

## GCSE Mathematics (1MA1)

### Themed papers – Statistical Diagrams: Box Plots

#### Compiled from student-friendly mark schemes

**Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn't show follow-through marks (marks that are awarded despite errors being made) or special cases.**

**It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.**

#### NOTES ON MARKING PRINCIPLES

##### Guidance on the use of codes within this mark scheme

M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.

P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.

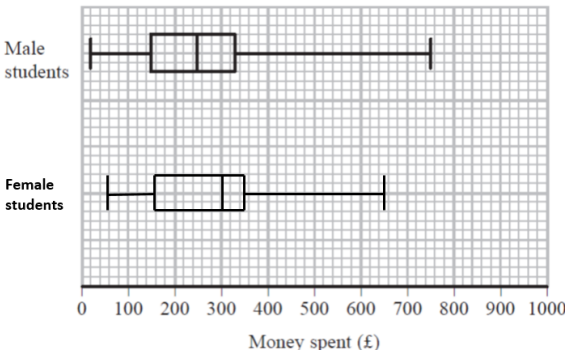
A1 – accuracy mark. This mark is generally given for a correct answer following correct working.

B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.

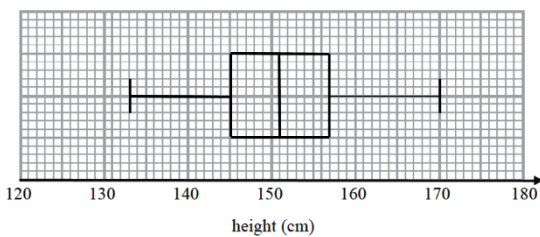
C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.

Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer).

**Question 1 (Total 5 marks)**

| Part | Working or answer an examiner might expect to see                                                                                                                                                      | Mark | Notes                                                                                                                             |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------|
| (a)  | 330 – 150                                                                                                                                                                                              | M1   | This mark is given for evidence of using values for the lower quartile (150) and the upper quartile                               |
|      | 180                                                                                                                                                                                                    | A1   | This mark is given for the correct answer only                                                                                    |
| (b)  |  <p>Male students</p> <p>Female students</p> <p>0 100 200 300 400 500 600 700 800 900 1000</p> <p>Money spent (£)</p> | B2   | These marks are given for a fully correct box plot<br><br>(one mark is for showing a box and at least 3 correctly plotted values) |
| (c)  | Yes, because the female students have a greater median than the male students                                                                                                                          | C1   | This mark is given for a correct comparative statement relevant to the question                                                   |

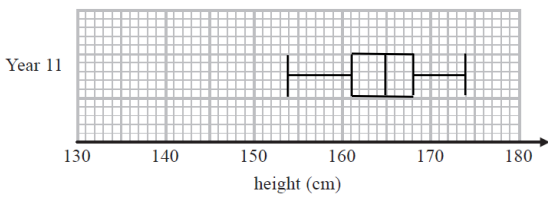
**Question 2 (Total 5 marks)**

| Part | Working or answer an examiner might expect to see                                 | Mark | Notes                                                                                                                                  |
|------|-----------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------|
| (a)  |  | B3   | These three marks are given for a fully correct box plot                                                                               |
|      |                                                                                   |      | (Two marks are given for at least three correctly plotted values, including box and whiskers)                                          |
|      |                                                                                   |      | (One mark is given for at least two correctly plotted values, including box and whiskers or 5 correct values with no box and whiskers) |
| (b)  | $\frac{3}{4} \times 80$                                                           |      | This mark is given for a method to find an estimate                                                                                    |
|      | 60                                                                                |      | This mark is given for the correct answer only                                                                                         |

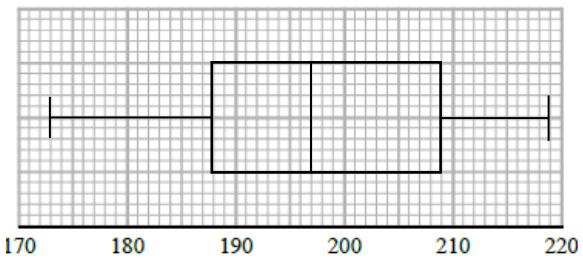
**Question 3 (Total 3 marks)**

| Part | Working or answer an examiner might expect to see                                                                                                                        | Mark | Notes                                                                                                                       |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------|
| (a)  | Megan is not correct; the median weight of her potatoes is 57g, not 50g                                                                                                  | B1   | This mark is given for a correct conclusion with a correct reason                                                           |
| (b)  | The median weight of Megan's potatoes is 57g; the median weight of Amy's potatoes is 42g                                                                                 | C1   | This mark is given for a correct comparison of the median weights for Megan's potatoes and for Amy's potatoes in context    |
|      | The interquartile (IQR) range for the weight of Megan's potatoes is $65 - 39 = 26$ g; the interquartile (IQR) range for the weight of Amy's potatoes is $51 - 35 = 16$ g | C1   | This mark is given for a correct comparison of the measure of spread for Megan's potatoes and for Amy's potatoes in context |

**Question 4 (Total 5 marks)**

| Part | Working an or answer examiner might expect to see                                 | Mark | Notes                                                                                                 |
|------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------|
| (a)  | UQ = 168<br>Highest value = 174                                                   | 1    | This mark is given for finding the upper quartile or the highest value                                |
|      | Lowest value = 154<br>LQ = 161<br>Median = 165                                    | 1    | This mark is given for a box plot shown with at least three correctly plotted values from those shown |
|      |  | 1    | This mark is given for the correct answer only                                                        |
| (b)  | The median height of Year 7 girls is smaller than that of Year 11 girls           | 1    | This mark is given for a statement making a comparison of the medians, in context                     |
|      | Year 11 girls have a smaller range of heights than Year 7 girls                   | 1    | This mark is given for a statement making a comparison of the spreads, in context                     |

**Question 5 (Total 3 marks)**

| Part | Working or answer an examiner might expect to see                                   | Mark | Notes                                                                                                                                           |
|------|-------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|      |  | P1   | This mark is given for a process to identify one of the lower quartile (188), median (197) or upper quartile (209) from the stem & leaf diagram |
|      |                                                                                     | M1   | This mark is given for a method to show a box with at least three correctly plotted values from 173, 188, 197, 209 and 219                      |
|      |                                                                                     | A1   | This mark is given for a fully correct boxplot drawn                                                                                            |

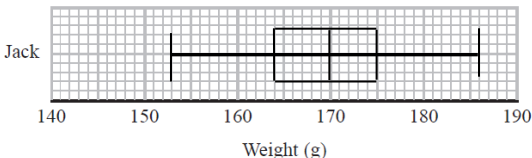
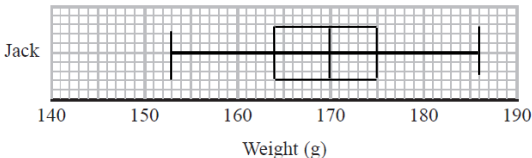
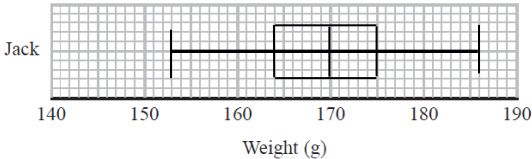
**Question 6 (Total 6 marks)**

| Part | Working or answer an examiner might expect to see                   | Mark | Notes                                                                               |
|------|---------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|
| (a)  |                                                                     | B1   | This mark is given for whiskers at 0 and 42                                         |
|      |                                                                     | B1   | This mark is given for a median of 10 shown                                         |
|      |                                                                     | B1   | This mark is given for ends of the box at 4 and 20                                  |
| (b)  |                                                                     | C1   | This mark is given for a correct comparison of medians                              |
|      |                                                                     | C1   | This mark is given for a correct comparison of measure of spread (range and/or IQR) |
| (c)  | No; there might not be any delays between 25 minutes and 30 minutes | C1   | This mark is given for a correct statement                                          |

**Question 7 (Total 2 marks)**

| Part | Working or answer an examiner might expect to see | Mark | Notes                                                                                          |
|------|---------------------------------------------------|------|------------------------------------------------------------------------------------------------|
|      | A & Y, B & X, C & Z, D & W                        | B2   | Two marks are given for all four correct pairs<br>(B1 is given for two or three correct pairs) |

### Question 8 (Total 6 marks)

| Part | Working or answer an examiner might expect to see                                                                                                                                                                   | Mark | Notes                                                                                                                                                                |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (a)  | $166 - 158 = 8$                                                                                                                                                                                                     | B1   | This mark is given for a correct answer only                                                                                                                         |
| (b)  |                                                                                                                                    | C1   | This mark is given for at least 2 correctly plotted values, including box or whiskers / tails, or 5 correct values and no whiskers / tails                           |
|      |                                                                                                                                    | C1   | This mark is given for at least 2 correctly plotted values including box and whiskers / tails                                                                        |
|      |  <p>Fully correct box plot drawn<br/>(minimum = 153, lower quartile = 164, median = 170, upper quartile = 175, maximum = 186)</p> | C1   | This mark is given for a fully correct box plot                                                                                                                      |
| (c)  |                                                                                                                                                                                                                     | C1   | This mark is given for a correct comparison of medians                                                                                                               |
|      |                                                                                                                                                                                                                     | C1   | <p>This mark is given for a correct comparison of a measure of spread</p> <p>For the award of both marks, at least one of the comparisons must be interpretative</p> |

### Question 9 (Total 2 marks)

| Part | Working an or answer examiner might expect to see        | Mark | Notes                                   |
|------|----------------------------------------------------------|------|-----------------------------------------|
|      | Median plotted incorrectly                               | B1   | This mark is given for a correct reason |
|      | Range plotted rather than maximum or maximum nor plotted | B1   | This mark is given for a correct reason |

**Question 10 (Total 6 marks)**

| Part | Working or answer an examiner might expect to see                           | Mark | Notes                                                                                                    |
|------|-----------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------|
|      |                                                                             | B1   | This mark is given for a box drawn with at least two correct values from LQ = 23, Median = 28, UQ = 32.5 |
|      |                                                                             | B1   | This mark is given for the lowest value (17) and the highest value (41) shown on the grid                |
|      |                                                                             | B1   | This mark is given for a fully correct diagram                                                           |
|      | $\frac{a}{25}, a < 25$ or $\frac{10}{b}, 10 < b \leq 25$                    | M1   | This mark is given for a correct denominator 25 or a correct numerator between 10 and 25                 |
|      | $\frac{10}{25}$                                                             | A1   | This mark is given for the correct answer only                                                           |
|      | The class intervals are incorrect (they should be $0 < a \leq 30, 40, 50$ ) | C1   | This mark is given for a correct reason                                                                  |

## Mark scheme for 1MA1 Higher themed papers: Statistical Diagrams: Box Plots

### Performance data:

| Q      | Taken from |            |       | Total Marks available | TOPIC      | Spec Ref | AO | % Mean marks | Edexcel mean averages<br>Marks of candidates who achieved grade: |       |       |       |       |       |       |      |   |   |      |
|--------|------------|------------|-------|-----------------------|------------|----------|----|--------------|------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|------|---|---|------|
|        | Q          | Series     | Paper |                       |            |          |    |              | ALL                                                              | 9     | 8     | 7     | 6     | 5     | 4     | 3    | 2 | 1 | U    |
| 1a     | 9a         | June 2017  | 3H    | 2                     | Statistics | S4       | 2  | 74           | 1.47                                                             | 1.88  | 1.78  | 1.67  | 1.54  | 1.36  | 1.05  | 0.63 | - | - | 0.29 |
| 1b     | 9b         | June 2017  | 3H    | 2                     | Statistics | S3       | 2  | 95           | 1.90                                                             | 1.97  | 1.96  | 1.94  | 1.92  | 1.89  | 1.83  | 1.62 | - | - | 1.11 |
| 1c     | 9c         | June 2017  | 3H    | 1                     | Statistics | S4       | 2  | 60           | 0.60                                                             | 0.75  | 0.68  | 0.63  | 0.59  | 0.57  | 0.52  | 0.45 | - | - | 0.31 |
| 2a     | 10a        | June 2018  | 1H    | 3                     | Statistics | S4       | 2  | 97           | 2.91                                                             | 2.99  | 2.98  | 2.97  | 2.96  | 2.92  | 2.83  | 2.59 | - | - | 1.86 |
| 2b     | 10b        | June 2018  | 1H    | 2                     | Statistics | S4       | 2  | 41           | 0.82                                                             | 1.76  | 1.42  | 1.10  | 0.79  | 0.53  | 0.31  | 0.17 | - | - | 0.10 |
| 3a     | 11a        | Nov 2019   | 2H    | 1                     | Statistics | S4       | 2  | 40           | 0.40                                                             | 1.00  | 0.76  | 0.58  | 0.64  | 0.47  | 0.33  | 0.24 | - | - | 0.16 |
| 3b     | 11b        | Nov 2019   | 2H    | 2                     | Statistics | S4       | 2  | 28           | 0.56                                                             | 1.56  | 1.35  | 1.11  | 0.89  | 0.68  | 0.48  | 0.17 | - | - | 0.06 |
| 4a     | 12a        | Nov 2017   | 1H    | 3                     | Statistics | S4       | 2  | 43           | 1.29                                                             | 3.00  | 2.74  | 2.66  | 2.62  | 2.35  | 1.51  | 0.72 | - | - | 0.21 |
| 4b     | 12b        | Nov 2017   | 1H    | 2                     | Statistics | S5       | 2  | 22           | 0.44                                                             | 1.38  | 1.06  | 0.93  | 0.87  | 0.77  | 0.49  | 0.29 | - | - | 0.08 |
| 5      | 12         | Nov 2019   | 3H    | 3                     | Statistics | S4       | 2  | 43           | 1.29                                                             | 2.67  | 2.51  | 2.25  | 1.90  | 1.60  | 1.14  | 0.59 | - | - | 0.11 |
| 6a     | 9a         | Nov 2018   | 1H    | 3                     | Statistics | S3, S4   | 2  | 30           | 0.89                                                             | 2.80  | 1.67  | 1.68  | 1.31  | 1.08  | 0.75  | 0.59 | - | - | 0.44 |
| 6b     | 9b         | Nov 2018   | 1H    | 2                     | Statistics | S4       | 2  | 17           | 0.33                                                             | 1.10  | 0.64  | 0.73  | 0.67  | 0.46  | 0.28  | 0.08 | - | - | 0.03 |
| 6c     | 9c         | Nov 2018   | 1H    | 1                     | Statistics | S4       | 2  | 1            | 0.01                                                             | 0.60  | 0.06  | 0.02  | 0.02  | 0.01  | 0.01  | 0.01 | - | - | 0.00 |
| 7      | 11         | Mock Set 1 | 1H    | 2                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 8a     | 11a        | Mock Set 1 | 3H    | 1                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 8b     | 11b        | Mock Set 1 | 3H    | 3                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 8c     | 11c        | Mock Set 1 | 3H    | 2                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 9      | 13         | Mock Set 2 | 2H    | 2                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 10a i  | 9ai        | Mock Set 3 | 1H    | 3                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 10a ii | 9aai       | Mock Set 3 | 1H    | 2                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
| 10b    | 9b         | Mock Set 3 | 1H    | 1                     | Statistics | -        | -  | -            | -                                                                | -     | -     | -     | -     | -     | -     | -    | - | - | -    |
|        |            |            |       | 43                    |            |          |    |              | 12.91                                                            | 23.46 | 19.61 | 18.27 | 16.72 | 14.69 | 11.53 | 8.15 | - | - | 4.76 |



