**GCSE Mathematics (1MA1)**

**Themed papers – Algebraic Fractions**

**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** |
|  | 2*x*2 – 5*x* – 12 = (2*x* + 3)(*x* – 4) | M1 | This mark is given for factorising the denominator |
| *x*2 – 16 = (*x* + 4)(*x* – 4) | M1 | This mark is given for factorising the numerator |
|  | A1 | This mark is given for the correct answer only  |

**Question 2 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 3*x*2 – 8*x* – 3 = (3*x* + 1)(*x* – 3) | M1 | This mark is given for expanding the brackets of the numerator |
| 2*x*2 – 6*x* = 2*x*(*x* – 3) | M1 | This mark is given for expanding the brackets of the denominator |
|  =  | A1 | This mark is given for cancelling (*x* – 3) for the correct answer |

**Question 3 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | (3 + 2*x*)(1 − 2*x*) | M1 | This mark is given for factorising the numerator of the fraction |
| (2*x* − 1)(*x* – 3) | M1 | This mark is given for factorising the denominator of the fraction |
|  | 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** |
|  | (2*x* − 5)(*x* + 1) | M1 | This mark is given for a start to the factorisation |
| (*x* + 5)(*x* + 1) | M1 | This mark is given for factorisation |
|  | A1 | This mark is given for the correct answer only |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  |  – =  | M1 | This mark is given for writing at least **two** algebraic factions with a common denominator  |
| 3(3*x* – 2) – 4(2*x* + 5) = 2(1 – *x*) | M1 | This mark is given for a method to eliminate all fractions in the equation |
| 9*x* – 8*x* + 2*x* = 2 + 6 + 203*x* = 28 | M1 | This mark is given for rearranging and correctly isolating terms in *x* |
| *x* =  | A1 | This mark is given for the correct answer only  |

**Question 6 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 6 +  | B1 | This mark is given for factorising *x*2 + 3*x* – 10 |
| = 6 + = 6 +  | M1 | This mark is given for a method to rearrange the fraction in brackets and cancel through by (*x* – 5) |
| =  + =  | M1 | This mark is given for putting the two terms of the expression over the same common denominator |
|  | A1 | This mark is given for a correct answer only |

**Question 7 (Total 2 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 |

**Question 8 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  |  | M1 | This mark is given for at least two correct terms in rearranging the equation |
|  | M1 | This mark is given for the correct expansion of at least two expressions |
|  | M1 | This mark is given for collecting terms |
| =  , so *a* = 4, *b* = –42 | A1 | This mark is given for the correct answer only |

**Question 9 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | *x*2 – 4*x* – 5 = (*x* – 5)(*x* + 1) | B1 | This mark is given for factorisation, although may be seen later |
| or | M1 | This mark is given for finding a common denominator |
|  | M1 | This mark is for simplifying the expression |
|  | A1 | This mark is given for the correct answer only |

**Question 10 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
| (a) |  ×  | M1 | This mark is given for a method to factorise the numerator |
|   | M1 | This mark is given for a method to factorise the denominator |
|  | A1 | This mark is given for cancelling the numerator and denoiminator by *x*(2*x* + 3)(*a* = 4, *b* = –6, *c* = 3, *d* = –9) |
| (b) | (*x* + 1)(*x* – 2)*x* | M1 | This mark is given for finding a common denominator |
|  | M1 | This mark is given for finding a numerator |
| = =  | 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** |
|  | 2*x*2 + *x* − 15 = (2*x* − 5)(*x* + 3)3*x*2 + 9*x* = 3*x*(*x* + 3) | M1 | This mark is given for factorising the denominators of the fractions |
|  | M1 | This mark is given for inverting one fraction and multiplying |
|  (*a* = 3, *b* = 2, *c* = –5) | A1 | This mark is given for the correct answer only |

**Question 12 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | $\frac{3(x+2)}{(x-5)(x+2)}$ ( =$ \frac{3}{(x-5)} $) | M1 | Factorising numerator and denominator of first fraction |
| $\frac{x+5}{x(x+5)(x-5)}$ ( = $\frac{1}{x(x-5)}$ ) | M1 | Factorising denominator of second fraction |
| $\frac{3(x+2)}{(x-5)(x+2)}$ × $\frac{x(x+5)(x-5)}{(x+5)}$  | M1 | Multiplication by reciprocal |
| 3*x* | A1 | Completing algebra to reach 3*x* |

**Question 13 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | or  | C1 |  |
|  | C1 | This mark is given for a complete chain of reasoning |

**Question 14 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | $$\left(x+3\right)(x+2)$$ | B1 | This mark is given for factorising |
|  | M1 | This mark is given for dealing with the division of $\left(x+3\right)$ by $\frac{x²+5x+6}{x-2}$ |
|  | M1 | This mark is given for two correct fractions with a common denominator or a correct single fraction |
| $$\frac{3x+10}{x+2}$$ | 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 averagesMarks of candidates who achieved grade:** |
| **Q** | **Series** | **Paper** | **ALL** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **U** |
| 1 | 14a | June 2017 | 3H | 3 | Algebra | A4 | 1 | 45 | 1.36 | 2.93 | 2.69 | 2.12 | 1.33 | 0.6 | 0.19 | 0.05 | - | - | 0.02 |
| 2 | 17 | June 2018 | 1H | 3 | Algebra | A4 | 1 | 42 | 1.25 | 2.92 | 2.59 | 1.96 | 1.18 | 0.51 | 0.18 | 0.07 | - | - | 0.03 |
| 3 | 17b | Mock Set 3 | 1H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 15 | Spec Set 1  | 1H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 11 | June 2017 | 2H | 4 | Algebra | A17 | 1 | 33 | 1.32 | 3.50 | 2.76 | 1.89 | 1.13 | 0.55 | 0.22 | 0.07 | - | - | 0.04 |
| 6 | 13 | June 2019 | 2H | 4 | Algebra | A4 | 2 | 32 | 1.29 | 3.46 | 2.61 | 1.71 | 1.02 | 0.53 | 0.24 | 0.10 | - | - | 0.07 |
| 7 | 13a | Nov 2019 | 1H | 2 | Algebra | A4 | 1 | 21 | 0.42 | 2 | 1.86 | 1.36 | 0.88 | 0.55 | 0.14 | 0.02 | - | - | 0.01 |
| 8 | 19 | June 2017 | 2H | 4 | Algebra | A4 | 1 | 20 | 0.79 | 2.4 | 1.71 | 1.18 | 0.64 | 0.25 | 0.07 | 0.02 | - | - | 0 |
| 9 | 18 | Mock Set 4 | 3H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 10a | 12a | Nov 2018 | 2H | 3 | Algebra | A4 | 2 | 7 | 0.22 | 2.5 | 2.21 | 0.91 | 0.39 | 0.26 | 0.08 | 0.02 | - | - | 0.03 |
| 10b | 12b | Nov 2018 | 2H | 3 | Algebra | A4 | 1 | 9 | 0.26 | 2.2 | 1.79 | 1.26 | 0.62 | 0.29 | 0.06 | 0.02 | - | - | 0 |
| 11 | 17b | Mock Set 2 | 1H | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 12 | 20 | Spec Set 2  | 1H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 13 | 15 | Spec Set 2 | 3H | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 14 | 14 | Spec Set 1  | 3H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | **49** |  |  |  |  | **6.91** | **21.91** | **18.22** | **12.39** | **7.19** | **3.54** | **1.18** | **0.37** | **-** | **-** | **0.2** |