

STATISTICS (A) UNIT 1**TEST PAPER 1**

1. A histogram is to be drawn to represent the following grouped continuous data:

Group	0 - 10	10 - 20	20 - 25	25 - 30	30 - 50	50 - 100
Frequency	$2x$	$3x$	$5x$	$6x$	$2x$	x

The '10 - 20' bar has height 6 cm and width 4 cm. Calculate

- (a) the height of the '20 - 25' bar, (4 marks)
- (b) the total area under the histogram. (3 marks)
2. The events A and B are independent. Given that $P(A) = 0.4$ and $P(A \cap B) = 0.12$, find
- (a) $P(B)$, (2 marks)
- (b) $P(A \cup B)$, (2 marks)
- (c) $P(A' \cap B)$, (2 marks)
- (d) $P(A | B)$. (1 mark)
3. The random variable X has the discrete uniform distribution over the set of consecutive integers $\{-7, -6, \dots, 10\}$.
- Calculate (a) the expectation and variance of X , (5 marks)
- (b) $P(X > 7)$, (2 marks)
- (c) the value of n for which $P(-n \leq X \leq n) = \frac{7}{18}$. (2 marks)
4. The marks, x out of 100, scored by 30 candidates in an examination were as follows:

5	19	20	21	23	25	31	37	39	41
42	44	47	51	56	57	60	61	62	65
67	70	71	73	75	77	81	82	98	100

Given that $\sum x = 1600$ and $\sum x^2 = 102\,400$,

- (a) find the median, the mean and the standard deviation of these marks. (5 marks)

The marks were scaled to give modified scores, y , using the formula $y = \frac{4x}{5} + 20$.

- (b) Find the median, the mean and the standard deviation of the modified scores. (4 marks)

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5. The table shows the numbers of cars and vans in a company's fleet having registrations with the prefix letters shown.

Registration letter	<i>K</i>	<i>L</i>	<i>M</i>	<i>N</i>	<i>P</i>	<i>R</i>	<i>S</i>	<i>T</i>	<i>V</i>
Number of cars (x)	6	7	9	11	15	14	12	10	7
Number of vans (y)	8	10	14	13	13	15	14	9	8

- (a) Plot a scatter graph of this data, with the number of cars on the horizontal axis and the number of vans on the vertical axis. **(5 marks)**
- (b) If there were 4 *J*-registered cars, estimate the number of *J*-registered vans. **(2 marks)**
- Given that $\sum x^2 = 1001$, $\sum y^2 = 1264$ and $\sum xy = 1106$,
- (c) calculate the product-moment correlation coefficient between x and y . Give a brief interpretation of your answer. **(5 marks)**
6. The distributions of two independent discrete random variables X and Y are given in the tables:

x	0	1	2
$P(X=x)$	$\frac{3}{5}$	$\frac{3}{10}$	$\frac{1}{10}$

y	0	1
$P(Y=y)$	$\frac{5}{8}$	$\frac{3}{8}$

- The random variable Z is defined to be the sum of one observation from X and one from Y .
- (a) Tabulate the probability distribution for Z . **(5 marks)**
- (b) Calculate $E(Z)$. **(3 marks)**
- (c) Calculate (i) $E(Z^2)$, (ii) $\text{Var}(Z)$. **(4 marks)**
- (d) Calculate $\text{Var}(3Z - 4)$. **(2 marks)**
7. The times taken by a large number of people to read a certain book can be modelled by a normal distribution with mean 5.2 hours. It is found that 62.5% of the people took more than 4.5 hours to read the book.
- (a) Show that the standard deviation of the times is approximately 2.2 hours. **(5 marks)**
- (b) Calculate the percentage of the people who took between 4 and 7 hours to read the book. **(4 marks)**
- (c) Calculate the probability that two of the people chosen at random both took less than 5 hours to read the book, stating any assumption that you make. **(4 marks)**
- (d) If a number of extra people were taken into account, all of whom took exactly 5.2 hours to read the book, state with reasons what would happen to
- (i) the mean, (ii) the variance
- and explain briefly why the distribution would no longer be normal. **(4 marks)**