**GCSE Mathematics (1MA1) – Higher Tier Paper 2H**

**November 2019 student-friendly mark scheme**

**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 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | For example:  There is no frequency label  The *y*-axis is not labelled  The polygon should not be closed  The polygon should not have a line at the bottom  The first and last points should not be connected  The point (15, 6) has been plotted incorrectly  The point (15, 6) has been plotted at (15, 8) | C2 | These marks are given for two correct statements  (C1 is given for one correct statement) |

**Question 2 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 127.5 ≤ length < 128.5 | B1 | This mark is given for 127.5 in the correct position |
| B1 | This mark is given for 128.5 in the correct position |

**Question 3 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | × 3 = 72 | P1 | This mark is given for a process to find out how many stamps Tom originally had |
| × 3 = 90 | P1 | This mark is given for a process to find out how many stamps Tom had after buying some from Adam |
| 90 – 72 | P1 | This mark is given for a process to find how many stamps Tom bought from Adam |
| 18 | A1 | This mark is given for the correct answer only |

**Question 4 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (i) | × 700 | M1 | This mark is given for a process to find out how many bags Stan should order |
| 238 | A1 | This mark is given for a correct answer only |
| (ii) | For example:  The sample is representative, otherwise the answer might be wrong  The sample is random, otherwise the answer might be different  The 50 people sampled are from the 700 in the fitness club, otherwise the answer might be inaccurate  17 out of every 50 people want a sports bag, otherwise the answer might be wrong |  | This mark is given for a valid assumption and an explanation |

**Question 5 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  | P1 | This mark is given for identifying the correct graph for the equation *y* = *x*3 |
| (b) |  | P1 | This mark is given for identifying the correct graph for the equation *y* = |

**Question 6 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | The terms of 2*n*2 – 1 are  1, 7, 17, 31, 49… | M1 | This mark is given for a method to generate at least three terms of the first sequence |
| The terms of 40 – *n*2 are  39, 36, 31, 24, 15… | M1 | This mark is given for a method to generate at least three terms of the second sequence |
| 31 | A1 | This mark is given for a correctly identifying the only number in both sequence |

**Question 7 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | ×  = 0.456 × 10–1 | M1 | This mark is given for a method to find an answer in standard form |
| 4.56 × 10–2 | A1 | This mark is given for the correct answer only |

**Question 8 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Ali’s company will use  = 18 workers  Hayley’s company will use  = 24 workers | P1 | This mark is given for a process to find the number of workers needed by each company |
| 24 – 18 | P1 | This mark is given for a process find out how many more workers Hayley’s company will need |
| 6 | A1 | This mark is given for the correct answer only |

**Question 9 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | (2 × 6 × 8) + (2 × 6 × 18) + (2 × 8 × 18) =  96 + 216 + 288 cm2 | P1 | This mark is given for a process to find the area of at least three faces of the cuboid |
| 600 cm2 | P1 | This mark is given for a complete process to find the surface area of the cuboid |
| = 100 cm2  √100 = 10 cm | P1 | This mark is given for a process to find the length of one side of the cube |
| Volume of cuboid = 6 × 8 × 18 = 864 cm3  Volume of cube = 10 × 10 × 10 = 1000 cm3 | P1 | This mark is given for a process to find the volumes of the cube and the cuboid |
| Volumes are different so Janet is not correct | A1 | This mark is given for a correct conclusion supported by correct working |

**Question 10 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y*2 = 2*m* – *k* | M1 | This mark is given for a method to square both sides of the equation given |
| *k* = 2*m* – *y*2 | A1 | This mark is given for the correct answer only |

**Question 11 (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 = 26g; the interquartile (IQR) range for the weight of Amy’s potatoes is 51 – 35 = 16g | 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 12 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | sin 40° =  *DB* = 8.6 sin 40° = 5.528 | P1 | This mark is given for a process to find the length *DB* |
| *ED* =  = 2.764 | P1 | This mark is given for a process to find the length *ED* |
| ∠ *EAD* = tan–1 | P1 | This mark is given for a process to find the angle *EAD* |
| ∠ *EAD* = 32.1 | A1 | This mark is given for the correct answer given to 1 decimal place |

**Question 13 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 3550 × (1.026)2 = 3737.00 | P1 | This mark is given for a process to find the amount in the savings account after two years |
|  | P1 | This mark is given for a process to find the value of *R* |
| 2.2 | A1 | This mark is given for the correct answer only |

**Question 14 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  | P1 | This mark is given for a method to find the number of combinations |
| 7 | A1 | This mark is given for the correct answer only |

**Question 15 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | (3*x* + 2)(2*x* + 1) = 6*x*2 + 5*x* + 2  or  (2*x* + 1)(*x* – 5) = 2*x*2 – 9*x* – 5 | M1 | This mark is given for a method to find the product of any two linear expressions |
| (6*x*2 + 5*x* + 2)(*x* – 5)  or  (3*x* + 2)(2*x*2 – 9*x* – 5) | M1 | This mark is given for a method to find the product of the quadratic expression formed with the remaining term |
| 6*x*3 – 23*x*2 – 33*x* – 10 | A1 | This mark is given for the correct answer only |

**Question 16 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | ×  = | P1 | This mark is given for a process to find the probability that the product is an odd number |
| 1 – | P1 | This mark is given for a process to find the probability that the product is an even number |
|  | A1 | This mark is given for the correct answer only |

**Question 17 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *OAD* = 90 | B1 | This mark is given for a finding the size of the angle *OAD* |
| *AOB* = 90 + 32 = 122  *OAB* =  = 29 | M1 | This mark is given for a method to find the size of the angle *OAB* |
| *CAB* = 180 – 90 – 29 = 61 | A1 | This mark is given for the correct answer only |

**Question 18 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | 1.2 × 2.5 = 3, 2 × 2.5 = 5, 2.8 × 5 = 14, 0.8 × 12.5 = 10  3 + 5 + 14 + 10 = 32 | M1 | This mark is given for a method to find the number of trees represented by the bars shown |
| 32 ×  = 8 | M1 | This mark is given for method to find the number of trees between 10 and 12.5 metres |
| = 3.2 | C1 | This mark is given for a bar drawn with frequency density 3.2 |

**Question 19 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | ×  × *π* × (4.2)3 | P1 | These marks is given for a process to find the volume of the hemisphere |
| 155 | A1 | This mark is given for the correct answer only (to 3 significant figures) |

**Question 20 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 10.85 ≤ *c* < 10.95 | M1 | This mark is given for a method to use the formula to find an estimate of the height of the building |
| (10.85)3 = 159.66…  or  (10.95)3 = 164.11… | M1 | This mark is given for finding an upper or lower bound for *d* |
| 159.66 ≤ *d* < 164.11… | A1 | This mark is given for finding both an upper and lower bound for *d* |
| *d* = 160 since both bounds round to 160 | C1 | This mark is given for a correct degree of accuracy with reason given |

**Question 21 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | + (50 × 12) + | P1 | This mark is given for a process to find the area under the graph |
| 180 + 600 + 120 = 900 | A1 | This mark is given for correctly finding the area under the graph |
| = 270  = 22.5 | P1 | This mark is given for a process to find the time taken to travel half the distance between two stations |
| 30 + 22.5 = 52.5 | A1 | This mark is given for the correct answer only |
| (b) | Acceleration in the first part of the journey is positive but in the second half of the journey is negative | C1 | This mark is given for a valid comparison |

**Question 22 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *P*2 = (1.2 × 200) – 50 = 190 | P1 | This mark is given for a process to find the number of rabbits at the end of April |
| *P*3 = (1.2 × 190) – 50 = 178 | P1 | This mark is given for a process to find the number of rabbits at the end of May |
| *P*3 = (1.2 × 178) – 50 = 163.6  163 rabbits | A1 | This mark is given correctly finding the number of rabbits at the end of June (accept 163 or 164) |
| Eventually there will be no rabbits on the farm | C1 | This mark is given for a valid statement |

**Question 23 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | (2*x* – 1)(10 – *x*) × sin 150° | M1 | This mark is given for a method to find the area of the parallelogram |
| (2*x* – 1)(10 – *x*) > 15 | M1 | This mark is given for a method to form an inequality |
| (2*x* – 1)(10 – *x*) > 30  ­–2*x*2 + 21*x* – 10 > 30  –2*x*2 + 21*x* – 40 > 0  2*x*2 – 21*x* + 40 < 0 | C1 | This mark is given for a completely correct chain of reasoning leading to 2*x*2 – 21*x* + 40 < 0 |
| (b) | (2*x* – 5)(*x* – 8) < 0 | M1 | This mark is given for a method to factorise 2*x*2 – 21*x* + 40 < 0 |
| *x* = 2.5, *x* = 8 | M1 | This mark is given for a method to find the critical values 2.5 and 8 |
| 2.5 < *x* < 8 | A1 | This mark is given for the correct range of values for *x* |

**Question 24 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Rotation 180°  or  Rotation 90° clockwise  or  Rotation 90° anticlockwise | C1 | This mark is given for finding an angle of the rotation |
| about (–1, 2) or (–1, 4)  or  about (–1, 0)  or  about (–1, 6) | C1 | This mark is given for finding the corresponding centre of rotation |

**Question 25 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* =  – *x*, gradient = – | P1 | This mark is given for a process to find the gradient of **L** |
| Gradient of **M** =  Equation for **M** is *y* = *x* + *c*  Point *A* on the line **M** at (0, 2) ⇒ *c* = 2 | P1 | This mark is given for a process to find an equation for the perpendicular **M** |
| *B* = (0, ) | B1 | This mark is given for identifying the coordinates of the point *B* |
| – *x* = *x* + 2  = *x*,  *x* = 3, *y* = 4  *C* = (3, 4) | P1 | This mark is given finding the coordinates of the point *C* |
| Area *ABC* = (8.5 – 2) × 3 = 9.75 | A1 | This mark is given for the correct answer only |