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INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 2 (WST02)

Statistics 2 Practice Paper 1

Edexcel IAL Statistics 2

AIMING FOR B

Written in the style of the Pearson Edexcel International Advanced Level paper (WST02/01) • Calculator allowed

A full 75-mark paper of multi-step exam questions covering every Statistics 2 chapter, with a separate mark scheme

Time	Total	You must have
1 hour 30 minutes	**75 marks**	**Mathematical Formulae and Statistical Tables, calculator**

Instructions

- Use black ink or ball-point pen. Pencil may be used for diagrams and sketches.
- Answer **all** questions, in the spaces provided.
- Show enough working to make your method clear. Answers without working may not gain full credit.
- Give inexact answers to **three significant figures** unless the question says otherwise.

Information

- There are 7 questions in this paper. The total mark is 75.
- The marks for each question are shown in brackets.

Advice

- Sit the paper in one go, in 1 hour 30 minutes, with the mark scheme closed.
- Read each question carefully and try every question. Check your answers if you have time.
- Then mark it line by line with the mark scheme and fill in your score.

Track your score

Q	Topic	Marks	Score
1	A binomial model	8	
2	A census and a sampling distribution	9	
3	A Poisson model for calls	10	
4	A rod broken at random	9	
5	Poisson and normal approximations	11	
6	Two one-tailed binomial tests	12	
7	A continuous random variable	16	
	Total	**75**	

Rough grade guide (out of 75): A* **66** • A **59** • B **50** • C **42**

Based on recent WST02 grade boundaries. Real boundaries change every series, so treat this as a guide, not a grade.

Mark scheme | Exam questions by topic | More practice papers

Name ..... Date .....

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1. On any day, the probability that a particular train arrives late is 0.15. A commuter records the number of days, X, on which the train arrives late over a period of 20 days.

(a) State two assumptions, in context, that are needed for X to be modelled by a binomial distribution.

(2)

(b) Find $P(X = 3)$

(2)

(c) Find $P(2 \leqslant X < 6)$

(2)

(d) Find the mean and the variance of X

(2)

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Question 1 continued

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(Total for Question 1 is 8 marks)

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2. The owner of a café wants to find out what her customers think of a new menu.

(a) Give one advantage and one disadvantage of asking every customer, rather than a sample of customers.

(2)

(b) Suggest a suitable sampling frame.

(1)

The café sells coffee in three sizes. A small coffee costs £2, a medium coffee costs £3 and a large coffee costs £5. Of the coffees sold, 50% are small, 30% are medium and 20% are large. A random sample of two coffee orders is taken, and T is the total cost, in pounds, of the two coffees.

(c) Find the sampling distribution of T

(5)

(d) Find P($T > 6$)

(1)

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Question 2 continued

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(Total for Question 2 is 9 marks)

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3. Calls to a helpline arrive at random at a mean rate of 3 every 10 minutes.

(a) Give two reasons why a Poisson distribution may be a suitable model for the number of calls in a 10-minute period.

(2)

(b) Find the probability that exactly 4 calls arrive in a 10-minute period.

(2)

(c) Find the probability that at least 8 calls arrive in a 30-minute period.

(3)

(d) Find the probability that more than 4 but fewer than 10 calls arrive in a 20-minute period.

(3)

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Question 3 continued

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(Total for Question 3 is 10 marks)

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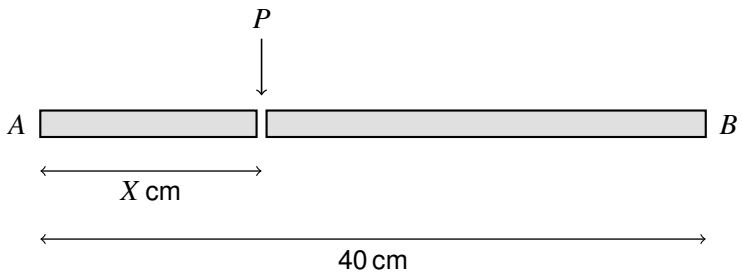

Figure 1

A rod AB of length 40 cm is broken into two pieces at a point P, chosen at random along its length. The random variable X is the length, in cm, of AP, as shown in Figure 1.

(a) Find P$(12 < X < 30)$

(2)

(b) Find E(X) and Var(X)

(3)

(c) Find the probability that the longer piece is more than four times as long as the shorter piece.

(2)

Four such rods are each broken at random, independently.

(d) Find the probability that for exactly one of the four rods the longer piece is more than four times as long as the shorter piece.

(2)

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Question 4 continued

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(Total for Question 4 is 9 marks)

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5. **(i)** A factory makes light bulbs, and 2% of the bulbs are faulty. A box contains 200 bulbs, chosen at random.

(a) Using a suitable approximation, find the probability that the box contains more than 6 faulty bulbs.

(4)

(b) Explain why the approximation you used in part (a) is suitable.

(1)

(ii) In a large town, 40% of the customers of a shop pay by card. A random sample of 150 customers is taken.

(c) Using a suitable approximation, find the probability that more than 66 of the customers in the sample pay by card.

(6)

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Question 5 continued

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(Total for Question 5 is 11 marks)

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6. A seed supplier claims that 30% of a type of plant flower in their first year. A gardener believes that the proportion is less than 30%. She plants 20 of the seeds and records the number, X, of plants that flower in their first year.

(a) Write down suitable hypotheses to test the gardener's belief.

(1)

(b) Using a 5% level of significance, find the critical region for a test of these hypotheses.

(3)

(c) Write down the actual significance level of this test.

(1)

In her sample, 3 of the plants flower in their first year.

(d) Comment on the gardener's belief, giving a reason for your answer.

(2)

The supplier now sells a new fertiliser and claims that, when it is used, more than 30% of the plants flower in their first year. The gardener uses the fertiliser on 25 plants and 12 of them flower in their first year.

(e) Test the supplier's claim at the 5% level of significance. State your hypotheses clearly.

(5)

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Question 6 continued

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(Total for Question 6 is 12 marks)

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7. The continuous random variable X has probability density function

$$f(x) = \begin{cases} kx^2(3-x) & 0 \leqslant x \leqslant 3 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Show that $k = \frac{4}{27}$

(3)

(b) Sketch the graph of $f(x)$ for $0 \leqslant x \leqslant 3$

(2)

(c) Find the cumulative distribution function $\mathrm{F}(x)$ for all values of x

(4)

(d) Show that the median, m, of X satisfies $2m^4 - 8m^3 + 27 = 0$

(2)

(e) Show that the median of X lies between 1.8 and 1.9

(2)

(f) Use calculus to find the mode of X

(2)

(g) Describe the skewness of the distribution, giving a reason for your answer.

(1)

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Question 7 continued

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Question 7 continued

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(Total for Question 7 is 16 marks)

TOTAL FOR PAPER IS 75 MARKS

END

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