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INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 1 (WST01)

Statistics 1 Practice Paper 1

Edexcel IAL Statistics 1

AIMING FOR B

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

A full 75-mark paper of multi-step exam questions covering every Statistics 1 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 discrete random variable	10	
2	Stem-and-leaf diagram and box plot	10	
3	Correlation and regression	11	
4	A Venn diagram and independence	9	
5	Histogram and grouped data	12	
6	The normal distribution	11	
7	Tree diagram without replacement	12	
	Total	**75**	

Rough grade guide (out of 75): A **63** • B **54** • C **45**

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 has probability function

$$\mathrm{P}(X = x) = \begin{cases} kx & x = 1, 2, 3 \\ k(7 - x) & x = 4, 5, 6 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Show that $k = \frac{1}{12}$

(2)

(b) Find F(2.5)

(2)

(c) Write down the value of E(X), giving a reason for your answer.

(1)

(d) Show that Var$(X) = \frac{23}{12}$

(3)

(e) Find Var$(5 - 3X)$

(2)

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Question 1 continued

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(Total for Question 1 is 10 marks)

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2.

Key: 2 | 3 means 23 minutes

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

Figure 1

The stem and leaf diagram in Figure 1 shows the waiting times, in minutes, of 27 patients at a clinic.

(a) Find the median and the quartiles of these waiting times.

(3)

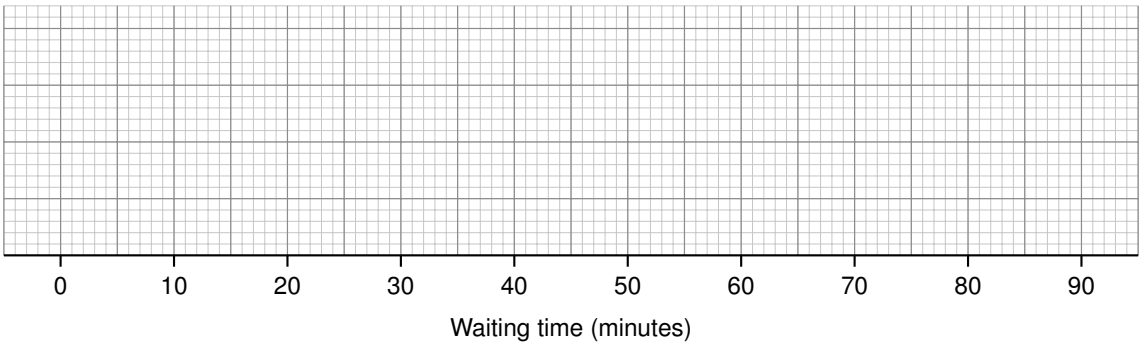
An outlier is defined as a value that is greater than $Q_3 + 1.5(Q_3 - Q_1)$ or less than $Q_1 - 1.5(Q_3 - Q_1)$

(b) Show that 86 is an outlier, and that there are no other outliers.

(2)

(c) On the grid below, draw a box plot to represent these waiting times.

(3)



(d) Describe the skewness of the waiting times, giving a reason for your answer.

(2)

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Question 2 continued

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(Total for Question 2 is 10 marks)

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3. On each of 10 days in spring, a café records the maximum temperature, t °C, and the number of hot drinks it sells, d

The results are summarised below.

$$\sum t = 112 \qquad \sum d = 770 \qquad \sum t^2 = 1470 \qquad \sum d^2 = 62446 \qquad \sum td = 7829$$

$$S_{tt} = 215.6 \qquad S_{dd} = 3156$$

(a) Show that $S_{td} = -795$

(2)

(b) Find the product moment correlation coefficient between t and d.

(2)

(c) Interpret your value of the correlation coefficient in the context of the question.

(1)

(d) Find the equation of the regression line of d on t, in the form $d = a + bt$, giving the values of a and b to 3 significant figures.

(3)

(e) Use your regression line to estimate the number of hot drinks sold on a day when the maximum temperature is 12 °C.

(1)

The lowest maximum temperature on these 10 days was 4 °C and the highest was 19 °C.

(f) Explain why the regression line should not be used to estimate the number of hot drinks sold on a day when the maximum temperature is 30 °C.

(1)

(g) The café owner says that the regression line will give the exact number of hot drinks sold on any day. Give a reason why a statistical model like this can only be an approximation.

(1)

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Question 3 continued

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(Total for Question 3 is 11 marks)

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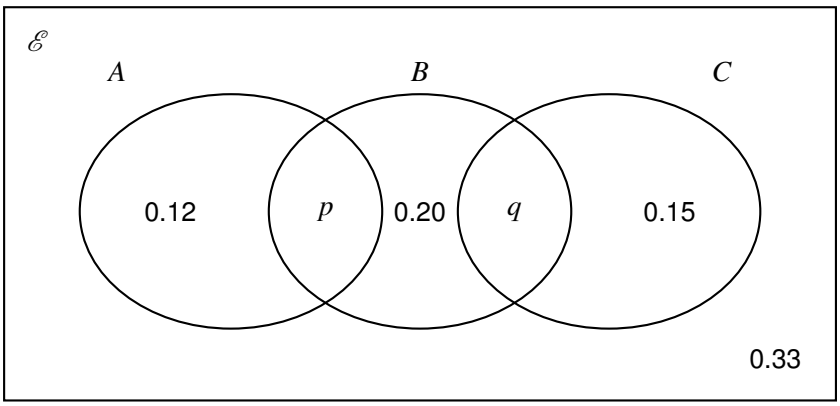

Figure 2

The Venn diagram in Figure 2 shows the probabilities associated with three events, A, B and C

The events A and C are mutually exclusive, and p and q are probabilities.

Given that the events A and B are independent,

(a) find the value of p and the value of q

(4)

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

(3)

(c) Determine whether or not the events B and C are independent. Show your working clearly.

(2)

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Question 4 continued

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(Total for Question 4 is 9 marks)

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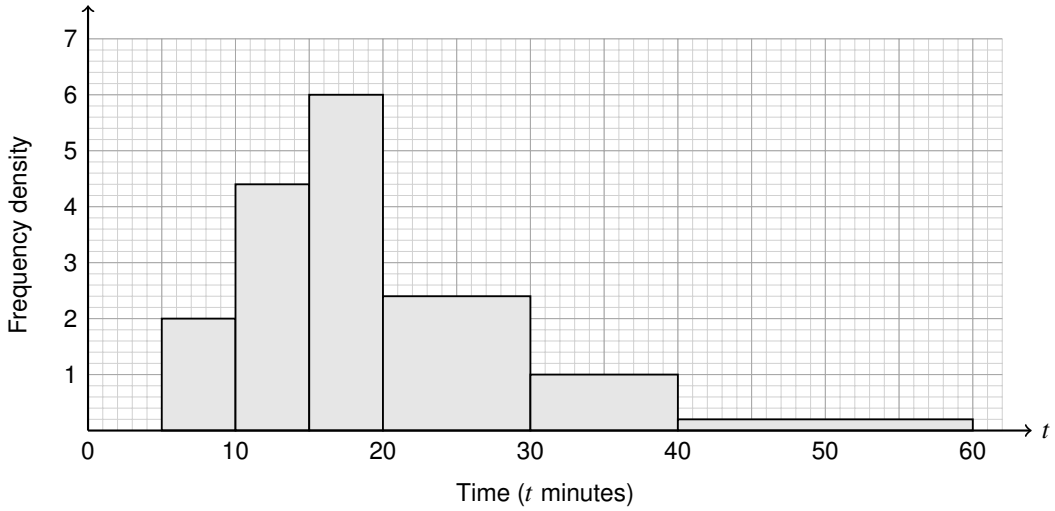

Figure 3

The histogram in Figure 3 shows the times, t minutes, taken by 100 people to complete a puzzle.

(a) Find the number of people who took less than 15 minutes.

(2)

(b) Estimate the number of people who took between 12 minutes and 25 minutes.

(2)

(c) Use linear interpolation to estimate the median time.

(2)

(d) Using the midpoints of the classes, find estimates of the mean and the standard deviation of the times.

(3)

(e) Describe, giving a reason, the skewness of the times.

(2)

(f) Give a reason why a normal distribution would not be a suitable model for these times.

(1)

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Question 5 continued

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(Total for Question 5 is 12 marks)

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6. The mass of flour in a bag, X grams, is modelled by a normal distribution with mean 1010 grams and standard deviation 8 grams.

(a) Find the probability that a randomly chosen bag contains less than 1000 grams of flour.

(2)

(b) Write down the probability that a randomly chosen bag contains more than 1020 grams of flour.

(1)

(c) Find the value of w such that $P(X > w) = 0.05$

(3)

Three bags are chosen at random.

(d) Find the probability that exactly two of the three bags contain less than 1000 grams of flour.

(2)

The machine that fills the bags is adjusted so that the mean changes but the standard deviation stays at 8 grams. After the adjustment, 1% of bags contain less than 1000 grams of flour.

(e) Show that the new mean is 1019 grams, to the nearest gram.

(3)

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Question 6 continued

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(Total for Question 6 is 11 marks)

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7. A bag contains 6 red counters and 4 blue counters. Two counters are taken from the bag at random, one after the other, without replacement.

(a) Complete the tree diagram in Figure 4.

(2)

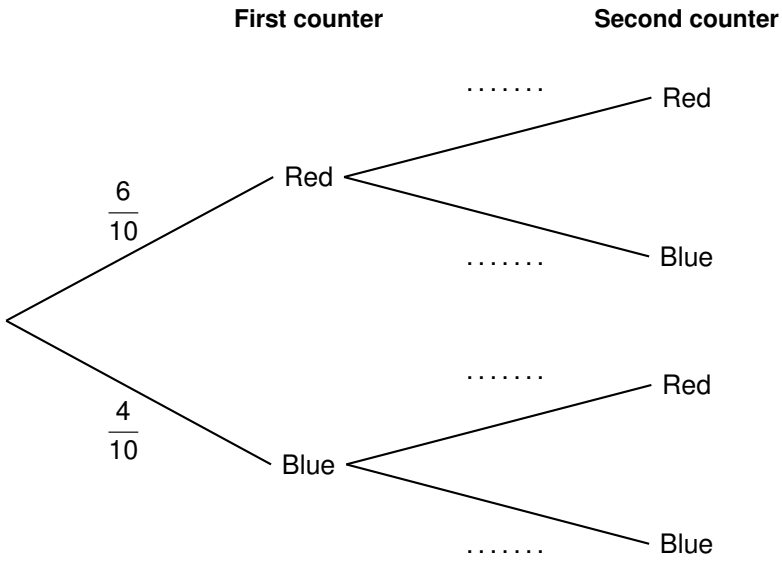

Figure 4

(b) Find the probability that the two counters are the same colour.

(2)

(c) Find the probability that at least one of the counters is blue.

(2)

(d) Given that at least one of the counters is blue, find the probability that the first counter taken is red.

(3)

The counters are put back in the bag, and then k more blue counters are added. Two counters are again taken at random without replacement. The probability that both counters are red is now $\frac{1}{7}$

(e) Show that $k^2 + 19k - 120 = 0$ and hence find the value of k.

(3)

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Question 7 continued

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(Total for Question 7 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS

END

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