

Approximating the Binomial distribution

Question Paper 1

Level	A LEVEL
Exam Board	Edexcel
Subject	Mathematics
Module	Statistics
Topic	Normal distribution
Sub-Topic	Approximating the Binomial distribution
Booklet	Question Paper 1

Time Allowed: 39 minutes

Score: /34

Percentage: /100

Grade Boundaries:

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

- 1 The owner of a small restaurant decides to change the menu. A trade magazine claims that 40% of all diners choose organic foods when eating away from home. On a randomly chosen day there are 20 diners eating in the restaurant.

Find the mean and standard deviation of X . **(3)**

(Total 3 marks)

2 The discrete random variable X is distributed $B(n, p)$.

(a) Write down the value of p that will give the most accurate estimate when approximating the binomial distribution by a normal distribution. (1)

(b) Give a reason to support your value. (1)

(c) Given that $n = 200$ and $p = 0.48$, find $P(90 \leq X < 105)$. (7)

(Total 9 marks)

- 3 A manufacturer supplies DVD players to retailers in batches of 20. It has 5% of the players returned because they are faulty.

Find the mean and variance of the number of faulty DVD players in a batch. (2)

(Total 2 marks)

- 4 A disease occurs in 3% of a population.

Find the mean and variance of the number of people with the disease in a random sample of 100 people. (2)

(Total 2 marks)

- 5 The probability of a telesales representative making a sale on a customer call is 0.15

Find the probability that

Representatives are required to achieve a mean of at least 5 sales each day.

Find the least number of calls each day a representative should make to achieve this requirement.

(2)

(Total 2 marks)

- 6 A random variable X has the distribution $B(12, p)$.

Given that the variance of X is 1.92, find the possible values of p .

(4)

(Total 4 marks)

7 A company always sends letters by second class post unless they are marked first class. Over a long period of time it has been established that 20% of letters to be posted are marked first class.

In a random selection of 10 letters to be posted, find the probability that the number marked first class is

(a) at least 3, (2)

(b) fewer than 2. (2)

One Monday morning there are only 12 first class stamps. Given that there are 70 letters to be posted that day,

(c) use a suitable approximation to find the probability that there are enough first class stamps. (7)

(d) State an assumption about these 70 letters that is required in order to make the calculation in part (c) valid. (1)

(Total 12 marks)