A Level Statistics
AQA Past Exam Questions

TOPIC: Numerical Measures

Candidates may use any calculator allowed by Pearson regulations. Calculators must not have retrievable mathematical formulae stored in them.

Instructions

• Use **black** ink or ball-point pen.

• If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.

• **Fill in the boxes** at the top of this page with your name, centre number and candidate number.

• Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.

• Answer the questions ***on paper***

• You should show sufficient working to make your methods clear. Answers without working may not gain full credit.

• Unless otherwise stated, statistical tests should be carried out at the 5% significance level.

• When a calculator is used, the answer should be given to three significant figures unless otherwise stated.

Information

• ***You may use the*** booklet 'Statistical Formulae and Tables'

• There are **8** questions in this question paper. The total mark for this paper is ***95***

• The marks for **each** question are shown in brackets – use this as a guide as to how much time to spend on each question.

Advice

• Read each question carefully before you start to answer it.

• Try to answer every question.

• Check your answers if you have time at the end.

• If you change your mind about an answer, cross it out and put your new answer and any working underneath.

• Check your answers if you have time at the end.

AQA_JUNE_2018_2

The table summarises the volume of water, v cubic metres, used during one month by each of the 100 households on a new estate.

Volume of water (v)	Number of households
$0 < v < 2$	1
$2 < v < 4$	5
$4 < v < 6$	13
$6 < v < 8$	18
$8 < v < 10$	27
$10 < v < 15$	16
$15 < v < 20$	12
$20 < v < 30$	8

(a) Calculate estimates for the mean and the standard deviation of these data.

[4 marks]

(b) For each household, the monthly cost for water used is a fixed cost of £1.85 plus a cost of £1.30 per cubic metre of water used. For the households on this new estate, calculate, to the nearest 1p, estimates for the mean and the standard deviation of the monthly cost of water used.

[4 marks]

AQA_JUNE_2017_1

The delay times, in minutes, of appointments for a sample of 15 patients at a clinic were recorded. The times, in ascending order, were as follows.

7 9 11 13 18 23 28 31 35 38 42 47 52 58 above 60

(a) For these 15 times, name and find the value of:

(i) a measure of average;

(ii) a measure of spread.

[4 marks]

(b) Subsequently, it was discovered that the time recorded as 'above 60' was, in fact, 83 minutes. Calculate values for the mean and the standard deviation of the 15 times.

[3 marks]

AQA_JUNE_2016_2

Jeremy records the specified petrol consumptions, in miles per gallon (mpg), of 10 vehicles with similar-sized petrol engines as follows.

45.6 48.9 51.3 48.1 47.0 46.7 50.5 49.6 47.2 46.1

(a) Calculate values for the mean and the variance of these 10 petrol consumptions.

[3 marks]

(b) Richard asks Jeremy to find the values in part (a) based upon equivalent petrol consumptions measured in kilometres per litre (km/l). Given that 1 mpg is approximately 0.354 km/l, find the equivalent values to those found in part (a) in the units asked for by Richard.

[4 marks]

AQA_JUNE_2015_1

The number of passengers getting off the 11.45 am train at a railway station on each of 35 days is summarised as follows.

Number of passengers	6	7	8	10	11	12	14	15	18
Number of days	1	1	2	9	7	4	5	3	3

For these data:

(a) find values for the mode, the median and the interquartile range;

[4 marks]

(b) calculate the value for the mean.

[2 marks]

AQA_JUNE_2014_1

The weights, in kilograms, of a random sample of 15 items of cabin luggage on an aeroplane were as follows.

4.6 3.8 3.9 4.5 4.9 3.6 3.7 5.2 4.0 5.1 4.1 3.3 4.7 5.0 4.8

For these data:

(a) find values for the median and the interquartile range;

[4 marks]

(b) find the value for the range;

[1 mark]

(c) state why the mode is not an appropriate measure of average.

[1 mark]

AQA_JUNE_2013_1a

The average maximum monthly temperatures, u degrees Fahrenheit, and the average minimum monthly temperatures, v degrees Fahrenheit, in New York City are as follows.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum (u)	39	40	48	61	71	81	85	83	77	67	54	41
Minimum (v)	26	27	34	44	53	63	68	66	60	51	41	30

(a) (i) Calculate, to one decimal place, the mean and the standard deviation of the 12 values of the average maximum monthly temperature.

(2 marks)

(ii) For comparative purposes with a UK city, it was necessary to convert the temperatures from degrees Fahrenheit (F) to degrees Celsius (C).

The formula used to convert f ^{o}F to c ^{o} C is:

$$c = \frac{5}{9}(f - 32)$$

Use this formula and your answers in part (a)(i) to calculate, in C, the mean and the standard deviation of the 12 values of the average maximum monthly temperature.

(3 marks)

AQA_JUNE_2010_2

Before leaving for a tour of the UK during the summer of 2008, Eduardo was told that the UK price of a 1.5-litre bottle of spring water was about 50p.

Whilst on his tour, Eduardo noted the prices, x pence, which he paid for 1.5-litre bottles of spring water from 12 retail outlets.

He then subtracted 50p from each price and his resulting differences, in pence, were

-18 -11 1 15 7 -1 17 -16 18 -3 0 9

(a) (i) Calculate the mean and the standard deviation of these differences.

(2 marks)

(ii) Hence calculate the mean and the standard deviation of the prices, x pence, paid by Eduardo.

(2 marks)

(b) Based on an exchange rate of a1.22 to £1, calculate, in euros, the mean and the standard deviation of the prices paid by Eduardo.

(3 marks)

AQA_JUNE_2008_4

The runs scored by a cricketer in 11 innings during the 2006 season were as follows.

47 63 0 28 40 51 a 77 0 13 35

The exact value of a was unknown but it was greater than 100.

(a) Calculate the median and the interquartile range of these 11 values.

(4 marks)

(b) Give a reason why, for these 11 values:

(i) the mode is not an appropriate measure of average;

(ii) the range is not an appropriate measure of spread.

(2 marks)

AQA_JUNE_2012_2

Katy works as a clerical assistant for a small company. Each morning, she collects the company's post from a secure box in the nearby Royal Mail sorting office.

Katy's supervisor asks her to keep a daily record of the number of letters that she collects.

Her records for a period of 175 days are summarised in the table.

Daily number of letters (x)	**Number of days (f)**
0–9	5
10 –19	16
20	23
21	27
22	31
23	34
24	16
25 –29	10
30 –34	5
35 –39	3
40 –49	4
50 or more	1
Total	175

(a) For these data:

(i) state the modal value;

(1 mark)

(ii) determine values for the median and the interquartile range.

(3 marks)

(b) The most letters that Katy collected on any of the 175 days was 54. Calculate estimates of the mean and the standard deviation of the daily number of letters collected by Katy.

(4 marks)

(c) During the same period, a total of 280 letters was also delivered to the company by private courier firms. Calculate an estimate of the mean daily number of all letters received by the company during the 175 days

(2 marks)

AQA_JUNE_2009_5

A survey of all the households on an estate is undertaken to provide information on the number of children per household.

The results, for the 99 households with children, are shown in the table.

Number of children (x)	1	2	3	4	5	6	7
Number of households (f)	14	35	25	13	9	2	1

(a) For these 99 households, calculate values for:

(i) the median and the interquartile range;

(3 marks)

(ii) the mean and the standard deviation.

(3 marks)

(b) In fact, 163 households were surveyed, of which 64 contained no children.

(i) For all 163 households, calculate the value for the mean number of children per household.

(2 marks)

(ii) State whether the value for the standard deviation, when calculated for all 163 households, will be smaller than, the same as, or greater than that calculated in part (a)(ii).

(1 mark)

(iii) It is claimed that, for all 163 households on the estate, the number of children per household may be modelled approximately by a normal distribution. Comment, with justification, on this claim. Your comment should refer to a fact other than the discrete nature of the data.

(2 marks)

AQA_JUNE_2011_1

The number of matches in each of a sample of 85 boxes is summarised in the table.

Number of matches	**Number of boxes**
Less than 239	1
239–243	1
244–246	2
247	3
248	4
249	6
250	10
251	13
252	16
253	20
254	5
255–259	3
More than 259	1
Total	85

(a) For these data:

(i) state the modal value;

(1 mark)

(ii) determine values for the median and the interquartile range.

(3 marks)

(b) Given that, on investigation, the 2 extreme values in the above table are 227 and 271 :

(i) calculate the range;

(1 mark)

(ii) calculate estimates of the mean and the standard deviation.

(4 marks)

(c) For the numbers of matches in the 85 boxes, suggest, with a reason, the most appropriate measure of spread.

(2 marks)

AQA_JUNE_2007_4

A library allows each member to have up to 15 books on loan at any one time.

The table shows the numbers of books currently on loan to a random sample of 95 members of the library.

Number of books on loan	0	1	2	3	4	5–9	10–14	15
Number of members	4	13	24	17	15	11	5	6

(a) For these data:

(i) state values for the mode and range;

(2 marks)

(ii) determine values for the median and interquartile range;

(4 marks)

(iii) calculate estimates of the mean and standard deviation.

(4 marks)

(b) Making reference to your answers to part (a), give a reason for preferring:

(i) the median and interquartile range to the mean and standard deviation for summarising the given data;

(1 mark)

(ii) the mean and standard deviation to the mode and range for summarising the given data.

(1 mark)