



eClassroom

INTERNATIONAL A LEVEL MATHEMATICS • STATISTICS 1

Statistics 1

Exam Questions by Topic

Pearson Edexcel International Advanced Level (WST01/01) • Calculator and Statistical Tables allowed

Multi-step exam questions at the difficulty of the real WST01 paper, with a full mark scheme

Chapters (tap a chapter to jump to it)	Qs	Marks	Page	My score
1 Mathematical Modelling Not examined on its own: modelling ideas are tested within Chapters 2 to 7	—	—	Not applicable	
2 Measures of Location and Spread Averages, quartiles, interpolation, standard deviation, coding	10	83	own PDF	
3 Representations of Data Histograms, stem and leaf, box plots, outliers, skewness, comparisons	10	80	2	
4 Probability Venn and tree diagrams, conditional probability, independence	10	80	own PDF	
5 Correlation and Regression PMCC, least squares regression, interpretation, coding	10	84	own PDF	
6 Discrete Random Variables Probability and cumulative distributions, $E(X)$, $\text{Var}(X)$, uniform	10	82	own PDF	
7 The Normal Distribution Standardising, tables, finding μ and σ , conditional problems	10	83	own PDF	

[Full mark scheme](#)

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CHAPTER 3 • KEY SKILLS

Representations of Data

Specification S1: representation of data • 10 questions • 80 marks • about 95 minutes

1 Histograms

Area is proportional to frequency:

$$\text{frequency density} = \frac{\text{frequency}}{\text{class width}}$$

Scale widths *and* heights.**2 Estimating from histograms**

Count a part of a bar by area: $\frac{2}{5}$ of a 5-unit-wide bar holds $\frac{2}{5}$ of its frequency.

3 Stem and leaf diagrams

Read with the key. Leaves in order; back to back diagrams read outwards on the left.

4 Quartiles from diagrams

Use the discrete rules: $\frac{n}{4}$, $\frac{n}{2}$, $\frac{3n}{4}$ (round up, or average two values if whole).

5 Outliers

Use the rule given, e.g.

$$> Q_3 + 1.5(Q_3 - Q_1) \text{ or outside } \bar{x} \pm 2\sigma.$$

State which values are outliers.

6 Box plots

Box Q_1 to Q_3 with the median; whiskers to the most extreme non-outliers; outliers marked $\times$

7 Skewness

Positive: $Q_3 - Q_2 > Q_2 - Q_1$, or mean $>$ median. Measures:

$$\frac{3(\text{mean} - \text{median})}{\text{sd}}, \frac{Q_3 - 2Q_2 + Q_1}{Q_3 - Q_1}$$

8 Comparing distributions

Compare a location *and* a spread, with values, in context. Median with IQR; mean with sd.

9 Cleaning data

Remove an anomaly only with a reason, then recalculate n , $\sum x$ and $\sum x^2$

Skills map every skill above is tested at least once; interleaved skills come from GCSE or other chapters

Skill	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Marks	5	5	5	5	5	11	11	11	10	12
1 Histograms	•						•			
2 Estimating from histograms	•						•			
3 Stem and leaf diagrams		•			•	•		•		
4 Quartiles from diagrams		•	•		•	•		•		
5 Outliers		•				•		•	•	•
6 Box plots			•			•				•
7 Skewness			•	•		•		•		
8 Comparing distributions			•	•				•	•	•
9 Cleaning data									•	
Interleaved: interpolation, mean and sd (Chapter 2)						•	•		•	
Interleaved: inequalities (P1)										•
Interleaved: mean or median in context (Chapter 2)				•		•				

Exam difficulty. Questions 1 to 5 check each skill on its own. Questions 6 to 10 are multi-part questions built like the 11 to 14 mark questions on a real WST01 paper, where one part leads into the next and skills are combined.

Must learn. Always use the outlier rule given in the question. A comparison needs context, a named statistic and its values for *both* data sets.



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- | Time, t (min) | Frequency |
|------------------|-----------|
| $30 \leq t < 35$ | 18 |
| $35 \leq t < 40$ | 32 |
| $40 \leq t < 42$ | 20 |
| $42 \leq t < 50$ | 40 |
| $50 \leq t < 60$ | 10 |

(a) Find the width and the height of the bar for the $42 \leq t < 50$ class.

(3)

- (b)** Estimate the number of runners who took between 38 and 45 minutes.

(2)

Question 1 continued

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2. The ages of the 19 members of a club are shown in the stem and leaf diagram.

Key: 2 | 3 means 23 years

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

- (a) Find the median and the quartiles of the ages.

(3)

An outlier is a value that is more than $1.5 \times (Q_3 - Q_1)$ above Q_3 or below Q_1

- (b) Show that there is exactly one outlier.

(2)



Question 2 continued

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The box plot displays the distribution of marks for two schools. The horizontal axis represents the mark, ranging from 10 to 100. For School A, the minimum mark is 12, the first quartile (Q1) is 35, the median is 48, the third quartile (Q3) is 60, and the maximum mark is 85. For School B, the minimum mark is 25, the first quartile (Q1) is 42, the median is 50, the third quartile (Q3) is 55, and the maximum mark is 70. There is an outlier for School B at a mark of 94, indicated by an 'x'.

School	Minimum	Q1	Median	Q3	Maximum	Outliers
School A	12	35	48	60	85	None
School B	25	42	50	55	70	94

Figure 1

(a) Write down the median and the interquartile range of the marks for school A.

(2)

(b) Compare the marks at the two schools.

(2)

(c) Describe, with a reason, the skewness of the marks for school *B*.

(1)

Question 3 continued

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4. The daily sales of a café are summarised by

Q_1	Q_2	Q_3	mean	standard deviation
21	26	38	29.4	11.2

- (a) Calculate $\frac{3(\text{mean} - \text{median})}{\text{standard deviation}}$ and describe the skewness it shows. (2)
- (b) Calculate $\frac{Q_3 - 2Q_2 + Q_1}{Q_3 - Q_1}$, giving your answer to 2 significant figures. (2)
- (c) State, with a reason, whether the median and interquartile range, or the mean and standard deviation, are more suitable to summarise these data. (1)



Question 4 continued

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5. The times, in minutes, that 16 people spent in a museum are

34 41 28 45 37 52 31 39 44 29 36 48 41 33 27 40

- (a) Draw a stem and leaf diagram to represent these data.

(2)

- (b) Find the median and the interquartile range.

(3)

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Question 5 continued

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(Total for Question 5 is 5 marks)



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6. The number of emails received by an office on each of 30 days is summarised in the stem and leaf diagram.

Key: 2 | 4 means 24

0	7 8 9	(3)
1	2 3 5 5 6 8 9	(7)
2	0 1 3 3 <i>w</i> 6 7 8	(8)
3	0 2 4 5 7 9	(6)
4	1 3 6 8	(4)
5	2	(1)
6	8	(1)

The quartiles are $Q_1 = x$, $Q_2 = 25.5$ and $Q_3 = y$

- (a) Find the values of w , x and y .

(3)

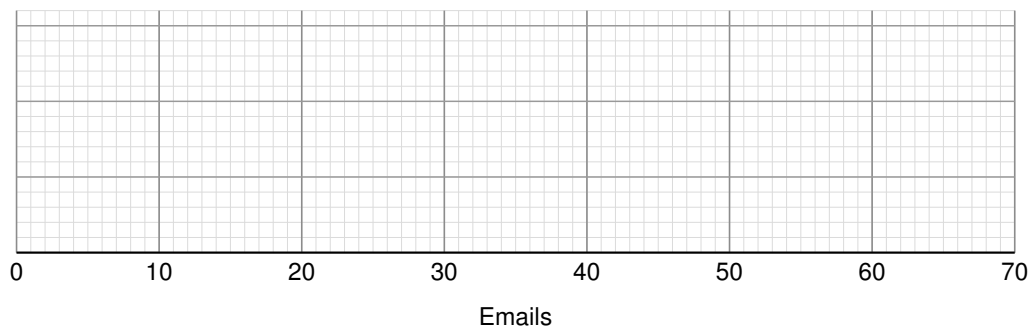
Outliers are defined as values greater than $Q_3 + 1.0 \times (Q_3 - Q_1)$

- (b) Showing your working, identify any outliers.

(2)

- (c) Draw a box plot for these data on the grid below.

(3)



- (d) Use $\frac{(Q_3 - Q_2) - (Q_2 - Q_1)}{Q_3 - Q_1}$ to find the skewness of these data, giving your answer to 2 significant figures.

(2)

The manager wants to estimate the total number of emails the office will receive in a year.

- (e) Explain why the manager should use the mean rather than the median.

(1)



Question 6 continued

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Question 6 continued

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7.

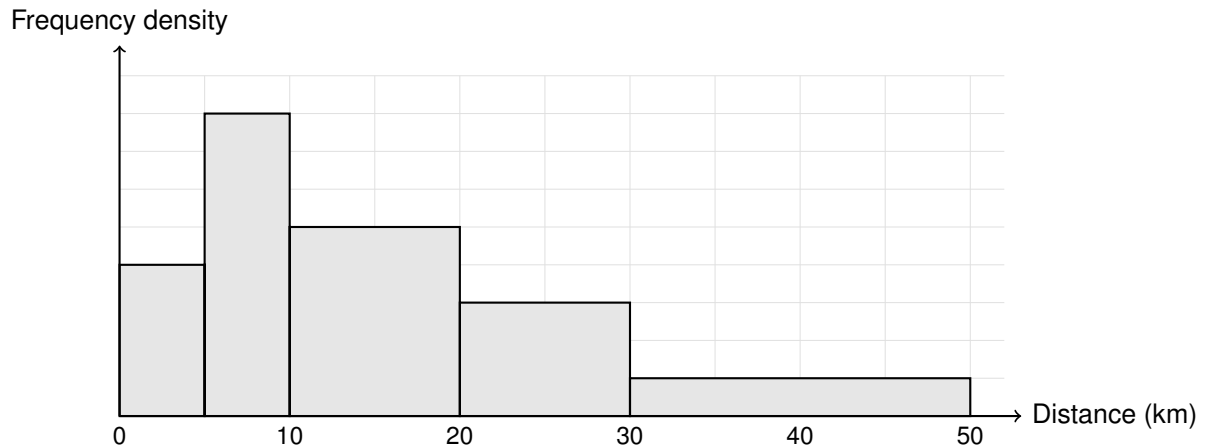
**Figure 2**

Figure 2 shows a histogram of the distances, in km, that a group of people travel to work.

Exactly 40 people travel between 5 km and 10 km.

- (a) Find the total number of people in the group. (3)
- (b) Estimate the number of people who travel between 8 km and 25 km. (3)
- (c) Use linear interpolation to estimate the median distance. (3)
- (d) Estimate the mean distance travelled. (2)



Question 7 continued

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Question 7 continued

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(Total for Question 7 is 11 marks)



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8. The resting pulse rates, in beats per minute, of 15 athletes and 15 non-athletes are shown below.

Key: 8 | 5 | 2 means 58 for athletes and 52 for non-athletes

Athletes		Non-athletes
8 5	4	
9 8 6 5 5 3 2 0	5	8
4 3 1 0	6	2 4 6 7 8
0	7	0 2 2 5 6 9
	8	1 4
	9	
	10	1

For the athletes, $Q_1 = 52$, $Q_2 = 56$ and $Q_3 = 61$

- (a) Find the median and the quartiles of the pulse rates of the non-athletes.

(3)

An outlier is a value more than $1.5 \times (Q_3 - Q_1)$ above Q_3 or below Q_1

- (b) Show that the non-athletes have exactly one outlier.

(2)

- (c) Compare the pulse rates of the two groups.

(3)

- (d) Use the quartiles to describe the skewness of each distribution.

(2)

A person has a resting pulse rate of 69 beats per minute.

- (e) State, with a reason, which group this person is more likely to belong to.

(1)



Question 8 continued

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Question 8 continued

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9. The heights, x cm, of 12 seedlings grown in tray P are

12 14 15 15 16 17 18 18 19 20 21 42

(You may use $\sum x = 227$ and $\sum x^2 = 4949$)

- (a) Find the mean and the standard deviation of the heights.

(3)

An outlier is a value that lies more than 2 standard deviations from the mean.

- (b) Show that 42 is an outlier.

(2)

The value 42 was a recording error, so it is removed from the data.

- (c) Find the mean and the standard deviation of the remaining 11 heights.

(3)

Seedlings in tray Q have a mean height of 15.2 cm and a standard deviation of 3.9 cm.

- (d) Using your answers to part (c), compare the heights of the seedlings in the two trays.

(2)



Question 9 continued

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Question 9 continued

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(Total for Question 9 is 10 marks)



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10. The growths, in cm, of 25 plants of type *A* are summarised below.

Smallest value	Q_1	Q_2	Q_3	Two largest values
8	14	18	22	33 and 36

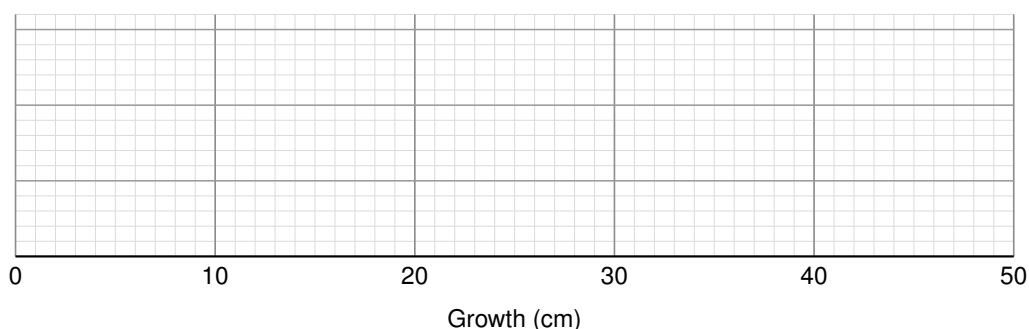
An outlier is a value more than $1.5 \times (Q_3 - Q_1)$ above Q_3 or below Q_1

- (a) Show that there is exactly one outlier for type *A*.

(2)

- (b) Draw a box plot for type *A* on the grid below.

(3)



Plants of type *B* have $Q_1 = 17$, $Q_2 = 24$ and $Q_3 = 28$, with smallest value 10 and largest value 38

- (c) Compare the growths of the two types of plant.

(2)

A plant of type *A* is chosen. Its growth, g cm, is greater than the upper quartile for type *B*, and it is *not* an outlier.

- (d) Find the range of possible values of g .

(2)

- (e) Using the same outlier rule, find the set of values of the growth, h cm, of a type *B* plant that would be an outlier.

(3)



Question 10 continued

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Question 10 continued

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(Total for Question 10 is 12 marks)

TOTAL FOR CHAPTER 3 IS 80 MARKS

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