

Q1. Zoe recorded the weights, in kilograms, of 15 people.

Here are her results.

87 51 46 77 74 58 68 78
 48 63 52 64 79 60 66

Complete the ordered stem and leaf diagram to show these results.

4	
5	
6	
7	
8	

Key:

(Total 3 marks)

Q2. Zoe recorded the weight of each of 15 people.
 She showed her results in a stem and leaf diagram.

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

Key:

4|6 means 46 kg

(a) Write down the number of people with a weight of more than 70 kg.

.....

(1)

(b) Work out the range of the weights.

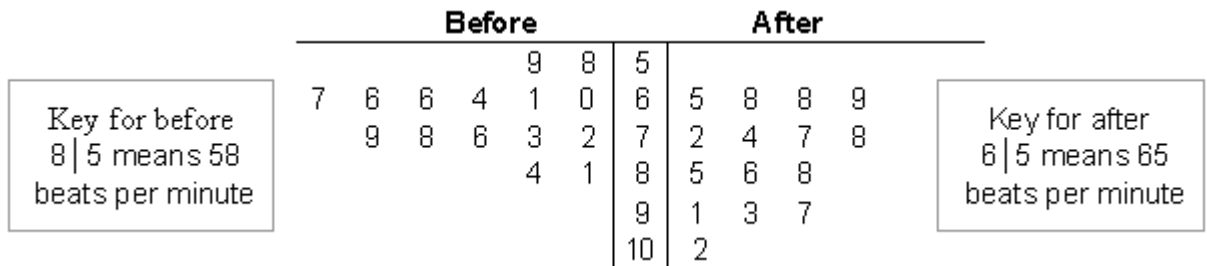
..... kg

(2)

(Total 3 marks)

Q3. Zoe recorded the heart rates, in beats per minute, of each of 15 people. Zoe then asked the 15 people to walk up some stairs. She recorded their heart rates again.

She showed her results in a back-to-back stem and leaf diagram.



Compare the heart rates of the people before they walked up the stairs with their heart rates after they walked up the stairs.

(Total 6 marks)

Q4. Zoe recorded the heart rate of each of 15 people.
She showed her results in a stem and leaf diagram.



Key:
5 | 8 means 58 beats per minute

(a) Find the median heart rate.

..... beats per minute

(1)

(b) Work out the range of the heart rates.

..... beats per minute

(2)

Zoe then asked the 15 people to walk up some stairs.
Zoe recorded the heart rates again.

She used the results to work out the median and the range.

Median	78
Range	37

- (c) Compare the heart rates of the people before they walked up the stairs with their heart rates after they walked up the stairs.

.....

.....

.....

.....

(2)
(Total 5 marks)

- Q5.** The stem and leaf diagram shows information about the ages, in years, of the people on a fairground ride.

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

Key: 4|2 means 42 years

- (a) How many people were on the fairground ride?

.....

(1)

- (b) Work out the median age.

.....

(1)

(c) Work out the range of the ages.

.....

(2)

(Total 4 marks)

Q6. Some students did a test.

This back-to-back stem and leaf diagram shows information about their scores.

Boys' scores	Stem	Girls' scores
8 2	2	7 8
9 6 5 2	3	0 4 7 8
9 5 4 3 2 1 0	4	3 5 5 7 8
7 7 7 6 5 4	5	0 1 3 5 7 7 7 9 9
5 3 2 1	6	0 3 6

Key for boys' scores 8 2 means 28		Key for girls' scores 2 7 means 27
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Compare and contrast the scores of these students.

(Total 6 marks)

Q7. Some students did a test.
Here are their scores.

Boys' scores	27	20	12	28	35	28	37		
Girls' scores	29	31	35	15	18	25	35	27	40

Compare fully the scores of these students.

(Total 6 marks)

Q8. Here are the ages, in years, of 15 teachers.

35 52 42 27 36

23 31 41 50 34

44 28 45 45 53

Draw an ordered stem and leaf diagram to show this information.
You must include a key.



Key:

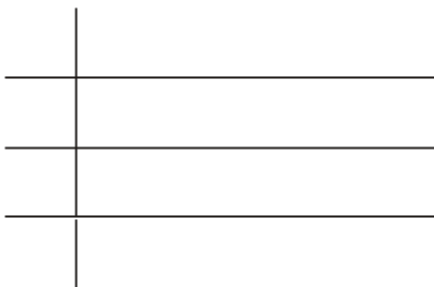
(Total 3 marks)

Q9. Here are the ages, in years, of 15 teachers.

35 52 42 27 36

23 31 41 50 34
 44 28 45 45 53

- (a) Draw an ordered stem and leaf diagram to show this information.
 You must include a key.



Key:

(3)

One of these teachers is picked at random.

- (b) Work out the probability that this teacher is more than 40 years old.

.....

(2)
 (Total 5 marks)

Q10. Jason collected some information about the heights of 19 plants.

This information is shown in the stem and leaf diagram.

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

Key: 4|8 means 48mm

Find the median.

..... mm

(Total 2 marks)

Q11. Here is some information about the time, in minutes, it took the 21 teachers at a school to get to work on Monday.

13	18	20	35	45	34	44
23	33	12	46	21	22	17
22	31	23	8	15	22	10

(a) Draw an ordered stem and leaf diagram to show this information.

(3)

Roadworks near the school meant that the time to travel to school by every teacher on Tuesday was increased by 5 minutes.

(b) What was the median of the times on Tuesday?

..... minutes

(2)

- (c) State whether the interquartile range of the times on Tuesday would be less, greater or the same as the interquartile range of the times on Monday.
Give a reason for your answer.

.....

.....

(1)

(Total 6 marks)

M1.

Answer		Mark	Additional Guidance
46	8	3	M1 for unordered leaves (condone two errors or omissions) A1 for a fully correct ordered stem and leaf diagram B1 for key, eg 4 6 means 46
51	28		
60	3 4 6 8		
74	7 8 9		
87			
Total for Question: 3 marks			

M2.

	Working	Answer	Mark	Additional Guidance
(a)		5	1	B1 cao
(b)	87 – 46	41	2	M1 for 87 – 46, (accept 46 to 87 and 46 – 87) A1 cao
Total for Question: 3 marks				

M3.

Working	Answer	Mark	Additional Guidance
Median (before) = 67 Median (after) = 78	Comparison of 1. medians / means	6	B2 for median (before) = 67 and median (after) = 78 (B1 for one correct median)

<p>Mean (before) = 69.6 Mean (after) = 80.8(6...)</p> <p>Range (before) = 84 – 58 = 26 Range (after) = 102 – 65 = 37</p> <p>IQR (before) = 78 – 61 = 17 IQR (after) = 91 – 69 = 22</p>	2. range / IQR	<p>OR</p> <p>B2 for mean (before) = 69.6 and mean (after) = 80.9 / 80.8(6..) (B1 for one correct mean)</p> <p>B2 for range (before) = 26 and range (after) = 37</p> <p>OR</p> <p>B2 for IQR (before) = 17 and IQR (after) = 22 (B1 for one correct range/IQR)</p> <p>OR</p> <p>B2 for fully correct diagram/chart to compare, e.g. box plots, cumulative frequency diagrams, etc (B1 for diagram/chart with one error in presentation)</p> <p>C1 for median (after) > median (before) oe or ft their medians OR for mean (after) > mean (before) oe or ft their means</p> <p>OR</p> <p>C1 for range (after) > range (before) oe or ft their ranges OR for IQR (after) > IQR (before) oe or ft their IQRs</p> <p>C1 for comments, in context, relating to an average and to the spread of the data (dep on B3). QWC: Decisions should be justified and calculations attributable</p> <p>SC If no marks scored, B1 for a correct comparison (eg Heart rates are faster after walking up the stairs)</p>
Total for Question: 6 marks		

M4.

	Working	Answer	Mark	Additional Guidance
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(a)		67	1	B1 cao
(b)	$84 - 58 = 26$	26	2	M1 for $84 - 58$, accept 58 to 84 and $58 - 84$ A1 cao
(c)		Two comparisons	2	Ft B1 for heart rates faster after walking , bigger median, median increase by 11 Ft B1 for heart rates more spread out after walking, bigger range, range increases by 11 Statements must be entirely true and not contradictory
Total for Question: 5 marks				

M5.

	Working	Answer	Mark	Additional Guidance
(a)		27	1	B1 cao
(b)	$(27 + 1)/2 = 14$ so 14th is median value	23	1	B1 cao
(c)	$53 - 8$	45	2	M1 for $53 - 8$ A1 cao [SC: B1 for 8 to 53 or $8 - 53$ oe or 8 and 53 identified if M0 A0 awarded]
Total for Question: 4 marks				

M6.

	Working	Answer	Mark	Additional Guidance
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QWC (i, iii)	Median (boys) = 45 Median (girls) = 50 Range (boys) = 65 – 22 = 43 Range (girls) = 66 – 27 = 39 IQR (boys) = 57 – 39 = 18 IQR (girls) = 57 – 38 = 19	Compares 1. medians 2. range/IQR	6	B2 for median (boys) = 45 and median (girls) = 50 (B1 for one correct median) B2 for range (boys) = 43 and range (girls) = 39 OR IQR (boys) = 18 and IQR (girls) = 19 (B1 for one correct range/IQR) OR B2 for fully correct diagram/chart to compare, e.g. box plots, cumulative frequency diagrams, etc (B1 for diagram/chart with one error in presentation) C1 for median (girls) > median (boys) oe or ft their medians or for range (boys) > range (girls) oe or ft their ranges or IQR (girls) > IQR (boys) oe or ft their IQRs C1 for comments relating to all working (ie range/median/charts dep on B4) QWC: Decisions should be justified, and calculations attributable SC If no marks scored B1 for a correct comparison
Total for Question: 6 marks				

M7.

	Working	Answer	Mark	Additional Guidance
QWC	12, 20, 7, 28, 28, 35, 37 15, 18, 25, 27, 29, 31, 35, 35, 40	Compares 1. medians/ means 2. ranges	6	B2 for median (boys) = 28 and median (girls) = 29 OR mean (boys) = 26.7 or better and mean (girls) = 28.3 or better (B1 for one correct median/mean) B2 for range (boys) = 25 and range (girls) = 25

			<p>(B1 for one correct range)</p> <p>OR</p> <p>B2 for fully correct diagram/chart to compare, e.g. back-to-back stem and leaf diagram, dual bar chart, vertical (stick) graphs, etc</p> <p>(B1 for diagram chart with one error in presentation)</p> <p>C1 for median (girls) > median (boys) oe</p> <p>or mean (girls) > mean (boys) oe</p> <p>or for range (boys) = range (girls) oe</p> <p>C1 for comments relating to all working (ie range/mean/median/charts dep on B4) QWC: Decisions should be justified, and calculations attributable</p> <p>SC If no marks scored B1 for a correct comparison</p>
Total for Question: 6 marks			

M8.

Answer	Mark	Additional Guidance
<pre> 2 378 3 456 4 12455 5 023 2 3 = 23 </pre>	3	<p>M1 for using 2, 3, 4 and 5 as stem</p> <p>A1 for ordered stem and leaf diagram</p> <p>A1 for consistent key, e.g. 2 3 = 23 (years)</p> <p>OR</p> <p>M1 for using 20, 30, 40 and 50 as stem</p> <p>A1 for ordered stem and leaf diagram</p> <p>A1 for consistent key, e.g. 20 3 = 23 (years)</p>

		(NB: Condone use of comma between leaves)
Total for Question: 3 marks		

M9.

	Answer	Mark	Additional Guidance
(a)	$\begin{array}{c} 2378 \\ 31456 \\ 412455 \\ 5023 \\ \hline 2 \mid 3 = 23 \end{array}$	3	<p>M1 for using 2, 3, 4 and 5 as stem A1 for ordered stem and leaf diagram A1 for consistent key, e.g. 2 3 = 23 (years)</p> <p>OR</p> <p>M1 for using 20, 30, 40 and 50 as stem A1 for ordered stem and leaf diagram A1 for consistent key, e.g. 20 3 = 23 (years)</p>
(b)	$\frac{8}{15}$	2	<p>B2 ft for $\frac{8}{15}$ (ft from stem and leaf diagram)</p> <p>(B1 for $\frac{8}{a}$, $a > 8$, or $\frac{b}{15}$, $b < 15$)</p> <p>SC: B1 for '8' : '15' or '8' out of '15'</p>
Total for Question: 5 marks			

M10.

Answer	Mark	Additional Guidance
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30	2	M1 for finding the middle value or indication of 0, 29, 29.5, 30.5, 31, 31.5, 32 or writing "10 th value" oe A1 cao
Total for Question: 2 marks		

M11.

	Working	Answer	Mark	Additional Guidance
(a)	0: 8 1: 023578 2: 0122233 3: 1345 4: 456 Key 4 6 means 46 minutes	Correct stem and leaf	3	B3 Fully correct (B2 All entries correct, no key) (B1 correct entries unordered, key or no key) OR (B2 Three rows correct, key or no key) (B1 Two rows correct, key or no key)
(b)	Old median = 22 New median = 22 + 5	27 minutes	2	M1 finds median correctly for original data and adds 5 A1 cao OR M1 Redoes table (ft) with each value increased by 5 and attempts to find median A1 cao
(c)		The same + reason	1	C1 All the values have increased by 5 minutes so when you subtract the 5 minutes will cancel out.
Total for Question: 6 marks				

E1. Candidates are becoming more and more familiar with stem and leaf diagrams as shown by this question where over 92% of the candidates scored 2 or 3 marks. The most common error was to lose a mark for an incorrect key although 75% of the candidates did score all available marks. There were a substantial number of candidates who did not realise the diagram required the numbers to be ordered.

E2. Only 66% of the candidates were able to write that 5 people had a weight of more than 70 kg. The most common incorrect responses were 2 (two 7's in the leaves) and 4 (probably from sight of 4 numbers in the 70s).

In part (b) over half the candidates could provide 41 as the range of the weights with another 5% scoring one mark for identifying 87 and 46. It was surprising how many of these candidates made arithmetic errors in working out the difference between the two numbers. A significant number of candidates calculated the median value rather than the range.

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This question was worth 6 marks so it was somewhat surprising to see that some candidates limited themselves to a brief comment stating that heart rates were higher after people had walked up the stairs. Examiners were able to give this little credit without any supportive evidence. At the other extreme a significant number of candidates worked out the mode, median, mean, range and interquartile range for "before" and "after". Some then made an attempt to interpret their findings whilst others judged that they had completed the question once the calculations were done. What was required, of course, was the calculation and comparison of an appropriate average (i.e. the median or mean) for "before" and "after", the calculation and comparison of an appropriate measure of spread (i.e. the range or interquartile range) and then some interpretation in the context of the question. Most candidates were able to score marks for the calculations, but far fewer were able to deduce that the hearts rates had risen (due to the rise in the average considered) and that they were more varied after the 15 people had walked up the stairs (due to the rise in the measure of spread considered). Common errors included giving "60" as the median and "81" as the highest heart rate for the people before they walked up the stairs. This seems to have arisen because candidates took the leaf furthest to the right as having the highest value.

##

Many candidates scored some marks on this question. There were often able to find the median from the stem and leaf diagram although 66 was a common error. The range was less successfully answered. Most candidates showed no working for this part of the question. Those that did, with incorrect answers, used 81 as the largest value. Another common error was just to give 58 as the range. In part (c) candidates were expected to compare, whilst many wrote the correct managed to say something plausible for the raise in the median values, few pupils made correct comments about the increase in the range. Too many candidates gave long explanations about what exercise does to your body and did not concentrate on the mathematics.

##

Part (a) was generally correctly answered, careless rather than conceptual errors accounting for the greater number of mistakes.

Part (b) was poorly answered, clearly showing a lack of understanding of the ordering of information in a stem and leaf diagram. 3 and 22.5 were the most common errors here.

Only a half of the candidature was able to correctly find the range in part (c).

$50 - 8 = 42$ and $53 - 9 = 44$ were the usual errors together with $5 - 0 = 5$. Even when the readings of 53 and 8 were correctly achieved many didn't appreciate that they needed the difference and merely stated the two extremities.

E8. This question was done well by the majority of the candidates. Most were able to draw an ordered stem and leaf diagram. Typical errors included omitting a number, usually the 0 in 50 or the 5 in the repeated 45s; or drawing an incorrect key. A surprising number of candidates gave more than one example for the key.

E9. Those candidates who were familiar with stem and leaf diagrams usually answered part (a) quite well although many did not understand how to complete the key. Some candidates made no attempt to order the leaves but many who did were careless and made one error in the ordering or omitted one or two leaves. A significant number of candidates did not know what was meant by a stem and leaf diagram and many tally charts and pictograms were seen. The probability in part (b) was often correct even when

the diagram in part (a) was incorrect or not attempted and it was pleasing that most candidates expressed the probability in a correct form. Many candidates did not understand that to find the number of teachers over 40 years old they must include those over 50 as well so $\frac{5}{15}$ was a common incorrect answer. Some showed $\frac{5}{15}$ in their working, gaining one mark, and then simplified it to $\frac{1}{3}$ but those who gave an answer of $\frac{1}{3}$ with no working got no mark.

E10. Foundation

It was pleasing to see how many candidates could not only interpret data from a stem and leaf diagram but also find the median correctly (over 45%). Many scored 1 mark for writing their median as 29, 29.5, 30.5, 31, 31.5 or 32 and a few scored 1 mark for realising that 0 was the middle value but then failed to write this as 30. The most common incorrect response was to list the single digit numbers from the table in order, and then find the middle value. This did not score any marks.

Higher

Approximately 65% of candidates were able to gain full marks. A further 17% gained one mark for demonstrating a correct method to find the median. Common errors were to list the numbers given as the leaves in order and find the median of these or to find the mean.