Teacher Support

GCSE Mathematics (4360)

Unit 1 – Statistics and Number (43601F and 43601H)

Feedback materials on the March 2011 examination

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Question 4

4 Shola has **two** of these coins.

1p   2p   5p   10p   20p   50p   £1

The value of one coin is 10% of the value of the other coin.

Work out the possible **total** amounts of money Shola could have.

....

....

....

....

Answer ....

(3 marks)

Mark scheme:

4	11p, 22p, 55p, £1.10 or 110p	B3	B2 two or three correct totals B2 four correct pairs B1 one correct total B1 one, two or three correct pairs Condone money notation errors for up to B2

One of the key skills required in the new specification is that of setting out problems in a measured and systematic way if possible.

This is a question worth 3 marks. Far too many candidates did not have a method which could be rewarded with part marks should their answers be incorrect.

It was rare to see candidates showing that they were working out 10% of some coins for which there was a method mark. The candidate below has shown some method but has missed one of the four possible answers perhaps by not systematically working through the possible options.

Work out the possible **total** amounts of money Shola could have.

10%. £1.00 = 1p

10%. 50 = 5p

10%. of 20 = 2p

Answer £1.01., £0.55p., £0.22.p.,
£0.11,

(3 marks)

However, even the above is not really a method, it just shows some outcomes. The method for finding 10% is not shown in the attempt below and consequently does not score.

Work out the possible **total** amounts of money Shola could have.

10% of 5p = 1p   10% of 10p = 2p

10% of 50p = 10p

10% of £1 = 20p

Answer

(3 marks)

Quite a number of candidates ignored the request for totals even though it was in bold.

Candidates should check they have answered the question being asked.

Work out the possible **total** amounts of money Shola could have.

10% of £1 = 10p

10% of 10p = 1p

10% of 50p = 5p

10% of 20p = 2p

Answer £1 and 10p or 50p and 5p or 20p and 2p or
10p and 1p

(3 marks)

5

Foundation tier Question 7 / Higher tier Question 2

*2   A company pays people to visit shops and test customer service.
        Paul works for this company.

        His fees in October are shown.

Fee (£)	Frequency
8	10
10	18
12	7
15	4
20	1

2 (a)   Calculate his mean fee.

        ....

        ....

        ....

                        Answer £ ....   *(3 marks)*

2 (b)   Paul says that his modal fee and his median fee are both £10.

        Is he correct?
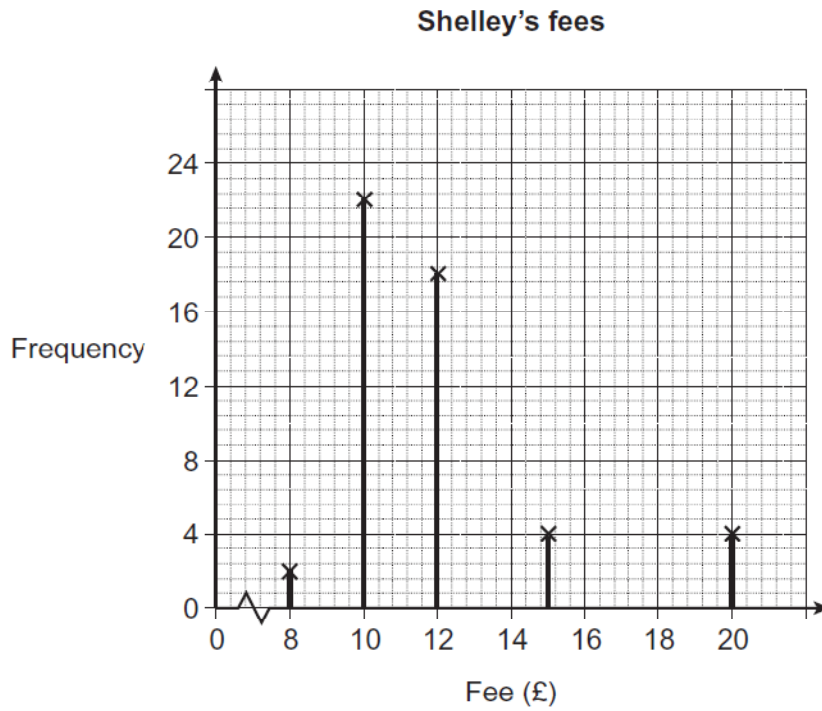   Give reasons and working to show how you decide.

        ....

        ....

        ....

        ....
                                                                                (2 marks)

2 (c)   Shelley also works for this company.
Her fees in the same month are shown.

Shelley's fees

Give **one** similarity and **one** difference in the fees of Paul and Shelley.

Similarity ....

....

Difference ....

....

(2 marks)

Mark scheme:

2a	Attempts to calculate fx (at least one attempt) or 424 seen	M1	8 × 10 (= 80) 10 × 18 (= 180) 12 × 7 (= 84) 15 × 4 (= 60) 20 × 1 (= 20)
	their 424 ÷ their 40	M1 dep	10.6
	10.60	Q1	Strand (i) Correct notation required Do not accept 10.6 SC2 404.5
2b	Mode = 10 as it is the value occurring most often	B1	oe
	Median is the 20th (or 20.5th) unless contradicts with conclusion	B1	oe SC1 both definitions only without 'Yes' or '£10'
2c	One similarity	B1	eg same range, same mode, same values for data, same frequency for £15 oe
	One difference	B1	Different mean, different median, Shelley 50 visits/fees, Paul 40 oe Calculations/working not required

Every part of this question had significant issues from which candidates can learn.

In part (a) there was a mark for Quality of Written Communication strand (i). This required candidates to use correct money notation (£10.60) in their answer. Many candidates, including some able ones, wrote £10.6 and scored M2Q0. Candidates are advised to consider the context of the question (i.e. money) when considering their answer and then they would realise that copying the calculator display as it stands is not appropriate in this case.

Many others obtained an incorrect answer of £13 from 65 ÷ 5 which scored 0 of course, but more strikingly many who knew the fx notation and correctly obtained 424 as its sum then went on to divide by 5 giving a final answer of 84.8(0). Clearly, candidates need to realise that with data in the range 8 – 20 this answer could not possibly be correct.

In part (b) candidates had to decide whether the mode was £10 and whether the median was £10. It was very common for the answers to just be quoted without any justification, which meant that marks could not be awarded. Only a short statement was required such as "Yes, the mode is £10 as it has the biggest frequency" or "median = 10 as it is the middle number".

In part (c) there were plenty of similarities available such as the range, mode, fee values or number of £15 fees, but differences were found to be more difficult for candidates to identify. Many said there were different frequencies, but this general statement was not clear enough as the £15 frequencies were the same. The total frequency being different was a good answer as it was looking at the total amount of money made by each person.

Foundation tier Question 9 / Higher tier Question 3

*3   Each day 147 trains leave Lea Road station.
One day, most trains are on time (0 minutes late).
19 trains are late.

3 (a)   What percentage of trains are late?
Give your answer to 1 decimal place.

....

....

....

Answer .... %   *(3 marks)*

3 (b)   The station manager records the number of minutes late for each of the 19 trains.

6	11	1	21	8	10	17	4	35	22
2	3	41	8	23	7	16	28	19	

3 (b) (i)   Draw an ordered stem-and-leaf diagram to show the data for the late trains.
Complete the key.

Key: ......│...... represents .... minutes late

(4 marks)

Mark scheme:

3a	$\dfrac{19}{147} \times 100$	M1	oe
	12.92(…) or 12.93	A1	Accept 13 with M1 working seen
	12.9	B1 ft	ft any value > 1 dp correctly rounded to 1 dp or their calculation given to 1 dp SC1 13 (answer only)
3bi	Stem (0), 1, 2, 3 and 4 and suitable key	B1	Accept 4, 3, 2, 1, (0)
	Leaves 1 2 3 4 6 7 8 8 0 1 6 7 9 1 2 3 8 5 1	B2	B1 4 rows correct B1 complete but unordered leaves
	Stem, leaves and aligned correctly	Q1	Strand (ii) Logical, organised order of working
3bii	8	B1	
3biii	0	B1	Accept 'none' or 'zero'
3c	Ticks the 19 late trains only	B1	
	States mode should now be 7	B1 dep	oe eg one minute less SC1 wrong or no box ticked and states new mode is 7

The stem-and-leaf diagram was generally very well done. The QWC mark here demanded a correct structure with stem, leaves (errors allowed for this mark) and correct ordering of the lengths of the rows according to the number of leaves in each row.

Therefore this candidate does get the QWC mark:
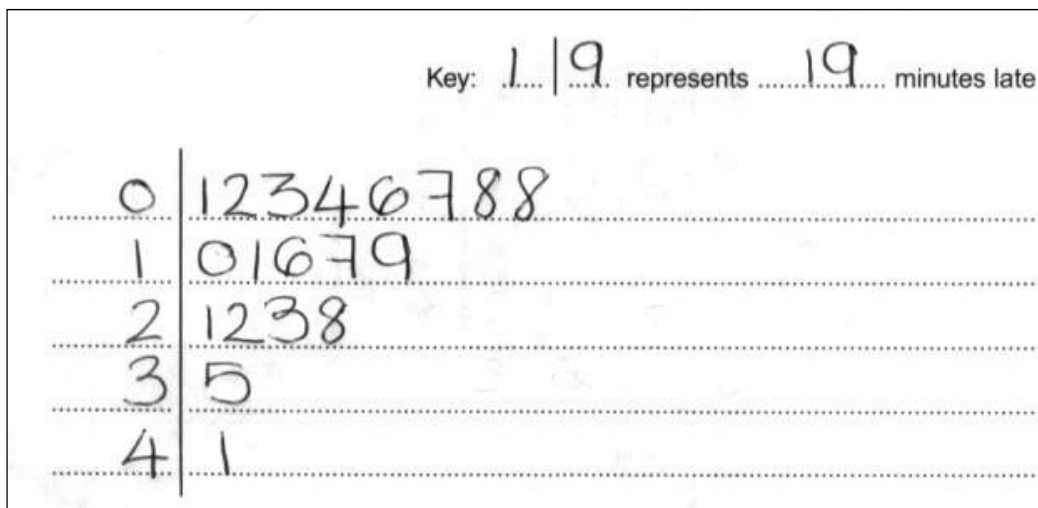
However, this candidate does not (the 20s row should not be longer than the 10s row as it has one fewer reading):

Key: 1 | 0 represents 10 minutes late

```
0 | 1, 2, 3, 4, 6, 7, 8, 8
1 | 0, 1, 6 7 9
2 | 1, 2, 3, 8
3 | 5
4 | 1
```
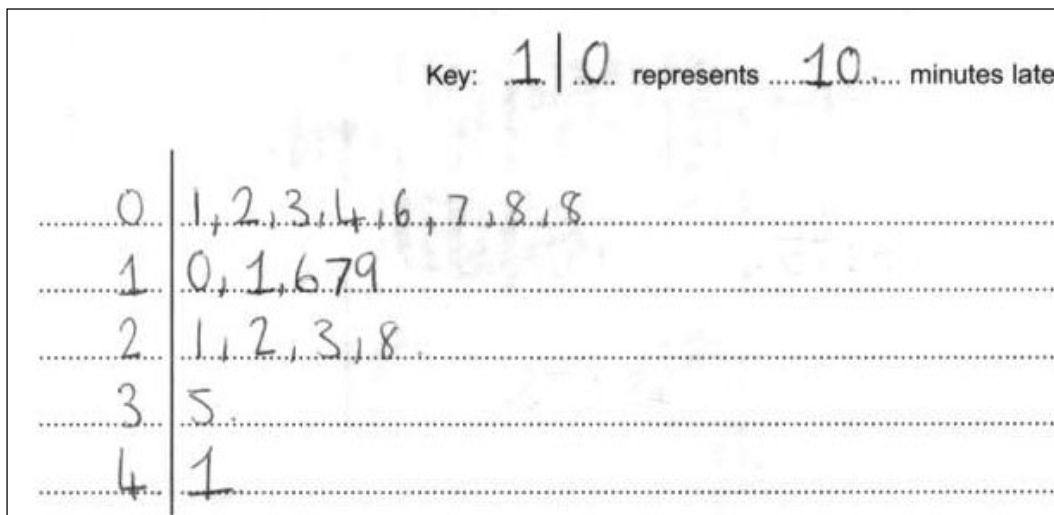
In part (c) it was not sufficient for 2 marks to simply restate the question and say only the 19 late trains had been recorded incorrectly. The best justification was that the mode had gone down to 7 from 8.

Question 5

5   A company makes 200 Easter bunnies.
It costs £2.46 to make each bunny.

28% of the bunnies are given to a charity.
Three-quarters of the rest are sold for the full price of £4.
Any left over are then sold at half price.

How much profit does the company make?

....

....

....

....

....

....

Answer £ ....   *(4 marks)*

Mark scheme:

5	200×2.46 (or 492) or 0.28×200 (= 56)	M1	
	$0.75 \times (200 -$ their 56$) \times 4$ or 108×4 (or 432) or $0.25 \times (200 -$ their 56$) \times 2$ or 36×2 (or 72) or 504	M1	
	their 432 + their 72 – their 492	M1 dep	
	12	A1	
	Alternative method		
	$0.28 \times 200 \times 2.46$ or 56×2.46 or 137.76	M1	
	their $108 \times (4 - 2.46)$ or 166.32 or their $36 \times (2.46 - 2)$ or 16.56	M1	
	their 166.32 – their 137.76 – their 16.56	M1 dep	
	12	A1	

Though there were some well set out solutions, many candidates were very disorganised in the way they attempted this question and presented their solutions.

These were some typical examples:

Any left over are then sold at half price.

How much profit does the company make?

$2.20 \times 3.46 = 492$

$20\% \ 200 = 40$ $56 = 28\%$ $56 \div 492 = 436$

$5\% = 10$ $436 \times 3 = 327$ $28\% = 56$

$1\% = 2$ $327 \times 4 = 1308$ 144

56 $154 \times 2 = 218$ $108 \times 4 = 432$

1526

Answer £ ....13.... (4 marks)

56

144

200×2.46

492 432

---

5   A company makes 200 Easter bunnies.
It costs £2.46 to make each bunny.

$(162 + 36) - 137.76$

$-132.84 - 84.28)$

$2.46 \times 200 = 492$

28% of the bunnies are given to a charity.
Three-quarters of the rest are sold for the full price of £4.
Any left over are then sold at half price.

$492 - 216 - 36 = £40$

How much profit does the company make?

$2.46 \ 200$ $200 \div 100 = 2$ $2 \times 28 = 56$

$56 \times 2.46 = £137.76 = charity.$

$1 - 0.28 = 0.72$ $0.72 \div 4 = 0.18$ $0.18 \times 3 = 0.54$

① $54 \times 4 = £216 \ sold$

② $0.18 \ ; \ 2 \times 18 = £36 \ sold$

$216 + 36 = 252$ $252 - 137.76 = 114.24$

Answer £ ....114.24 £240.... (4 marks)

$200 \div 100 = 2$ $2 \times 28 = 56$ $56 \times 2.46 = £137.76 = charity.$ $(162 + 136 = 84)$

$1 - 0.28 = 0.72$ $0.72 \div 4 = 0.18$ $0.18 \times 3 = 0.54$

$54 \times 3 = £162 \ sold$ $54 \times 2.46 = £132.84 \ loss$

$0.18 \ ; \ 2 \times 18 = £36 \ sold$ $(132.76 + 162 + 36) = ($

$18 \times 2.46 = £44.28 \ loss$

This is not a problem as long as the candidate has asked for and used an additional sheet.

Here is a solution which, although not well presented, was condoned as worthy of the marks as the method was quite clear.

How much profit does the company make?

28% = 28./100   200 x 2.46 = £492

200 ÷ 100 = 2 x 28 = 56 given to charity

200 - 56 = 144 left   144 ÷ 4 = 36 x 3 = 108

108 x 4 = £432   144 - 108 = 36 sold at half price

36 x 2 = £72

£432+£72   £432 + £72 = £504 - £492 =

Answer £ 12   (4 marks)

Many candidates missed critical information such as the three-quarters and consequently were only able to obtain part-marks on the question.

Question 6

6 Matt and Ruba each have one coin.
The total amount of money is less than 50p.

Work out the probability that exactly one of the coins is a 10p piece.
Assume that all possible coins are equally likely.

....

....

....

....

Answer ....   *(4 marks)*

Mark scheme:

6	Each has either 1p, 2p, 5p, 10p or 20p	B1	
	Two-way table or listing method with at least 5 outcomes	M1	
	Correct options all shown or highlighted	M1 dep	eg ticks in a two-way table
	$\dfrac{8}{25}$	A1	oe eg 0.32 SC2 $\dfrac{9}{25}$ oe SC1 $\dfrac{n}{25}$ $0 < n < 25$ (integer)

Alternative method		
Each has either 1p, 2p, 5p, 10p or 20p or $\frac{1}{5}$ or $\frac{4}{5}$ seen	B1	
$\frac{1}{5} \times \frac{4}{5} \left(= \frac{4}{25}\right)$	M1	oe
their $\frac{4}{25} \times 2$	M1 dep	oe
$\frac{8}{25}$	A1	oe eg 0.32 SC2 $\frac{9}{25}$ oe SC1 $\frac{n}{25}$ $0 < n < 25$ (integer)

There were two distinct approaches possible to this question, listing and a probability approach, the latter usually favoured by the more able candidates.

Able students were often quick to solve the problem with $\frac{1}{5} \times \frac{4}{5}$ then doubled or equivalent.

1   2   5   ⑩   20

P (exactly one 10p)
= P(⅕ × ⁴⁄₅) or (⁴⁄₅ × ⅕)
= ⁴⁄₂₅ + ⁴⁄₂₅ = ⁸⁄₂₅

Answer .... ⁸⁄₂₅

Here was a rare, totally successful listing diagram method.

Work out the probability that exactly one of the coins is a 10p piece.
Assume that all possible coins are equally likely.

	1	2	5	10	20
1	2	3	6	11	21
2	3	4	7	12	22
5	6	7	10	15	25
10	11	12	15	20	30
20	21	22	25	30	40

8 out of 25

$\frac{8}{25}$

Answer $\frac{8}{25} = 0.32$ (4 marks)

Surprising numbers did not successfully list all the possible coins below 50p but many were able to do this and then present a successful list, table or sample space diagram of their findings. Far fewer could then seemingly identify the correct outcomes which matched the scenario, quite a few ignoring that only one of the coins was a 10p piece and thus obtaining $\frac{9}{25}$.

Practice at this type of question will assist candidates in their future solutions for probability problem solving.

Question 8

*8   Two groups of people are trying to lose weight.

8 (a)   Group A join a gym.
        The graph shows information about their weight loss after one month.
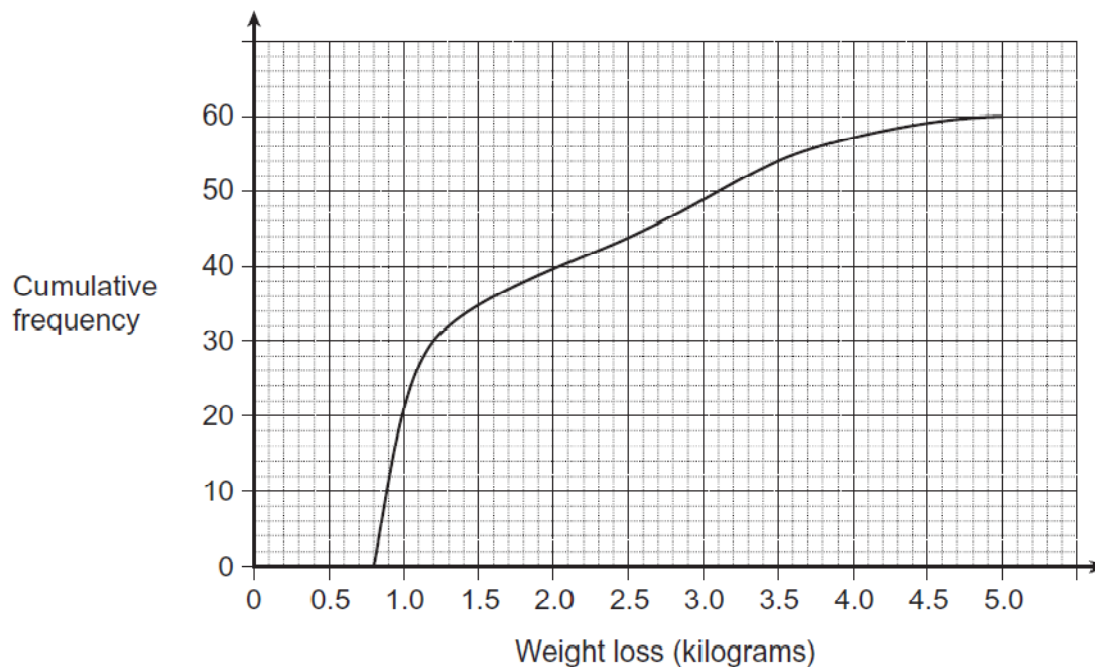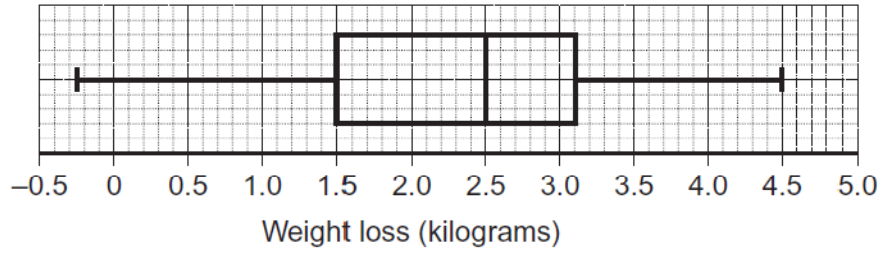

8 (a) (i) How many people are in group A?

          Answer ....   (1 mark)

8 (a) (ii) Does everyone in group A lose weight?
           Write down how you decide.

       ....

       ....
                                              (1 mark)

8 (b)   Group B follow a diet.
The box plot shows information about their weight loss after one month.

Weight loss (kilograms)

Does everyone in group B lose weight?
Write down how you decide.

....

....
(1 mark)

8 (c)   Compare the weight loss of group A with group B.

....

....

....

....

....

....

....

....

....

....
(5 marks)

Mark scheme:

8ai	60	B1	
8aii	Yes, least weight loss is 0.8 (kg)	B1	oe eg graph starts after zero
8b	No, minimum was a negative weight loss (= weight gain)	B1	oe – 0.3 ≤ value ≤ – 0.2 if value given
8c	At least one correct IQR	M1	Group A [1.6, 1.8] Group B 1.6 Spread (of weight loss) the same
	Both IQR correct and correct comparison	A1 ft	
	At least one median correct	M1	Group A [1.15, 1.25] Group B 2.5 Accept a stated difference of 1.3 (no tolerance) Group B have a higher average
	Both medians correct and correct comparison	A1	
	Two comparative statements in context	Q1	Strand (iii) eg above comparisons in context or all lost weight in group A but not B and one of above comparisons in context

At this higher grade question accuracy of language is important and in part (a)(ii) and particularly part (b) too many candidates did not give sufficient clarity to their writing.

For example, in part (a)(ii) stating " the graph does not start at 0" is ambiguous since this could imply it starts from a negative value. All that is required is, for example, "the graph starts at 0.8kg loss".
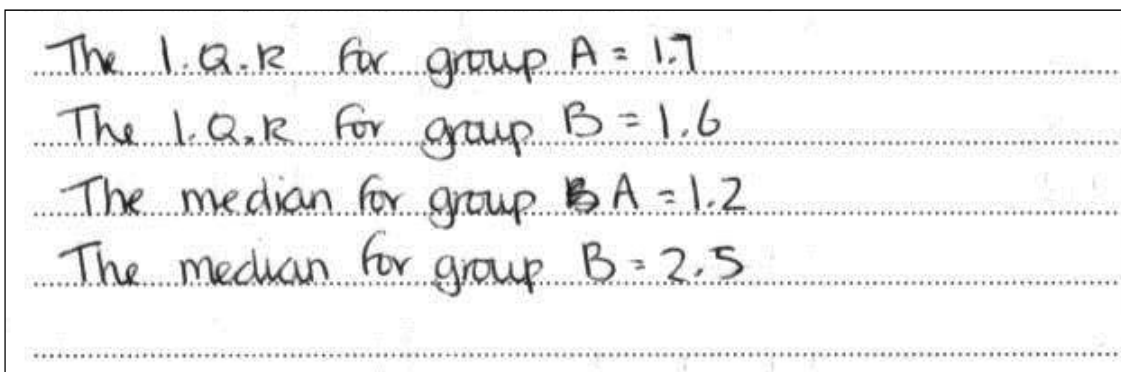
Responses which restate the question are insufficient, for example, in part (b) stating "No, as someone gained weight." An acceptable response would be, for example, "No, as the lowest point is a negative weight loss."

Part (c) was similar to a question in November and again tested the extremely important statistical skill of comparing two sets of data. Whilst many candidates again had problems with this question, it was noticeable that the responses were generally much better than in November.

It was clear that far more candidates knew that they should be looking at measures and not just making random statements about the data. Many correctly chose to look at the medians and the inter-quartile ranges. When the inter-quartile ranges are so readily available it was not deemed suitable for candidates on this occasion to be using the ranges.

Unfortunately many scored only 2 out of 5 as they simply made a list without making the comparisons.

For example:

The I.Q.R for group A = 1.7
The I.Q.R for group B = 1.6
The median for group ~~B~~ A = 1.2
The median for group B = 2.5

or

	group A	group B
range	4.2	4.75
median	1.2	2.5
U Q	2.65	3.1
L Q	0.95	1.5
I Q R	1.7	1.6

Others made statements, but had no evidence at all to support them, thus scoring 0.

For example:

Compare the weight loss of group A with group B.

group B lose more weight than group A.

To go from 2 marks to 4 marks a suitable comparable comment was required for the medians and the inter-quartile ranges respectively. These simply needed to be observations of relative size as contextuality was rewarded by the 5th mark which was for quality of written communication. At all times candidates should be seeking to comment in context at this level.

It is worthy of note that if two comments were made in context they would receive the quality of written communication mark even if one or both was wrong as the quality of written communication mark in this case is testing the ability to communicate findings not the accuracy of those findings.

Here are some examples of responses and how they were marked.

Candidate A

> Group A's has a more spread out data and a greater range.
> Group b's mean is a lot higher than A's
> Group B's lower and upper bounds are more spread out meaning A's IQR is higher.
> A's minimums and maxium are on a more spread out scale.

No measures calculated nor shown. (M0A0 M0A0)

No comments in context (Q0)

Total for Candidate A = 0/5

Candidate B

> The median in group B is a lot higher which means a lot more people lost weight. The interquartile range in group B is 5 and in group A is 1.65 so overall the people in the groups it shows again that group B lost the most weight

No medians shown M0A0

One correct IQR but not the second (M1A0)

Only one (repeated) comment in context (Q0)

Total for Candidate B = 1/5

Candidate C

The median weight loss in group A was 1.2 kg and the median of weight loss in group B was 3.5 kg. The range of group A was 5 - 0.8 = 4.2 kg. The range of group B was 7 kg. The IQR for group A is 1.7 and the IQR for group B is 1.6.

Both medians correct but no comparisons at all (M1A0)

Both IQRs correct but no comparisons at all (M1A0)

No comparisons in context (Q0)

Total for Candidate C = 2/5

Candidate D

> Group A have an interquartile range of 1·65 whereas group B have an interquartile range of 1·6 so group B is slightly more consistant. Group A has a median of 1·2 and group B having a large median of 2·5. This means that the majority of people in group B have a higher and more consistant weight loss than those in group A.

Line 1 scores M1 (either IQR correct)

Lines 3 and 4 score A1 (both IQRs correct and a correct comparison)

Line 5 gets M1 (either median correct)

Lines 6 and 7 scores another A1 (both medians correct and a correct comparison ("larger")

Lines 7 – 10 mention the context for the first time but this is not sufficient for two distinct contextual comments so it is Q0

Total for Candidate D = 4/5

Candidate E

Compare the weight loss of group A with group B.

The median for the Group B was higher ✓ at 2·5
than Group A 1·2kg, meaning, on average the
people who lost the most weight were in
group B. The interquartile range for
group A, at 1·7 kg was ~~better~~ higher than
group B's 1·6kg, meaning Group B was
more consistant at losing weight. Looking
at the 2 results, Group B were generally
better at losing weight than group A.

Lines 1 and 2 scores M1A1 (both medians correct and correct comparison)

Lines 4 – 6 scores M1A1 (both medians correct and correct comparison)

Lines 4 – 6 gets MM1A1 (both IQRs correct and correct comparison – "higher")

Lines 2 – 3 and lines 6 – 7 give two contextual comparisons for Q1

Total for Candidate E = 5/5