**GCSE Mathematics (1MA1)**

**Themed papers – Coordinate Geometry: Linear Graphs**

**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 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  | B3 | These marks are given for a correct straight line between the points (–2, –7) and (4, 5)  (B2 is given for a straight line segment through at least three of the points (–2, –7), (–1, 5), (0, –3), (1, –1) (2, 1), (3, 3) and (4, 5))  (B1 is give for at least two correct points stated or plotted or for a line drawn with gradient 2) |

**Question 2 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *m* = = 3 | M1 | This mark is given for a correct method to find the gradient of the line |
| Reading from the graph  *c* = –6 | M1 | This mark is given for finding –6 from the graph  **or** *y* = 3*x* + *c*  **or** 3*x* – 6 |
| *y* = 3*x* – 6 | A1 | 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** |
|  |  | M1 | This mark is given for a method to find the gradient |
|  | M1 | This mark is given for a method to find the c in *y=*m*x* + c |
|  |  | This mark is given for the correct answer or equivalent |

**Question 4 (Total 1 mark)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Shona’s line should have a positive *y*‑intercept rather than the negative one shown | C1 | This mark is given for a correct explanation |

**Question 5 (Total 5 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a)(i) | The starting price **or** a fixed charge | C1 | This communication mark is given for correct interpretation |
| (a)(ii) | The cost per minute **or** how much the price increases every minute | C1 | This communication mark is given for correct interpretation |
| (b) | 7.5 ÷ 5  **or**  the *y*-intercept = 0.5 | M1 | This method mark is given for an attempt to calculate the gradient, with 2 correct values used or for finding the *y*-intercept |
| 1.5*x* + 0.5 | M1 | This method mark is given for a gradient given as a coefficient of *x* in an equation |
| *y* = 1.5*x* + 0.5 | A1 | This accuracy mark is given for the fully correct equation for the gradient |

**Question 6 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | = | M1 | This mark is given for a method to find the gradient of the line |
| 1.5 | A1 | This mark is given for the correct answer only |
| (b) | The rate of change of the volume of the container with time | C1 | This mark is given for a correct explanation |
| (c) | The number of litres in the container to start with (when *t* = 0) | C1 | This mark is given for a correct explanation |

**Question 7 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 210 ÷ 140 | M1 | This mark is given for a method to find the gradient |
| –1.5 | A1 | This mark is given for a correct interpretation of the negative gradient |
| (b) | “rate of change of depth of water in tank” | C1 | This mark is given for a valid explanation |

**Question 8 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* = 3*x* – 2 so 3*y* = 9*x* – 6  3*y* – 9*x* + 5 = 0 so 3*y* = 9*x* − 5 | M1 | This mark is given for a method to start to form expressions which can be compared |
| Dividing rearranged equations by 3 gives *y* = 3*x* – 2 and *y* = 3*x* –  Gradient = 3 for both lines | A1 | This mark is given for comparing two equations and deducing that the gradients of the two lines are the same |

**Question 9 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | = 4 | P1 | This mark is given for a process to process to use the gradient |
|  | = 4 so *d* – 10 = 12 | P1 | This mark is given for a process to for a complete process to rearrange equation formed to isolate *d* |
|  | *d* = 22 | A1 | This mark is given for the correct answer only |

**Question 10 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | width: 38 – 6 = 32  height: 36 – 7 = 29 | P1 | This mark is given for a process to find the width and height of the diagram |
| 32 ÷ 4 = 8 | P1 | This mark is given for a process to find the length of a side of a square |
| 6 + 8 + 8 = 22 | P1 | This mark is given for a process to find the *x*-coordinate |
| 36 – 8 – 8 = 20 | P1 | This mark is given for a process to find the *y*-coordinate |
| (22, 20) | A1 | This mark is given for the correct answer only |

**Question 11 (Total 2 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | *x* = 2.2, *y* = –1.3 | M1 | This mark is given for use of the intersection point (evidenced by one solution given, solution reversed or solutions given as a coordinate) |
| A1 | This mark is given for *x* given in the range 2.2 to 2.3 and *y* given in the range –1.3 to –1.4 |

**Question 12 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* = *x* + | M1 | This mark is given for a method to rearrange the equation and identify the gradient |
| × *m* = –1, so perpendicular = – | M1 | This mark is given for a method to find the gradient of the line perpendicular to **L** |
| *y* = –*x* + *c*  –5 = –*x* + *c* so *c* = –  *y* = –*x* –  Rearranging, 4*y* + 3*x* = –11 | A1 | This mark is given for a correct equation (or any equivalent) |

**Question 13 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Gradient of *DB* = | P1 | This mark is given for finding the gradient of the line *DB* |
| Gradient of *AC* = – = –2,  so equation for *AC* is *y* = –2*x* + *c* | P1 | This mark is given for understanding that the line *AC* is perpendicular to *DB* and using – to find its gradient |
| 11 = ­–10 + *c*  *c* = 21 | P1 | This mark is given for substituting the values for the coordinates of *A* (*x* = 5 and *y* = 11) into *y* = –2*x* + *c* to find the value of *c* |
| *y* = −2*x* + 21 | A1 | This mark is given for the correct answer only |

**Question 14 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* = 3*x* + *c*  Using the coordinates for point *A*,  9 = (3 × 5) + *c*   *c* = –6 | P1 | This mark is given for a process to use the gradient given |
| *y* = 3*x* – 6  Using the coordinates for point *B*,  15 = (3 × *d*) – 6  3*d* = 21 | P1 | This mark is given for a process to find a value for *d* |
| *d* = 7 | A1 | This mark is given for the correct answer only |

**Question 15 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* = –*x* + | P1 | This mark is given for a process to rearrange to give the equation of the line perpendicular to *PQ* in terms of *x* |
| Gradient of *PQ* = | P1 | This mark is given for a process to find the gradient of *PQ* using *mn* = –1 |
| Equation for *PQ* is *y*  = *x* + *c* | P1 | This mark is given for a process to find an equation for *PQ* |
| *y*  = *x* + *c* at (3, 4)  4 = 2 + *c*  *c* = 2 | P1 | This mark is given for finding the value of *c* |
| *b* = *a* + 2 | A1 | This mark is given for a correct answer only |

**Question 16 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | = – | P1 | This mark is given for a process to find a gradient of the line **L**1 |
|  | **L**1 = –*x* + *c*  When *x* = 4, *y* = 6 and when *x* = 12, *y* = 2  so **L**1 = –*x* + 8  **L**2 = –3*x* | P1 | This mark is given for a process to find equations for the lines **L**1 and **L**2 |
|  | When –*x* + 8 = –3*x*, *x* = –  *y* = –3*x* = | P1 | This mark is given for a process to find the *x*- and *y*-coordinates common to both lines |
|  |  | A1 | This mark is given for the correct answer only. |

**Question 17 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  |  | P1 | Tis mark is given for a process to find the gradient of the line *AB* |
|  | use of −1/*m* | P1 | This mark is given for a process to find the gradient of a perpendicular line |
|  |  | P1 | This mark is given for substitution of *x*=5, *y*=−1 |
|  |  | A1 | This mark is given for the correct equation stated or a correct equivalent |

**Question 18 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *B* = (12, 0), *E* = (0, 6)  Gradient of **L** = – | 1 | This mark is given for rearranging to find a gradient or positions of *B* and *E* |
| *A* = (–12, 12) | 1 | This mark is given for finding the position of *A* |
| Gradient of **M** = 2 | 1 | This mark is given for a finding the gradient of **M** |
| Equation of **M** is *y* = 2*x* + 36 | 1 | This mark is given for the correct answer only |

**Question 19 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | (=) | P1 | This mark is given for a process to find the gradient of the line *PQ* |
|  | *x* = −9 + ( × 20) (= −1)  *y* = 7 + ( × 5) (= 9)  Coordinates of *M* are(–1, 9) | P1 | This mark is given for a process to process to find the *x* or *y* coordinate of the point *M* |
|  | gradient of line **L** *=*  (= −4) | P1 | This mark is given for a process to method to find gradient of line **L** |
|  | *y =* −4*x* + *c*  when *x* = –1 and *y* = 9, *c* = 5 | M1 | This mark is given for a method to substitution of found values for *x*, *y* and *M* into equation for straight line |
|  | *y =* −4*x* + 5 | A1 | This mark is given for the correct answer only |

**Performance data:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
| 1 | 2 | June 2019 | 2H | 3 | Algebra | A10 | 2 | 89 | 2.68 | 2.96 | 2.93 | 2.89 | 2.80 | 2.59 | 2.16 | 1.54 | - | - | 0.96 |
| 2 | 3 | June 2018 | 2H | 3 | tbc | tbc | tbc | 64 | 1.92 | 2.95 | 2.84 | 2.61 | 2.19 | 1.49 | 0.71 | 0.25 | - | - | 0.08 |
| 3 | 3 | Spec Set 1 | 3H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 5c | Mock Set 3 | 3H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5a | 2a | Mock Set 1 | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5b | 2b | Mock Set 1 | 1H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6a | 12a | June 2018 | 3H | 2 | Ratio | R14 | 1 | 62 | 1.24 | 1.92 | 1.81 | 1.65 | 1.39 | 0.99 | 0.51 | 0.17 | - | - | 0.05 |
| 6b | 12b | June 2018 | 3H | 1 | Ratio | R14 | 2 | 42 | 0.42 | 0.86 | 0.72 | 0.56 | 0.41 | 0.27 | 0.16 | 0.08 | - | - | 0.05 |
| 6c | 12c | June 2018 | 3H | 1 | Algebra | A15 | 2 | 64 | 0.64 | 0.96 | 0.89 | 0.78 | 0.66 | 0.53 | 0.39 | 0.28 | - | - | 0.18 |
| 7a | 10a | Spec Set 1 | 2H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7b | 10b | Spec Set 1 | 2H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8 | 6 | June 2017 | 1H | 2 | Algebra | A9 | 2 | 60 | 1.20 | 1.98 | 1.92 | 1.74 | 1.33 | 0.79 | 0.35 | 0.12 | - | - | 0.05 |
| 9 | 1 | Mock Set 2 | 3H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10 | 6 | June 2018 | 1H | 5 | Geometry | G11, A8, A21 | 3 | 51 | 2.55 | 4.58 | 3.82 | 3.11 | 2.51 | 1.97 | 1.45 | 0.93 | - | - | 0.54 |
| 11 | 10 | June 2019 | 1H | 2 | Algebra | A19 | 2 | 48 | 0.95 | 1.91 | 1.69 | 1.28 | 0.85 | 0.52 | 0.30 | 0.18 | - | - | 0.13 |
| 12 | 16 | June 2019 | 2H | 3 | Algebra | A9 | 3 | 31 | 0.93 | 2.81 | 2.37 | 1.42 | 0.54 | 0.13 | 0.03 | 0.01 | - | - | 0.00 |
| 13 | 18 | June 2017 | 1H | 4 | Algebra | A9G4 | 3 | 31 | 1.23 | 3.82 | 3.33 | 2.00 | 0.71 | 0.18 | 0.04 | 0.01 | - | - | 0.00 |
| 14 | 6 | Nov 2018 | 2H | 3 | Algebra | A8A10, A17 | 3 | 28 | 0.83 | 3.00 | 2.82 | 2.54 | 1.99 | 1.27 | 0.38 | 0.16 | - | - | 0.04 |
| 15 | 19 | June 2018 | 1H | 5 | Algebra | A22, A1 | 3 | 24 | 1.18 | 4.57 | 3.37 | 1.67 | 0.61 | 0.16 | 0.04 | 0.01 | - | - | 0.00 |
| 16 | 18 | Nov 2018 | 2H | 4 | Algebra | A9 | 3 | 9 | 0.37 | 3.40 | 3.29 | 2.01 | 0.85 | 0.36 | 0.07 | 0.01 | - | - | 0.00 |
| 17 | 23 | Spec Set 1 | 1H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 18 | 19 | Nov 2017 | 1H | 4 | Geometry | A9, G11 | 3 | 3 | 0.11 | 3.62 | 2.38 | 1.21 | 0.40 | 0.12 | 0.02 | 0.00 |  |  | 0.00 |
| 19 | 19 | Mock Set 1 | 2H | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | **66** |  |  |  |  | **16.25** | **39.34** | **34.18** | **25.47** | **17.24** | **11.37** | **6.61** | **3.75** | **-** | **-** | **2.08** |