

# Measures of location and spread - Questions

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May 2014 Mathematics Advanced Paper 1: Statistics 1

1.  
2. The mark,  $x$ , scored by each student who sat a statistics examination is coded using

$$y = 1.4x - 20$$

The coded marks have mean 60.8 and standard deviation 6.60.

Find the mean and the standard deviation of  $x$ .

(4)

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2.  
4. The marks,  $x$ , of 45 students randomly selected from those students who sat a mathematics examination are shown in the stem and leaf diagram below.

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

Key	(3   6 means 36)
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- (a) Write down the modal mark of these students. (1)
- (b) Find the values of the lower quartile, the median and the upper quartile. (3)

For these students  $\sum x = 2497$  and  $\sum x^2 = 143\,369$ .

- (c) Find the mean and the standard deviation of the marks of these students. (3)
- (d) Describe the skewness of the marks of these students, giving a reason for your answer. (2)

The mean and standard deviation of the marks of all the students who sat the examination were 55 and 10 respectively. The examiners decided that the total mark of each student should be scaled by subtracting 5 marks and then reducing the mark by a further 10 %.

(e) Find the mean and standard deviation of the scaled marks of all the students.

(4)

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3.

2. Keith records the amount of rainfall, in mm, at his school, each day for a week. The results are given below.

2.8    5.6    2.3    9.4    0.0    0.5    1.8

Jenny then records the amount of rainfall,  $x$  mm, at the school each day for the following 21 days. The results for the 21 days are summarised below.

$$\sum x = 84.6$$

- (a) Calculate the mean amount of rainfall during the whole 28 days.

(2)

Keith realises that he has transposed two of his figures. The number 9.4 should have been 4.9 and the number 0.5 should have been 5.0.

Keith corrects these figures.

- (b) State, giving your reason, the effect this will have on the mean.

(2)

4.

5. On a randomly chosen day, each of the 32 students in a class recorded the time,  $t$  minutes to the nearest minute, they spent on their homework. The data for the class is summarised in the following table.

Time, $t$	Number of students
10 – 19	2
20 – 29	4
30 – 39	8
40 – 49	11
50 – 69	5
70 – 79	2

- (a) Use interpolation to estimate the value of the median.

(2)

Given that

$$\sum t = 1414 \quad \text{and} \quad \sum t^2 = 69\,378,$$

- (b) find the mean and the standard deviation of the times spent by the students on their homework.

(3)

- (c) Comment on the skewness of the distribution of the times spent by the students on their homework. Give a reason for your answer.

(2)

5.

5. A teacher selects a random sample of 56 students and records, to the nearest hour, the time spent watching television in a particular week.

Hours	1–10	11–20	21–25	26–30	31–40	41–59
Frequency	6	15	11	13	8	3
Mid-point	5.5	15.5		28		50

- (a) Find the mid-points of the 21–25 hour and 31–40 hour groups.

(2)

A histogram was drawn to represent these data. The 11–20 group was represented by a bar of width 4 cm and height 6 cm.

- (b) Find the width and height of the 26–30 group.

(3)

- (c) Estimate the mean and standard deviation of the time spent watching television by these students.

(5)

- (d) Use linear interpolation to estimate the median length of time spent watching television by these students.

(2)

The teacher estimated the lower quartile and the upper quartile of the time spent watching television to be 15.8 and 29.3 respectively.

- (e) State, giving a reason, the skewness of these data.

(2)

6.

3. The birth weights, in kg, of 1500 babies are summarised in the table below.

Weight (kg)	Midpoint, $x$ kg	Frequency, $f$
0.0 – 1.0	0.50	1
1.0 – 2.0	1.50	6
2.0 – 2.5	2.25	60
2.5 – 3.0		280
3.0 – 3.5	3.25	820
3.5 – 4.0	3.75	320
4.0 – 5.0	4.50	10
5.0 – 6.0		3

[You may use  $\sum fx = 4841$  and  $\sum fx^2 = 15\,889.5$ ]

- (a) Write down the missing midpoints in the table above. (2)
- (b) Calculate an estimate of the mean birth weight. (2)
- (c) Calculate an estimate of the standard deviation of the birth weight. (3)
- (d) Use interpolation to estimate the median birth weight. (2)
- (e) Describe the skewness of the distribution. Give a reason for your answer. (2)