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

**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 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 108 = **2** × **2** × **3** × **3** × **3**  120 = 2 × 2 × **2** × 3 × **5** | M1 | This mark is given for a method to list the prime factors of 108 or 120 |
| 2 × 2 × 3 × 3 × 3 × 2 × 5 | M1 | This mark is given for a method to find the LCM of 108 and 120 |
| 1080 | A1 | This mark is given for the correct answer only |

**Question 2 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Number of women in the choir:  60 ÷ 2 = 30  Number of men in the choir:  30 ÷ 3 = 10 | P1 | This mark is given for a process to find out the number of men in the choir |
| Number of children in the choir:  60 – 30 – 10 = 20 | P1 | This mark is given for a process to find out the number of children in the choir |
| 20 : 10 | P1 | This mark is given for a process to find out the ratio of the number of children in the choir to the number of men in the choir |
| = 2 : 1 so *n* = 2 | 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** |
|  | 1 =  1 = | P1 | This mark is given for a process to convert mixed numbers into improper fractions |
| ×  = | P1 | This mark is given for a correct multiplication |
| 2 | A1 | This mark is given for a correct answer (or an equivalent mixed number) |

**Question 4 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *C*  *D* | C2 | These marks are given for a fully correct construction with all relevant arcs drawn  (C1 is given for a perpendicular line drawn from *P* to the line *CD*) |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *ACB* = 180 – 75 – 51 = 54 | M1 | This mark is given for a method to find the angle *ACB* |
| *ACD* =  = 18  *DCB* =  × 2 = 36 | M1 | This mark is given for a method to find the size of angles *ACD* and *DCB* |
| *BDC* = 180 – 51 – 36 | M1 | This mark is given for a method to find the angle *BDC* |
| *BDC* = 93 | A1 | This mark is given for the correct answer only |

**Question 6 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 4 × 5 = 20 kg  5 × 9 = 45 kg | P1 | This mark is given for a process to find the weight of the red bricks or the blue bricks |
| 20 + 45 + 6 = 71 kg | P1 | This mark is given for a process to find the weight of all the bricks |
| Average weight of bricks is  = 7.1 kg  so Donna is incorrect | C1 | This mark is given for finding the average weights of the bricks with a correct conclusion stated |

**Question 7 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | *p*(2 × 5)  = *p*10 | B1 | This mark is given for the correct answer only |
| (b) | =  × *x*(7 – 3) × *y*(3 – 1) | M1 | This mark is given for a method to simplify the fraction |
| 2*x*4*y*2 | A1 | This mark is given for a correct answer only |

**Question 8 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (i) | *Q* | P1 | This mark is given for a process to draw a line at a bearing of 070° from *P* |
| *PQ* = 12 × 1.5 = 18 km | P1 | This mark is given for a process to work out the actual distance *PQ* |
| Distance on scale drawing:  18 ÷ 4 = 4.5 cm | P1 | This mark is given for a process to work out the distance *PQ* on the scale drawing |
| Distance *QL* on scale drawing = 5 cm  Actual distance *QL* = 5 × 4 = 20 km | A1 | This mark is given for finding the distance *QL* (in the range 20 – 23 km) |
| (ii) | *Q*  Bearing from *L* to *Q* is 320° | A1 | This mark is given for a bearing of *Q* from *L* (in the range 317 – 330) |

**Question 9 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 72 × | M1 | This mark is given for a method to find the distance travelled by the car |
| 21.6 | A1 | This mark is given for the correct answer only |
| 20 ×  = 72 | M1 | This mark is given for a method to convert 20 m/s to km/h |
| David is incorrect; 72 km/h is the same as 20 m/s, not faster | C1 | This mark is given for a valid conclusion supported by correct working |

**Question 10 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  | C2 | These marks are given for a correct cumulative frequency graph through (40, 5), (60, 25), (80, 35), (100, 38) and (120, 40)  (C1 is given for at least 4 points plotted) |
| (b) | Upper quartile = 68  Lower quartile = 44 | M1 | This mark s given for an upper or lower quartile identified (±2) |
| 68 – 44 = 24 | A1 | This mark is given for an answer in the range 20 to 28 |
| (c) |  | M1 | This mark is given for a method to find the difference between readings taken from the readings of points from a mark of 50 and a mark of 90 |
| = | A1 | This mark is given for a correct answer in the range  to |

**Question 11 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | =  *p* = | M1 | This mark is given for a method to find an estimate for the value for *p* |
| 72 | A1 | This mark is given for the correct answer only |

**Question 12 (Total 1 mark)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | For example:  All three terms should have been multiplied by 2, not just two of them  5 should also have been multiplied by 2  He should have written 2 × *T* = *q* + 10 | C1 | This mark is given for a correct explanation of Spencer’s mistake |

**Question 13 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | + | M1 | This mark is given for a method to find a common denominator and at least one correct numerator |
|  | A1 | This mark is given for a correct single simplified fraction |
| (b) | (*x*2 + 2*xy* + *y*2) + (3*x* + 3*y*) =  (*x* + *y*)(*x* + *y* + 3) | B1 | This mark is given for the correct answer only |

**Question 14 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | (*x* + 4)(*x* – 2) | P1 | This mark is given for a process to find the area of the triangle |
| (*x*2 + 2*x* – 8) = 27.5  *x*2 + 2*x* – 8 = 55  *x*2 + 2*x* – 63 = 0 | P1 | This mark is given for a process to expand brackets and find a quadratic equation to solve |
| (*x* – 7)(*x* + 9)  *x* = 7 | P1 | This mark is given for a process to factorise to find a value for *x* |
| Shortest side = 7 – 2 = 5 | 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** |
|  | Let *x* = 0.418181818…  1000*x* = 418.181818…  10*x* = 4.181818… | B1 | This mark is given for finding values for 1000*x* and 10*x* |
| 1000*x* – 10*x* =  418.181818… – 4.181818… = 414 |  | This mark is given for a method to eliminate recurring decimals |
| 990*x* = 418  *x* = | B1 | This mark is given for the correct answer only (or an equivalent fraction) |

**Question 16 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | ×  = | M1 | This mark is given for a method to multiply the numerator and denominator by √11 |
| = 2√11 | A1 | This mark is given for the correct answer only |
| (b) | ×  = | M1 | This mark is given for a method to multiply the numerator and denominator by 2√3 + 1 |
| (*a* = 6, *b* = 11) | M1 | This mark is given for either a correct numerator or correct denominator seen |
| A1 | This mark is given for a completely correct answer only |

**Question 17 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Ratio of lengths of containers =  √4 : √9 = 2 : 3 | P1 | This mark is given for a process to find corresponding lengths of the containers |
| Ratio of volumes of containers =  23 : 33 = 8 : 27 | P1 | This mark is given for a process to find corresponding volumes of the containers |
|  | P1 | This mark is given for a process to find how much bigger container **B** is than container **A** |
| = 3.375 so 4 times | C1 | This mark is given for the correct number of times Tyler fills container **A** |

**Question 18 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
| (a) | f–1(*x*) = | C1 | This mark is given for finding an expression for f–1(*x*) |
| f–1(*x*) =  =  = 3 | C1 | This mark is given for correctly substituting 50 into f–1(*x*) |
| (b) | hg(*x*) = (*x* + 2)2 | P1 | This mark is given for a process to find an expression for hg(*x*) |
| (*x* + 2)2 = 3*x*2 + *x* – 1  *x*2 + 4*x* + 4 = 3*x*2 + *x* – 1  2*x*2 – 3*x* – 5 = 0 | P1 | This mark is given for a process to find a quadratic equation to be solved |
| (2*x* – 5)(*x* + 1) = 0 | P1 | This mark is given for a process to factorise to solve for *x* |
| *x* = –1 and *x* = 2.5 | A1 | This mark is given for the correct answers only |

**Question 19 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | = × 3–(*x* + 1)  3–1 =  × 3–(*x* + 1) | P1 | This mark is given for a process to convert to a common base |
| –1 = – (*x* + 1) | P1 | This mark is given for a process to use the index laws to derive an equation in *x* |
| *x* = | A1 | This mark is given for the correct answer only |

**Question 20 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a) | *y* = f(*x* + 1) – 3 | C1 | These marks are given for a graph drawn translated by the vector  (C1 is given for a translation of the graph by vector  or  where *a* ≠ ­1 or *b* ≠ –3) |
| (b) | (2, 1) | B1 | This mark is given for the correct answer only |

**Question 21 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *x* = | M1 | This mark is given for a method to find the roots of *y* = 0 |
| *x* = 2 + , 2 – | M1 | This mark is given for finding the roots of *y* = 0 |
| *x*-coordinate for turning point =  (2 +  + 2 – ) = 2  When *x* = 2, *y* = –13 | M1 | This mark is given for the turning point of *y* = 2*x*2 – 8*x* – 5 |
| (2 + , 0)  (2 – , 0)  *y*  *x*  (0, –5)  (2, –13) | C2 | These marks are given for a fully correct parabola drawn with axes labelled, a turning point at (2, –13) and intercepts at (0, –5), (2 + , 0) and (2 – , 0) clearly shown |

**Question 22 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | ∠*ACB* = ∠*ADB* = 60°  Angles in the same segment are equal  ∠*DBC* = ∠*DAC* = 60°  Angles in the same segment are equal  Thus ∠*ACB* = ∠*DBC* = 60° | C1 | This mark is given for arguments to show that ∠*ACB* = ∠*ADB* and ∠*DBC* = ∠*DAC* with reasons given to show that ∠*ACB*= ∠*DBC* |
| ∠*ABC* = 60 + ∠*ABD* = 60 + ∠*ACD* = ∠*DCB*  Angles in the same segment are equal | C1 | This mark is given for an argument to show that ∠*ABC* = ∠*DCB* |
| *BC* is common to both triangles | C1 | This mark is given for finding a side common to both triangles |
| Thus triangles *ABC* and *DCB* are congruent (AAS) | C1 | This mark is given for a correct conclusion with reference to AAS |