**GCSE Mathematics (1MA1) – Higher Tier Paper 3H**

**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** |
| (a) | *x*2 + 5*x* – 9*x* – 45 | M1 | This mark is given for three terms correct |
| *x*2 – 4*x* – 45 | A1 | This mark is given for the correct answer only |
| (b) | 3(3*x*2 + 2*x*) | M1 | This mark is given for a partial factorisation |
| 3*x*(3*x* + 2) | A1 | This mark is given for the correct answer only |

**Question 2 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  | M1 | This mark is given for 836.4 or 5.3048091 seen |
| 157.66825 | A1 | This mark is given for the correct answer only |
| (b) | 157.7 | B1 | This mark is given for the correct answer only |

**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** |
|  | (1 × 7.5) + (2 × 12.5) + (7 × 17.5) + (8 × 22.5)= 7.5 + 25 + 122.5 + 180 | M1 | This mark is given for a method to find four products within the intervals |
|  | M1 | This mark is for a method to find ∑*ft* ÷ 18 |
| 18.6 | A1 | This mark is given for a correct answer in the range 18.61 to 18.62 |

**Question 5 (Total 1 mark)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 1 cm3 = 1000 mm337 cm3 = 37 000 mm3 | B1 | This mark is given for the correct answer only |

**Question 6 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 14 48 – 13 30 = 1 hour 18 minutes | P1 | This mark is given for a process to find the time taken for Nimer to arrive at the hotel |
| 1 hour 18 minutes = 1 hours = 1.3 hours | P1 | This mark is given for a process to find the number of hours taken |
|  = | P1 | This mark is given for a process to find the average speed (distance/time) |
| 50 (mph) | A1 | This mark is given for the correct answer only |

**Question 7 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 3.246 × 107 | B1 | This mark is given for the correct answer only |
| (b) | 0.00496 | B1 | This mark is given for the correct answer only |
| (c) | No; *B* is bigger since the power of 10 is bigger | C1 | This mark is given for a correct conclusion with a valid explanation given |

**Question 8 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 180 – 117 = 63 | P1 | This mark is given for a process to find the other angle in the parallelogram |
| 180 –  = 108 | P1 | This mark is given for a process to find the interior angle of the pentagon |
| 108 – 63 | P1 | This mark is given for a process to find the value of *x* |
| 45 | A1 | This mark is given for the correct answer only |

**Question 9 (Total 2 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  |  | B2 | These marks are given for a triangle with vertices at (2.5, 1), (2.5, 6) and (5, 6)(B1 is given for a triangle of the right size and orientation but in the wrong place **or** a correct enlargement of a different scale factor with centre (0, 1)) |

**Question 10 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 9 + *x* = 7(11 – *x*) | M1 | This mark is given for a method to multiply both sides by 7 |
| 9 + *x* = 77 – 7*x**x* + 7*x* = 77 – 9 8*x* = 68 | M1 | This mark is given for a method to isolate the *x* terms on one side |
| *x* = 8.5 | A1 | This mark is given for the correct answer only |
| (b) | 4(*y* + 3) | B1 | 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** |
|  | 0.07 × 0.98 = 0.06860.93 × 0.11 = 0.1203 | M1 | This mark is given for one correct product seen |
| 0.0686 + 0.1203 | M1 | This mark is given for a fully correct method to calculate the probability |
| 0.1709 | A1 | This mark is given for the correct answer only |

**Question 12 (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 13 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | *π* × *r* 2 × 25 = 225*π* | P1 | This mark is given for a process to find the volume of the container C |
| Vol of Liquid A: 225*π* ×  = 30*π*Vol of Liquid B: 225*π* ×  = 195*π* | P1 | This mark is given for a process to find the volume of Liquid A and the volume of Liquid B |
| Mass of Liquid A: 30*π* × 1.21 = 114.04Mass of Liquid B: 195*π* × 1.02 = 624.86 | P1 | This mark is given for a process to find the combined mass of Liquid A and Liquid B |
| 114.04 + 624.86 = 739 (3 sf) | A1 | This mark is given for a correct answer to 3 significant figures |

**Question 14 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Fraction choosing soup =  = Fraction choosing prawns =  =  | P1 | This mark is given for a process to find the proportion of people who chose soup or prawns as a starter |
| Soup and curry =  × Prawns and curry =  ×  | P1 | This mark is for a process to find out the proportion of people who chose soup and curry and the proportion of people who chose pawns and curry |
|  +  | P1 | This mark is given for a full process to find the faction of people who chose curry |
|  | A1 | This mark is given for a correct answer only (or an equivalent faction) |

**Question 15 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | Let two consecutive even numbers be 2*n* and 2*n* + 2 | P1 | This mark is given for a method to algebraically represent two consecutive even numbers |
| (2*n*)2 + (2*n* + 2)2= 4*n*2 + 4*n*2 + 4*n* + 4 | P1 | This mark is given for a process to find the number of boys who have packed lunches |
| = 4(2*n*2 + *n* + 1) which is a multiple of 4 for any *n* | A1 | This mark is given for a complete and correct proof |

**Question 16 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *y* =  so 8 =  | P1 | This mark is given for stating a correct relationship between *x* and *y* |
| *k* = 8 × 6.25 = 50 | P1 | This mark is given for a method to find the value of *k* |
|  =  *x*2 =  = 56.25*x* = 7.5 or – 7.5Negative value of *x* = –7.5 | P1 | 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** |
|  | (*x*2 – 3) – (*x*2 – 2*x* – 2) = 2*x* – 1 | P1 | This mark is given for recognising (*x*2 – 3) – (*x*2 – 2*x* – 2) = 2*x* – 1 |
|  | M1 | This mark is given for correctly plotting the line *y* = 2*x* – 1 |
| *x* = –0.7 and *x* = 2.7 | M1 | This mark is given for reading the points of intersection |
| A1 | This mark is given for finding *x* in the ranges 2.6 to 2.8 and –0.6 to –0.8 |

**Question 18 (Total 5 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | 3.42 = 6.12 + 6.22 – (2 × 6.1 × 6.2 × cos *C*) | B1 | This mark is given for the correct use of the cosine rule *c*2 = *a*2 + *b*2 cos *C* |
| 11.56 = 37.21 + 38.44 – (75.64 × cos *C*)cos *C* =  = 0.8473…*∠ BCA*  = 38.08° | P1 | This mark is given for a process to find the value of ∠ *BCA* |
|  =  =  | P1 | This mark is given for a correct substitution using the sine rule |
| *DC* =  | P1 | This mark is given for a process to find the length *DC* |
| 1.95 | A1 | This mark is given for a correct answer only (to 3 significant figures) |

**Question 19 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | For example, =  = 3.5 | M1 | This mark is given for drawing a suitable tangent at *t* = 6 |
| M1 | This mark is given for a method to find the gradient |
| A1 | This mark is given for a correct answer in the range (3.1 to 3.7) |

**Question 20 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | –1 0 3 8 15 1 3 5 7 2 2 2 | B1 | This mark is given for a correct deduction from differences: a second difference of 2 implies a term *n*2 |
| *n*2 – 2*n* | A1 | This mark is given for a correct expression |

**Question 21 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  =  | M1 | This mark is given for a method to find the probability of throwing one head |
| Probability of getting 4 tails =   | A1 | This mark is given for the correct answer only |

**Question 22 (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 factorise both the numerator and denominator of the first term |
|  =  | M1 | This mark is given for a method to factorise both the numerator and denominator of the second term |
| (b) |  ×  | M1 | This mark is given for a multiplication by the reciprocal and cancelling terms |
| 7*x* | A1 | This mark is given for the correct answer only |

**Question 23 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 56.8 =  × π × *r* 2 × 3.6 | P1 | This mark is given for a correct substitution in to the formula for the volume of the cone |
| *r* 2 =  = 15.066…*r* = 3.88… | P1 | This mark is given for a process to find the radius of the base of the cone |
| *h l* *r**l* 2= 3.62 + (3.88…)2*l* = 5.29… | P1 | This mark is given for a process to use Pythagoras find the sloping length *l* of the cone |
|  × *π* × 2 × 5.29 = 2 × *π* × 3.88*AOB* =  | P1 | This mark is given for a process to find the size of angle *AOB* |
| 264 |  | This mark is given for the correct answer only (to 3 significant figures) |

**Question 24 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  =  = **a** =  = **b** | P1 | This mark is given a process to find  and  |
|  =  = **a** – **b** = **a** | P1 | This mark is given for a process to use vector equivalence of opposite sides of a parallelogram to find vector expressions for  and  |
|  = **a** – **b** + **a** = **a** – **b** + **b** |  | This mark is given for a process to find  and  in terms of **a** and **b** |
| 12 = 12**a** – 12**b** + 4**a** = 16**a** – 12**b**12 = 12**a** – 12**b** + 3**b** = 12**a** – 9**b**16**a** – 12**b =** (12**a** – 9**b**)so =  |  | This mark is given for a process to write  and  as multiples of the same vector |
| 4 : 3 |  | This mark is given for the correct answer only (or an equivalent ratio) |