**GCSE Mathematics (1MA1)**

**Themed papers – Statistical diagrams: Scatter Graphs and Frequency Polygons**

**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**

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| **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) | (10, 19) | B1 | This mark is given for the correct answer only |
| (b) | Positive (correlation) | C1 | This mark is given for a correct comment |
| (c) | Line drawn from 16.4 up to (16.4, *y*) | M1 | This mark is given for an appropriate line of best fit drawn, or a point marked at (16.4, *y*) or a vertical line |
| Answer in the range 12 – 13 | A1 | This mark is given for an answer of hours in the range 12 to 13 |
| (d) | Yes, the graph appears to justify this since the majority of points for high temperature appear when there are more hours of sunshine (positive correlation) | C1 | This mark is given for a correct explanation |

**Question 2 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a)(i) |  | B1 | This mark is given for a line of best fit drawn on the scatter diagram |
| 490 minutes | B1 | This mark is given for an answer in the range 480 – 500 |
| (a)(ii) | Data is only a sample  Line of best fit can vary  Scale cannot be read exactly | C1 | This mark is given for one of the possible reasons shown |
| (b)(i) |  | M1 | This mark is given for a method to find the gradient of the line of best fit |
| = 9.5 | A1 | This mark is given for an answer in the range 9.4 – 9.8 |
| (b)(ii) | Speed in miles per minute | C1 | This mark is given for a correct interpretation of the line of best fit |

**Question 3 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  | M1 | This mark is given for drawing a suitable line of best fit |
| A1 | This mark is given for an answer in the range 30 to 40 |

**Question 4 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 40 < *h* ≤ 50 | B1 | This mark is given for the correct answer only |
| (b) |  | B2 | This mark is given for a correct polygon with points plotted at midpoints  (B1 is given for one point incorrect) |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | e.g. rain, school day, measurement error | C1 | This mark is given for a correct reason for low attendance in hot weather |
| (b) | Positive | B1 | This mark is given for the correct answer only |
| (c) |  | B1 | This mark is given for answer in range 15 – 25 |
| (d) | e.g. data out of range, number of children will be negative | C1 | This mark is given for a correct explanation of why it would not be sensible to use the scatter graph |

**Question 6 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 20 < *t* ≤ 30 | B1 | This mark is given for a correct answer only |
| (b) | Points plotted at (5,10), (15,26),  (25,23), (35,19), (45,14), (55,8) and joined with line segments | B2 | This mark is given for correct plotting of 6 points and joining with line segments |
|  |  | (B1 | 1 mark is given for points plotted at midpoints of intervals  **or** joining points with line segments at the correct heights and consistent within the class interval (including end values)  **or** correct frequency polygon with one point incorrect  **or** correct frequency polygon with first and last points joined)) |

**Question 7 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | Points are joined with a curve, not with line segments | C1 | This mark is given for a correct statement |
| Points should be plotted at mid-points of the intervals, not end points | C1 | This mark is given for a correct statement |

**Question 8 (Total 2 marks)**

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| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  | B2 | These marks are given for a correct frequency polygon with points plotted at (5, 14), (15, 18), (25, 26) and (35, 12)  (B1 is given for a frequency polygon with one point incorrect or a frequency polygon with first and last points joined) |

**Question 9 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 2 ÷ 40 × 100 | B1 | This mark is given for reading 2 students from the 20 to 24 bar |
| 5 | A1 | This mark is given for a correct answer only |
| (b) | 11, 8, 13, 6 and 2 | M1 | This mark is given for frequencies of 11, 8, 13, 6 and 2 used |
| 11 × 2 + 8 × 7 + 13 × 12 + 6 × 17 + 2 × 22  = 380 | M1 | This mark is given for totalling frequencies multiplied by correct mid‑interval terms 2, 7, 12, 17 and 22 |
|  | M1 | This mark is for dividing by the number of students |
| 9.5 | C1 | This mark is given for a correct estimate supported by correct working |

**Question 10 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 160 < *h* ≤ 170 | 1 | This mark is given for the correct answer only |
| (b) |  | 2 | These marks are given for a fully correct frequency polygon with line segments joining the points (135, 4), (145, 11), (155, 24), (165, 22) and (175, 19)  (1 mark is given if any points are incorrect) |

**Question 11 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | Negative | B1 | This mark is given for the correct answer only |
| (b) | The point is far away from the line of best fit | C1 | This mark is given for a correct explanation |
| (c) | Debbie’s conclusion is unreliable because the point is outside the range of the scatter diagram | C1 | This mark is given for a correct explanation |

**Question 12 (Total 3 marks)**

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| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  | M1 | This mark is given for a single line segment with a positive gradient that could be used as a line of best fit  or  a horizontal line from 740  or  a point plotted at (*x*, 740) where *x* is in the range 72 – 80 |
| 72 – 80 (cm) | A1 | This mark is given for an answer in range 72 – 80 |
| 110 cm is outside of the range of the data, the line of best fit cannot be extended that far | B1 | This mark is given for a correct explanation |

**Performance data:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q** | **Taken from** | | | **Total Marks available** | **TOPIC** | **Spec Ref** | **AO** | **% Mean marks** | **Edexcel mean averages Marks of candidates who achieved grade:** | | | | | | | | | | |
| **Q** | **Series** | **Paper** | **ALL** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **U** |
| 1a | 1a | June 2017 | 1H | 1 | Statistics | S4 | 2 | 98 | 0.98 | 0.99 | 0.99 | 0.99 | 0.98 | 0.98 | 0.96 | 0.92 | - | - | 0.80 |
| 1b | 1b | June 2017 | 1H | 1 | Statistics | S6 | 1 | 96 | 0.96 | 0.99 | 0.99 | 0.99 | 0.98 | 0.96 | 0.93 | 0.84 | - | - | 0.68 |
| 1c | 1c | June 2017 | 1H | 2 | Statistics | S6 | 2 | 96 | 1.91 | 1.96 | 1.95 | 1.93 | 1.91 | 1.90 | 1.86 | 1.77 | - | - | 1.57 |
| 1d | 1d | June 2017 | 1H | 1 | Statistics | S6 | 2 | 93 | 0.93 | 0.94 | 0.94 | 0.94 | 0.94 | 0.93 | 0.91 | 0.86 | - | - | 0.79 |
| 2ai | 1ai | Mock Set 3 | 2H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2aii | 1aii | Mock Set 3 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2bi | 1bi | Mock Set 3 | 2H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2bii | 1bii | Mock Set 3 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | 3 | Nov 2019 | 3H | 2 | Statistics | S6 | 2 | 89 | 1.78 | 1.89 | 1.97 | 1.99 | 1.92 | 1.86 | 1.79 | 1.67 | - | - | 1.30 |
| 4a | 3a | June 2019 | 3H | 1 | Statistics | S2 | 2 | 70 | 0.70 | 0.95 | 0.90 | 0.83 | 0.73 | 0.59 | 0.42 | 0.25 | - | - | 0.17 |
| 4b | 3b | June 2019 | 3H | 2 | Statistics | S2 | 2 | 69 | 1.38 | 1.81 | 1.68 | 1.55 | 1.41 | 1.22 | 0.99 | 0.73 | - | - | 0.46 |
| 5a | 3a | Mock Set 1 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5b | 3b | Mock Set 1 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5c | 3c | Mock Set 1 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5d | 3d | Mock Set 1 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6a | 3a | Mock Set 4 | 3H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6b | 3b | Mock Set 4 | 3H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 4 | Mock Set 1 | 3H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | 7 | Nov 2018 | 3H | 2 | Statistics | S4 | 2 | 49 | 0.98 | 1.90 | 1.24 | 1.38 | 1.16 | 1.03 | 0.96 | 0.84 | - | - | 0.59 |
| 9a | 4a | Nov 2018 | 3H | 2 | Ratio | R9 | 2 | 70 | 1.40 | 2.00 | 2.00 | 1.80 | 1.80 | 1.75 | 1.47 | 0.94 | - | - | 0.49 |
| 9b | 4b | Nov 2018 | 3H | 4 | Statistics | S2, S4 | 2 | 33 | 1.30 | 4.00 | 3.76 | 2.74 | 2.16 | 1.51 | 1.12 | 0.61 | - | - | 0.39 |
| 10a | 1a | Nov 2017 | 3H | 1 | Statistics | S2, S4 | 2 | 24 | 0.24 | 0.75 | 0.88 | 0.80 | 0.58 | 0.44 | 0.23 | 0.11 |  |  | 0.05 |
| 10b | 1b | Nov 2017 | 3H | 2 | Statistics | S4 | 2 | 47 | 0.94 | 1.25 | 1.21 | 1.14 | 1.28 | 1.03 | 1.02 | 0.90 |  |  | 0.63 |
| 11a | 1a | June 2018 | 3H | 1 | Statistics | S6 | 1 | 93 | 0.93 | 0.97 | 0.96 | 0.95 | 0.94 | 0.93 | 0.90 | 0.83 | - | - | 0.69 |
| 11b | 1b | June 2018 | 3H | 1 | Statistics | S6 | 2 | 68 | 0.68 | 0.87 | 0.81 | 0.75 | 0.69 | 0.63 | 0.56 | 0.44 | - | - | 0.33 |
| 11c | 1c | June 2018 | 3H | 1 | Statistics | S6 | 2 | 21 | 0.21 | 0.54 | 0.36 | 0.25 | 0.18 | 0.13 | 0.09 | 0.06 | - | - | 0.05 |
| 12a | 10a | Mock Set 2 | 2H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 12b | 10b | Mock Set 2 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | **42** |  |  |  |  | **15.32** | **21.81** | **20.64** | **19.03** | **17.66** | **15.89** | **14.21** | **11.77** | **-** | **-** | **8.99** |