

Binomial Distribution

Question Paper 3

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Discrete random variables
Sub Topic	Binomial Distribution
Booklet	Question Paper 3

Time Allowed: 65 minutes

Score: / 54

Percentage: /100

Grade Boundaries:

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

1 A manufacturer makes two sizes of elastic bands: large and small. 40% of the bands produced are large bands and 60% are small bands. Assuming that each pack of these elastic bands contains a random selection, calculate the probability that, in a pack containing 20 bands, there are

(i) equal numbers of large and small bands, [2]

(ii) more than 17 small bands. [3]

An office pack contains 150 elastic bands.

(iii) Using a suitable approximation, calculate the probability that the number of small bands in the office pack is between 88 and 97 inclusive. [6]

2 A box contains 300 discs of different colours. There are 100 pink discs, 100 blue discs and 100 orange discs. The discs of each colour are numbered from 0 to 99. Five discs are selected at random, one at a time, with replacement. Find

(i) the probability that no orange discs are selected, [1]

(ii) the probability that exactly 2 discs with numbers ending in a 6 are selected, [3]

(iii) the probability that exactly 2 orange discs with numbers ending in a 6 are selected, [2]

(iv) the mean and variance of the number of pink discs selected. [2]

3 (i) State two conditions which must be satisfied for a situation to be modelled by a binomial distribution. [2]

In a certain village 28% of all cars are made by Ford.

(ii) 14 cars are chosen randomly in this village. Find the probability that fewer than 4 of these cars are made by Ford. [4]

(iii) A random sample of 50 cars in the village is taken. Estimate, using a normal approximation, the probability that more than 18 cars are made by Ford. [4]

- 4 Single cards, chosen at random, are given away with bars of chocolate. Each card shows a picture of one of 20 different football players. Richard needs just one picture to complete his collection. He buys 5 bars of chocolate and looks at all the pictures. Find the probability that
- (i) Richard does not complete his collection, [2]
 - (ii) he has the required picture exactly once, [2]
 - (iii) he completes his collection with the third picture he looks at. [2]
- 5
- (i) A manufacturer of biscuits produces 3 times as many cream ones as chocolate ones. Biscuits are chosen randomly and packed into boxes of 10. Find the probability that a box contains equal numbers of cream biscuits and chocolate biscuits. [2]
 - (ii) A random sample of 8 boxes is taken. Find the probability that exactly 1 of them contains equal numbers of cream biscuits and chocolate biscuits. [2]
 - (iii) A large box of randomly chosen biscuits contains 120 biscuits. Using a suitable approximation, find the probability that it contains fewer than 35 chocolate biscuits. [5]
- 6
- (i) In a certain country, 68% of households have a printer. Find the probability that, in a random sample of 8 households, 5, 6 or 7 households have a printer. [4]
 - (ii) Use an approximation to find the probability that, in a random sample of 500 households, more than 337 households have a printer. [5]
 - (iii) Justify your use of the approximation in part (ii). [1]