**GCSE Mathematics (1MA1)**

**Themed papers – Indices**

**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 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
| (a) | 35 × 34 = 35+4 (= 39) or 35 ÷ 32 = 35-2 (= 33)or 34 ÷ 32 = 34−2 (= 32) | M1 | This mark is given for a first step using a rule of indices |
| 37 | A1 | This mark is given for the correct answer only |
| (b) | 1 | B1 | This mark is given for the correct answer only |
| (c) |  | B1 | This mark is given for the answer shown (or for 0.111…) |

**Question 2 (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 3 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | √36 = 6 |  | This mark is given for the correct answer only |
| (b) | 1 |  | This mark is given for the correct answer only |
| (c) |  =  = 3 |  | This mark is given for a correct first step in calculating the value |
| 3–2 =  |  | This mark is given for the correct answer only |

**Question 4 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  = √81 = 9 or  =  | M1 | This mark is given for a method using either a square root or a reciprocal |
|  | A1 | This mark is given for the correct answer only |
| (b) |  =  =  =  = 42 = 16 =  =  = 52 = 25 | M1 | This mark is given for a method to find the cube root of 64 and 125or16 or 25 seen |
|  | A1 | This mark is given for the correct answer only |

**Question 5 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
| (a) | *m*3 + 4 = *m*7 | B1 | This mark is given for the correct answer only |
| (b) | 53 × *n*3 × *p*3 × 3 = 125*n*3*p*9 | B2 | These marks are given for the correct answer only (B1 is given for 2 out of 3 terms correct in a single product) |
| (c) |  × *q*9 – 6 × *r*4 –1 = 8*q*6*r*3 | B2 | (B1 is given for 2 out of 3 terms correct in a single product) |

**Question 6 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  |  =  = 35 – 3 = 32 | M1 | This mark is given for using the laws of indices to simplify the expression |
| 9 | A1 | This mark is given for the correct answer only |

**Question 7 (Total 1 mark)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | Patrick needs to find the fourth root of 64 rather than a quarter of 64 | C1 | This mark is given for a correct explanation |

**Question 8 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a) | 10 | 1 | This mark is given for the correct answer only |
| (b) |  = ()2or = 5 | 1 | This mark is given for a start to finding the answer |
| 25 | 1 | 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** |
| (a) | 1 | B1 | This mark is given for the correct answer only |
| (b) |  or 7 | M1 | This mark is given for a first step towards the solution |
|  | A1 | This mark is given for the correct answer only |
| (c) |  = 4 or 642 = 4096 | M1 | This mark is given for a first step towards the solution |
| 16 | A1 | This mark is given for the correct answer only |

**Question 10 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a) |  = 3 and = 102 = 100 | B1 | This mark is given for the correct use of index rules |
| 3 × 100 = 300 | B1 | This mark is given for the correct answer only (as 300 or 3×102) |
| (b) |  =  =  =  | M1 | This mark is given for working out at least one step (reciprocal or cube root to both numbers) |
|  =  | 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** |
|  | 16 = 24 or 8 = 23 | P1 | This mark is given for converting to a common base with at least one correct conversion |
|  × 2*x* =  =  | P1 | This mark is given for a process to use of index laws to derive an equation |
|  + *x* = *x* =  = 1.45 | 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** |
|  | = × 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 13 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  = 2,  = 3 | M1 | This mark is given for a method to find the fourth root of both 16 and 81 |
| 23 = 8, 33 = 27 | A1 | This mark is given for the correct answer only |
| (b) | 3–1  = , 31.5 = 9√3, 3–0.5 =  | M1 | This mark is given for finding the values of *a*, *b* and *c* |
|  –2 + 2.5 – 0.5 | 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** |
|  | 34*n* or54 or(3–*n*)–4 or 0.2–4 | M1 | This mark is given for one of these terms seen in an attempt to set up an equation to solve  |
| 34*n* =54 or (3–*n*)–4 = 0.2–4 = 625 | A1 | This mark is given for the correct answer 625 only |

**Performance data:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q** | **Taken from**  | **Total Marks available** | **TOPIC** | **Spec Ref** | **AO** | **% Mean marks** | **Edexcel mean averagesMarks of candidates who achieved grade:** |
| **Q** | **Series** | **Paper** | **ALL** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **U** |
| 1a | 1a | Mock Set 3  | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1b | 1b | Mock Set 3  | 1H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1c | 1c | Mock Set 3  | 1H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2a | 7a | Nov 2019 | 1H | 1 | Algebra | A4 | 1 | 70 | 0.70 | 1.00 | 1.00 | 0.90 | 0.82 | 0.77 | 0.68 | 0.56 | - | - | 0.41 |
| 2b | 7b | Nov 2019 | 1H | 2 | Algebra | A4 | 1 | 73 | 1.46 | 2.00 | 2.00 | 1.91 | 1.86 | 1.70 | 1.48 | 0.99 | - | - | 0.52 |
| 3a | 9a | June 2018 | 1H | 1 | Number | N7 | 1 | 82 | 0.82 | 1.00 | 0.99 | 0.96 | 0.90 | 0.76 | 0.57 | 0.40 | - | - | 0.23 |
| 3b | 9b | June 2018 | 1H | 1 | Number | N7 | 1 | 87 | 0.87 | 1.00 | 0.98 | 0.96 | 0.92 | 0.83 | 0.72 | 0.58 | - | - | 0.40 |
| 3c | 9c | June 2018 | 1H | 2 | Number | N7 | 1 | 62 | 1.24 | 1.97 | 1.86 | 1.65 | 1.33 | 0.94 | 0.57 | 0.31 | - | - | 0.12 |
| 4a | 12a | June 2017 | 1H | 2 | Number | N7 | 1 | 69 | 1.38 | 1.97 | 1.89 | 1.73 | 1.48 | 1.14 | 0.75 | 0.42 | - | - | 0.22 |
| 4b | 12b | June 2017 | 1H | 2 | Number | N78 | 1 | 55 | 1.09 | 1.95 | 1.81 | 1.55 | 1.15 | 0.69 | 0.31 | 0.10 | - | - | 0.03 |
| 5a | 1a | June 2018 | 2H | 1 | Algebra | A4 | 1 | 97 | 0.97 | 1.00 | 0.99 | 0.99 | 0.99 | 0.97 | 0.94 | 0.88 | - | - | 0.74 |
| 5b | 1b | June 2018 | 2H | 2 | Algebra | A4 | 1 | 43 | 0.86 | 1.85 | 1.52 | 1.13 | 0.81 | 0.55 | 0.34 | 0.16 | - | - | 0.08 |
| 5c | 1c | June 2018 | 2H | 2 | Algebra | A4 | 1 | 79 | 1.57 | 1.97 | 1.92 | 1.81 | 1.66 | 1.45 | 1.17 | 0.83 | - | - | 0.50 |
| 6 | 1 | Nov 2018 | 1H | 2 | Number | N6, N7 | 1 | 36 | 0.71 | 1.10 | 1.67 | 1.29 | 1.08 | 0.91 | 0.67 | 0.37 | - | - | 0.23 |
| 7 | 12 | June 2019 | 3H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 8a | 10a | Nov 2017 | 1H | 1 | Number | N7 | 1 | 33 | 0.33 | 1.00 | 0.97 | 0.92 | 0.86 | 0.61 | 0.35 | 0.14 |  |  | 0.04 |
| 8b | 10b | Nov 2017 | 1H | 2 | Number | N7 | 1 | 29 | 0.58 | 2.00 | 2.00 | 1.71 | 1.54 | 1.08 | 0.57 | 0.27 |  |  | 0.09 |
| 9a | 12a | Mock Set 4  | 1H | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9b | 12b | Mock Set 4  | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 9c | 12c | Mock Set 4  | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10a | 15a | Mock Set 2  | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10b | 15b | Mock Set 2  | 1H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 11 | 18 | June 2017 | 2H | 3 | Number | N7, A4, A17 | 3 | 24 | 0.71 | 2.08 | 1.32 | 0.88 | 0.58 | 0.38 | 0.22 | 0.09 | - | - | 0.02 |
| 12 | 19 | Nov 2019 | 1H | 3 | Algebra | N7, A4 | 3 | 9 | 0.26 | 2.33 | 1.62 | 0.93 | 0.50 | 0.26 | 0.08 | 0.01 | - | - | 0.01 |
| 13a | 14a | Nov 2018 | 1H | 2 | Number | N7 | 1 | 27 | 0.53 | 2.00 | 1.94 | 1.64 | 1.06 | 0.84 | 0.29 | 0.09 | - | - | 0.05 |
| 13b | 14b | Nov 2018 | 1H | 2 | Number | N7 | 1 | 5 | 0.10 | 1.70 | 1.15 | 0.63 | 0.16 | 0.07 | 0.01 | 0.00 | - | - | 0.00 |
| 14 | 14 | Mock Set 1  | 2H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | **43** |  |  |  |  | **14.18** | **27.92** | **25.63** | **21.59** | **17.7** | **13.95** | **9.72** | **6.2** | **-** | **-** | **3.69** |