

Write your name here	
Surname	Other names
Pearson Edexcel Level 3 GCE	Centre Number
Candidate Number 	
Further Mathematics Advanced Subsidiary Further Mathematics options 23: Further Statistics 1 (Part of options B, E, F and G)	
Practice Paper 1	Paper Reference 8FM0-23
You must have: Mathematical Formulae and Statistical Tables, calculator	Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use black ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- Fill in the boxes at the top of this page with your name, centre number and candidate number.
- Answer all questions and ensure that your answers to parts of questions are clearly labelled.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- The total mark for this part of the examination is 40. There are 5 questions.
- The marks for each question are shown in brackets
 - use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

1. The discrete random variable X has probability distribution given by:

x	-2	-1	0	1	2
$P(X=x)$	0.1	a	0.15	0.2	b

The random variable $Y = 2X + 3$.

Given that $E(Y) = 4.48$,

- (a) find the values of a and b , (5)
- (b) calculate the exact value of $\text{Var}(X)$, (3)
- (c) find $P(Y - 2 > X)$. (2)

(Total for Question 1 is 10 marks)

2. A call centre receives calls about insurance at a rate of 3.2 per ten-minute interval and calls about utility bills at a rate of 4.1 per ten-minute interval. Calls about insurance and calls about utility bills are independent of each other.

- (a) In a ten-minute interval, calculate the probability that the company receives exactly 3 calls of each type. (2)
- (b) In a ten-minute interval, calculate the probability that the company receives at least 7 calls in total. (2)
- (c) In a one-hour period, calculate the probability that the company receives fewer than 45 calls in total. (2)

(Total for Question 2 is 6 marks)

3. A sports club collects data on the gender of its members and the sport that they play. A random sample of 250 members is taken and the data is recorded in the table below:

	Hockey	Cricket	Squash
Male	61	45	32
Female	66	23	23

A test is to be carried out at a 2.5% level of significance to determine whether or not there is an association between gender and choice of sport.

- (a) Write down suitable null and alternative hypotheses. (2)
- (b) Calculate the test statistic for this test. (4)
- (c) State the number of degrees of freedom of the test. (1)
- (d) State whether or not the null hypothesis is accepted. Give a reason for your answer. (2)
- (e) State the effect on your answer to part (d) if the test was carried out at the 5% level of significance. (1)

(Total for Question 3 is 10 marks)

4. A large pottery believes that 0.5% of the bowls that they make contain a defect. A quality control manager takes a random sample of 750 bowls.

- (a) Find the mean and variance of the number of bowls in the sample with a defect. (2)

By using a Poisson approximation,

- (b) estimate the probability that more than three bowls in the sample have a defect. (2)
- (c) Give a reason to support the use of a Poisson approximation. (1)

(Total for Question 4 is 5 marks)

5. Jennifer spins four identical coins 100 times and records the number of heads each time.

The results are shown in the table below.

Number of heads	0	1	2	3	4
Frequency	6	18	35	26	15

- (a) Use these results to estimate the probability of any single coin landing on heads. (2)

Jennifer believes that the binomial distribution is a suitable model for the number of heads.

Using your answer to part (a),

- (b) carry out a test at the 10% level of significance to check Jennifer's claim. You must state your hypotheses clearly. (7)

(Total for Question 5 is 9 marks)

TOTAL FOR FURTHER STATISTICS 1 IS 40 MARKS