3. The probability of a telesales representative making a sale on a customer call is 0.15

Find the probability that

(a) no sales are made in 10 calls,

(2)

(b) more than 3 sales are made in 20 calls.

(2)

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

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

(2)

(d) Calculate the least number of calls that need to be made by a representative for the probability of at least 1 sale to exceed 0.95

(3)

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.

May 2011

(6)

Jan 2011

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)

5. A company has a large number of regular users logging onto its website. On average 4 users every hour fail to connect to the company's website at their first attempt.

(a) Explain why the Poisson distribution may be a suitable model in this case.

(1)

Find the probability that, in a randomly chosen **2 hour** period,

(b) (i) all users connect at their first attempt,

(ii) at least 4 users fail to connect at their first attempt.

(5)

The company suffered from a virus infecting its computer system. During this infection it was found that the number of users failing to connect at their first attempt, over a 12 hour period, was 60.

(c) Using a suitable approximation, test whether or not the mean number of users per hour who failed to connect at their first attempt had increased. Use a 5% level of significance and state your hypotheses clearly.

(9)

June 2010

3. A robot is programmed to build cars on a production line. The robot breaks down at random at a rate of once every 20 hours.

(a) Find the probability that it will work continuously for 5 hours without a breakdown.

(3)

Find the probability that, in an 8 hour period,

(b) the robot will break down at least once,

(3)

(c) there are exactly 2 breakdowns.

(2)

In a particular 8 hour period, the robot broke down twice.

(d) Write down the probability that the robot will break down in the following 8 hour period. Give a reason for your answer.

(2)

Jan 2010

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)

June 2009

1. A botanist is studying the distribution of daisies in a field. The field is divided into a number of equal sized squares. The mean number of daisies per square is assumed to be 3. The daisies are distributed randomly throughout the field.

Find the probability that, in a randomly chosen square there will be

(a) more than 2 daisies,

(3)

(b) either 5 or 6 daisies.

(2)

The botanist decides to count the number of daisies, x, in each of 80 randomly selected squares within the field. The results are summarised below

$$\sum x = 295 \qquad \sum x^2 = 1386$$

(c) Calculate the mean and the variance of the number of daisies per square for the 80 squares. Give your answers to 2 decimal places.

(3)

(d) Explain how the answers from part (c) support the choice of a Poisson distribution as a model.

(1)

Jan 2009

6. A call centre agent handles telephone calls at a rate of 18 per hour.

(a) Give two reasons to support the use of a Poisson distribution as a suitable model for the number of calls per hour handled by the agent.

(2)

June 2008

(b) Find the probability that in any randomly selected 15 minute interval the agent handles

(i) exactly 5 calls,

(ii) more than 8 calls.

(5)