 5 Drama students are chosen at random. Find the probability that at least 1 of them is a boy. [6]

- 6 A factory makes a large number of ropes with lengths either 3 m or 5 m. There are four times as many ropes of length 3 m as there are ropes of length 5 m.

(i) One rope is chosen at random. Find the expectation and variance of its length. [4]

(ii) Two ropes are chosen at random. Find the probability that they have different lengths. [2]

(iii) Three ropes are chosen at random. Find the probability that their total length is 11 m. [3]