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INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 1 (WST01)

Statistics 1 Practice Paper 3

Edexcel IAL Statistics 1

AIMING FOR A/A*

Written in the style of the Pearson Edexcel International Advanced Level paper (WST01/01) • Calculator allowed

A full 75-mark paper set above the hardest recent series: long questions, unfamiliar settings and very few steps given

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 6 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 distribution from its cumulative function	12	
2	Grouped ages with missing frequencies	13	
3	Independence and a quadratic	12	
4	Regression with a negative coding	13	
5	A normal model and rounded data	12	
6	A back-to-back stem and leaf diagram	13	
	Total	**75**	

Rough grade guide (out of 75): A **53** • B **44** • C **35**

Based on recent WST01 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. The discrete random variable X takes the values 1, 2, 3, ..., n and has cumulative distribution function

$$F(x) = \frac{x(x+1)}{n(n+1)} \qquad x = 1, 2, 3, \ldots, n$$

(a) Show that $P(X = x) = \frac{2x}{n(n+1)}$ for $x = 1, 2, \ldots, n$

(3)

Given that $E(X) = 7$

(b) find the value of n

(4)

(c) find $\text{Var}(X)$

(3)

(d) find $P(X > E(X))$

(2)

You may use $\sum_{x=1}^{n} x^2 = \frac{n(n+1)(2n+1)}{6}$ and $\sum_{x=1}^{n} x^3 = \frac{n^2(n+1)^2}{4}$

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Question 1 continued

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(Total for Question 1 is 12 marks)

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2. The ages, in completed years, of the 80 members of a walking club are summarised below.

Age (years)	10–19	20–29	30–39	40–49	50–69
Frequency	12	a	22	b	8

An estimate of the mean age, using the midpoints of the classes, is 32.5 years.

(a) Find the value of a and the value of b

(4)

(b) Use linear interpolation to estimate the median age.

(3)

In a histogram of these data, the bar for the class 20–29 is 5.4 cm high.

(c) Find the height of the bar for the class 50–69

(2)

The midpoints, x, of the classes are coded using $y = \frac{x - 35}{5}$, and $\sum fy^2 = 544$

(d) Find an estimate of the standard deviation of the ages.

(4)

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Question 2 continued

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(Total for Question 2 is 13 marks)

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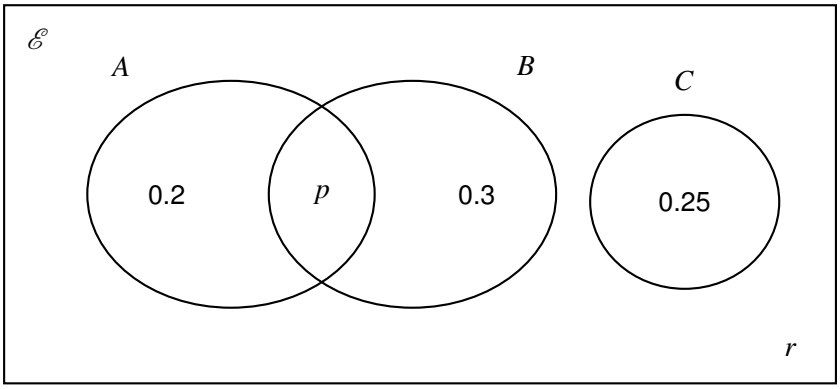

Figure 1

The Venn diagram in Figure 1 shows the probabilities associated with three events A, B and C, where p and r are probabilities.

The events A and B are independent.

(a) Find the value of p, explaining why any other possible value must be rejected.

(5)

(b) Find the value of r

(1)

(c) Find P $\left(A \mid A \cup B\right)$

(2)

(d) Find P $\left(B' \mid A'\right)$

(2)

The experiment is carried out twice, independently.

(e) Find the probability that the event $A \cup B$ occurs exactly once.

(2)

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Question 3 continued

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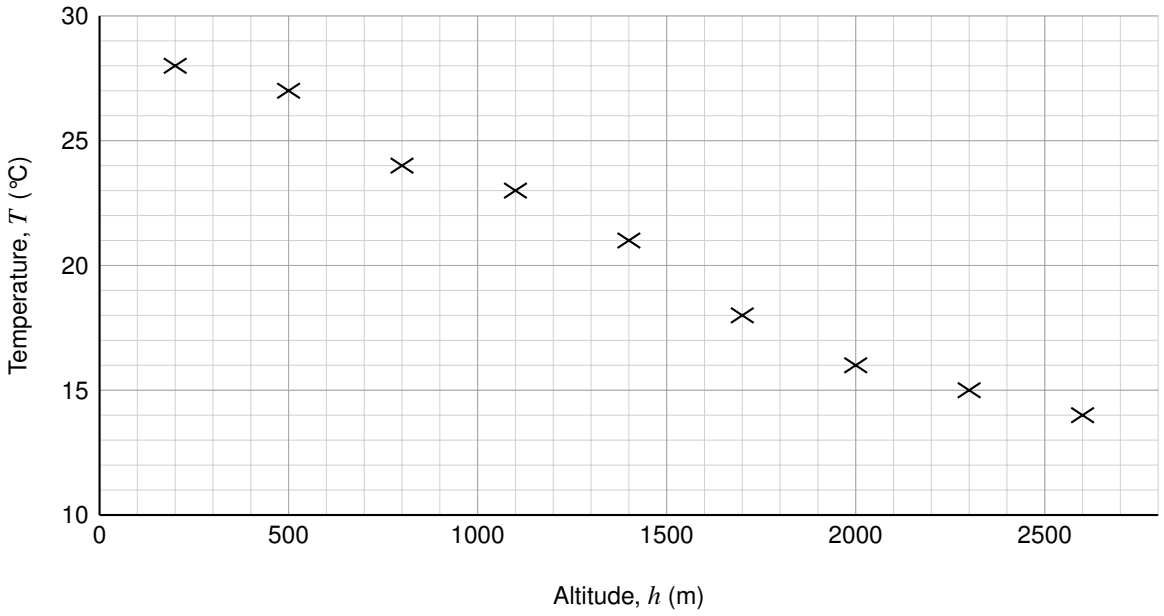

Figure 2

Figure 2 shows the altitude, h metres, and the mean daytime temperature, T °C, at 9 weather stations on a mountain.

The data are coded using

$$p = \frac{h - 1000}{100} \quad \text{and} \quad q = \frac{30 - T}{2}$$

and the coded results are summarised below.

$$\sum p = 36 \quad \sum q = 42 \quad \sum p^2 = 684 \quad \sum q^2 = 250 \quad \sum pq = 337.5$$

(a) Find S_{pp}, S_{qq} and S_{pq}

(3)

(b) Find the product moment correlation coefficient between h and T

(3)

(c) Find the equation of the regression line of T on h, giving your answer in the form $T = a + bh$

(5)

(d) Interpret the value of b in the context of the question.

(1)

(e) Explain why this regression line should not be used to estimate the altitude of a weather station where $T = 20$

(1)

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Question 4 continued

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(Total for Question 4 is 13 marks)

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5. The masses, X grams, of eggs from a farm are modelled by a normal distribution with mean μ and standard deviation σ

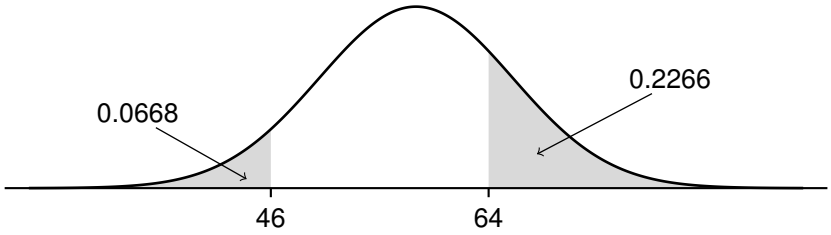

Figure 3

Figure 3 shows that P($X < 46$) = 0.0668 and P($X > 64$) = 0.2266

(a) Find the value of μ and the value of σ

(5)

(b) Find the value of k such that P $\left(|X - \mu| < k\right)$ = 0.9

(3)

The farm records the mass of each egg to the nearest gram.

(c) Find the probability that the recorded mass of a randomly chosen egg is 60 grams.

(2)

(d) Given that the recorded mass of an egg is at least 60 grams, find the probability that its true mass is more than 70 grams.

(2)

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Question 5 continued

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(Total for Question 5 is 12 marks)

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6.

Key: 8 | 2 | 6 means 28 seconds for group A and 26 seconds for group B

	Group A		Group B	
(3)	8 5 1	2	6	(1)
(5)	8 6 5 3 2	3	4 9	(2)
(4)	7 4 2 1	4	3 5 8	(3)
(2)	5 2	5	1 3 4 6 8	(5)
(0)		6	1 3 7	(3)
(1)	8	7	2	(1)

Figure 4

The back-to-back stem and leaf diagram in Figure 4 shows the times, in seconds, taken by two groups of 15 students to solve a puzzle.

(a) Find the median and the quartiles of the times for each group.

(3)

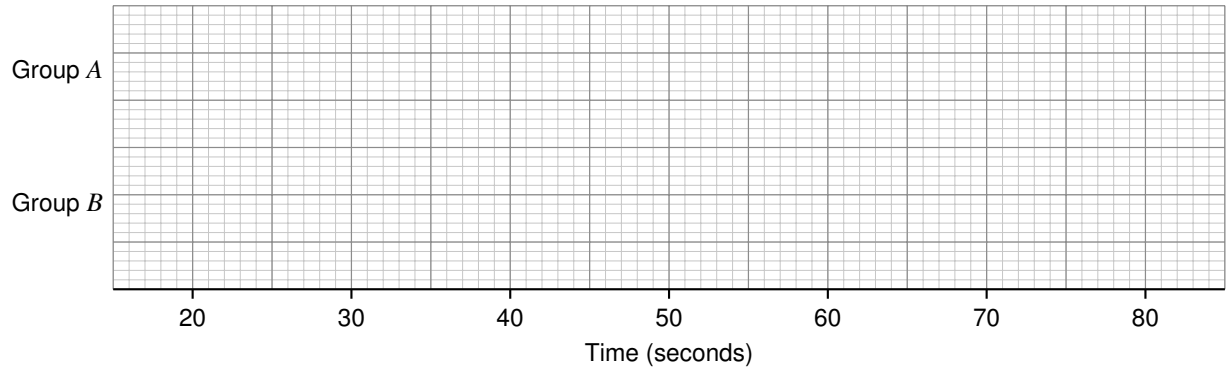
An outlier is a value greater than $Q_3 + 1.5(Q_3 - Q_1)$ or less than $Q_1 - 1.5(Q_3 - Q_1)$

(b) Show that group A has exactly one outlier and that group B has none.

(2)

(c) On the grid below, draw box plots for the two groups.

(3)



(d) Compare the times of the two groups.

(2)

(e) For group A, $\sum x = 607$ and $\sum x^2 = 27\,331$

Evaluate $\dfrac{3(\text{mean} - \text{median})}{\text{standard deviation}}$ for group A, and use it to comment on whether a normal distribution would be a suitable model for these times.

(3)

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Question 6 continued

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(Total for Question 6 is 13 marks)

TOTAL FOR PAPER IS 75 MARKS

END

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