

5. The probability of an electrical component being defective is 0.075
The component is supplied in boxes of 120

(a) Using a suitable approximation, estimate the probability that there are more than 3 defective components in a box.

(5)

A retailer buys 2 boxes of components.

(b) Estimate the probability that there are at least 4 defective components in each box.

(2)

5. Defects occur at random in planks of wood with a constant rate of 0.5 per 10 cm length. Jim buys a plank of length 100 cm.

(a) Find the probability that Jim's plank contains at most 3 defects.

(2)

Shivani buys 6 planks each of length 100 cm.

(b) Find the probability that fewer than 2 of Shivani's planks contain at most 3 defects.

(5)

(c) Using a suitable approximation, estimate the probability that the total number of defects on Shivani's 6 planks is less than 18.

(6)

Jan 2011 part d

1. A disease occurs in 3% of a population.

(a) State any assumptions that are required to model the number of people with the disease in a random sample of size n as a binomial distribution. (2)

(b) Using this model, find the probability of exactly 2 people having the disease in a random sample of 10 people. (3)

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

A doctor tests a random sample of 100 patients for the disease. He decides to offer all patients a vaccination to protect them from the disease if more than 5 of the sample have the disease.

(d) Using a suitable approximation, find the probability that the doctor will offer all patients a vaccination. (3)

6. Cars arrive at a motorway toll booth at an average rate of 150 per hour.

(a) Suggest a suitable distribution to model the number of cars arriving at the toll booth, X , per minute.

(2)

(b) State clearly any assumptions you have made by suggesting this model.

(2)

Using your model,

(c) find the probability that in any given minute

(i) no cars arrive,

(ii) more than 3 cars arrive.

(3)

(d) In any given 4 minute period, find m such that $P(X > m) = 0.0487$

(3)

(e) Using a suitable approximation find the probability that fewer than 15 cars arrive in any given 10 minute period.

(6)

June 2010 part c & d

2. Bhim and Joe play each other at badminton and for each game, independently of all others, the probability that Bhim loses is 0.2

Find the probability that, in 9 games, Bhim loses

- (a) exactly 3 of the games, **(3)**
- (b) fewer than half of the games. **(2)**

Bhim attends coaching sessions for 2 months. After completing the coaching, the probability that he loses each game, independently of all others, is 0.05

Bhim and Joe agree to play a further 60 games.

- (c) Calculate the mean and variance for the number of these 60 games that Bhim loses. **(2)**
- (d) Using a suitable approximation calculate the probability that Bhim loses more than 4 games.

jan 2010 part b

5. A café serves breakfast every morning. Customers arrive for breakfast at random at a rate of 1 every 6 minutes.

Find the probability that

- (a) fewer than 9 customers arrive for breakfast on a Monday morning between 10 am and 11 am.

(3)

The café serves breakfast every day between 8 am and 12 noon.

- (b) Using a suitable approximation, estimate the probability that more than 50 customers arrive for breakfast next Tuesday.

(6)

May 2009 part b

5. An administrator makes errors in her typing randomly at a rate of 3 errors every 1000 words.
- (a) In a document of 2000 words find the probability that the administrator makes 4 or more errors. (3)

The administrator is given an 8000 word report to type and she is told that the report will only be accepted if there are 20 or fewer errors.

- (b) Use a suitable approximation to calculate the probability that the report is accepted. (7)

jan 2009 part C

5. A factory produces components of which 1% are defective. The components are packed in boxes of 10. A box is selected at random.
- (a) Find the probability that the box contains exactly one defective component. (2)
- (b) Find the probability that there are at least 2 defective components in the box. (3)
- (c) Using a suitable approximation, find the probability that a batch of 250 components contains between 1 and 4 (inclusive) defective components. (4)
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May 2008 part c Poisson approx to Binomial

4. Each cell of a certain animal contains 11000 genes. It is known that each gene has a probability 0.0005 of being damaged.

A cell is chosen at random.

- (a) Suggest a suitable model for the distribution of the number of damaged genes in the cell. (2)
- (b) Find the mean and variance of the number of damaged genes in the cell. (2)
- (c) Using a suitable approximation, find the probability that there are at most 2 damaged genes in the cell. (4)
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