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		Language		
		French	Spanish	Mandarin
Gender	Male	23	22	20
	Female	38	32	15

(a) State the null hypothesis for this test. (1)

- (b) Show that the expected frequency for females choosing Spanish is 30.6

- (c) Calculate the test statistic for this test, stating the expected frequencies you have used. (3)

- (d) State whether or not the null hypothesis is rejected. Justify your answer. (2)

- (e) Explain whether or not the null hypothesis would be rejected if the test was carried out at the 10% level of significance.

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Question 1 continued

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[illegible]

2. The discrete random variable X has probability distribution given by

x	-1	0	1	2	3
$P(X=x)$	c	a	a	b	c

The random variable $Y = 2 - 5X$

Given that $E(Y) = -4$ and $P(Y \geq -3) = 0.45$

- (a) find the probability distribution of X .

(7)

Given also that $E(Y^2) = 75$

- (b) find the exact value of $\text{Var}(X)$

(2)

- (c) Find $P(Y > X)$

(2)

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Question 2 continued

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Question 2 continued

(Total for Question 2 is 11 marks)

3. Two car hire companies hire cars independently of each other.

Car Hire *A* hires cars at a rate of 2.6 cars per hour.

Car Hire *B* hires cars at a rate of 1.2 cars per hour.

(a) In a 1 hour period, find the probability that each company hires exactly 2 cars. (2)

(b) In a 1 hour period, find the probability that the total number of cars hired by the two companies is 3 (2)

(c) In a 2 hour period, find the probability that the total number of cars hired by the two companies is less than 9 (2)

On average, 1 in 250 new cars produced at a factory has a defect.

In a random sample of 600 new cars produced at the factory,

(d) (i) find the mean of the number of cars with a defect,
(ii) find the variance of the number of cars with a defect. (2)

(e) (i) Use a Poisson approximation to find the probability that no more than 4 of the cars in the sample have a defect.
(ii) Give a reason to support the use of a Poisson approximation. (2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 10 marks)

4. The discrete random variable X follows a Poisson distribution with mean 1.4

(a) Write down the value of

(i) $P(X = 1)$

(ii) $P(X \leq 4)$

(2)

The manager of a bank recorded the number of mortgages approved each week over a 40 week period.

Number of mortgages approved	0	1	2	3	4	5	6
Frequency	10	16	7	4	2	0	1

(b) Show that the mean number of mortgages approved over the 40 week period is 1.4

(1)

The bank manager believes that the Poisson distribution may be a good model for the number of mortgages approved each week.

She uses a Poisson distribution with a mean of 1.4 to calculate expected frequencies as follows.

Number of mortgages approved	0	1	2	3	4	5 or more
Expected frequency	9.86	r	9.67	4.51	1.58	s

(c) Find the value of r and the value of s giving your answers to 2 decimal places.

(2)

The bank manager will test, at the 5% level of significance, whether or not the data can be modelled by a Poisson distribution.

(d) Calculate the test statistic and state the conclusion for this test. State clearly the degrees of freedom and the hypotheses used in the test.

(6)

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Question 4 continued

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