

Mark scheme for 1MA1 Higher themed papers: Algebraic Fractions

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

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
	$2x^2 - 5x - 12 = (2x + 3)(x - 4)$	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
	$\frac{x + 4}{2x + 3}$	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
	$3x^2 - 8x - 3 = (3x + 1)(x - 3)$	M1	This mark is given for expanding the brackets of the numerator
	$2x^2 - 6x = 2x(x - 3)$	M1	This mark is given for expanding the brackets of the denominator
	$\frac{(3x + 1)(x - 3)}{2x(x - 3)} = \frac{3x + 1}{2x}$	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
	$(3 + 2x)(1 - 2x)$	M1	This mark is given for factorising the numerator of the fraction
	$(2x - 1)(x - 3)$	M1	This mark is given for factorising the denominator of the fraction
	$\frac{3 + 2x}{3 - x}$	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
	$(2x - 5)(x + 1)$	M1	This mark is given for a start to the factorisation
	$(x + 5)(x + 1)$	M1	This mark is given for factorisation
	$\frac{2x - 5}{x + 5}$	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
	$\frac{3(3x - 2)}{12} - \frac{4(2x + 5)}{12} = \frac{2(1 - x)}{12}$	M1	This mark is given for writing at least two algebraic factions with a common denominator
	$3(3x - 2) - 4(2x + 5) = 2(1 - x)$	M1	This mark is given for a method to eliminate all fractions in the equation
	$9x - 8x + 2x = 2 + 6 + 20$ $3x = 28$	M1	This mark is given for rearranging and correctly isolating terms in x
	$x = 9\frac{1}{3}$	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
	$6 + \left[(x+5) \div \frac{(x+5)(x-2)}{x-1} \right]$	B1	This mark is given for factorising $x^2 + 3x - 10$
	$= 6 + \left[(x+5) \times \frac{x-1}{(x+5)(x-2)} \right]$ $= 6 + \frac{x-1}{x-2}$	M1	This mark is given for a method to rearrange the fraction in brackets and cancel through by $(x-5)$
	$= \frac{6(x-2)}{x-2} + \frac{x-1}{x-2}$ $= \frac{6(x-2) + (x-1)}{x-2}$	M1	This mark is given for putting the two terms of the expression over the same common denominator
	$\frac{7x-13}{x-2}$	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)	$\frac{15x}{3x(x+1)} + \frac{2(x+1)}{3x(x+1)}$	M1	This mark is given for a method to find a common denominator and at least one correct numerator
	$\frac{17x+2}{3x(x+1)}$	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
	$\frac{2(x-3)(x+3) - (x+2)(x+3) - (x-6)(x-3)}{(x-3)(x+3)}$	M1	This mark is given for at least two correct terms in rearranging the equation
	$\frac{2x^2 - 18 - (x^2 + 5x + 6) - (x^2 - 9x + 18)}{(x-3)(x+3)}$	M1	This mark is given for the correct expansion of at least two expressions
	$\frac{2x^2 - 18x - x^2 - 5x - 6 - x^2 + 9x - 18}{(x-3)(x+3)}$	M1	This mark is given for collecting terms
	$= \frac{4x - 42}{(x^2 - 9)}, \text{ so } a = 4, b = -42$	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
	$x^2 - 4x - 5 = (x - 5)(x + 1)$	B1	This mark is given for factorisation, although may be seen later
	$\frac{3(x-1)}{(x+1)(x-5)} - \frac{2(x+1)}{(x+1)(x-5)} \text{ or } \frac{3(x-1)(x-5)}{(x^2 - 4x - 5)(x-5)} - \frac{2(x^2 - 4x - 5)}{(x^2 - 4x - 5)(x-5)}$	M1	This mark is given for finding a common denominator
	$\frac{x-5}{(x+1)(x-5)}$	M1	This mark is for simplifying the expression
	$\frac{1}{x+1}$	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)	$\frac{(2x-3)(2x+3)}{6x+9} \times \frac{2x}{x^2-3x}$	M1	This mark is given for a method to factorise the numerator
	$\frac{(2x-3)(2x+3)2x}{3(2x+3)x(x-3)}$	M1	This mark is given for a method to factorise the denominator
	$\frac{4x-6}{3x-9}$	A1	This mark is given for cancelling the numerator and denominator by $x(2x+3)$ ($a = 4, b = -6, c = 3, d = -9$)
(b)	$(x+1)(x-2)x$	M1	This mark is given for finding a common denominator
	$\frac{3x(x-2) + (x+1)x - 4(x+1)(x-2)}{x(x+1)(x-2)}$	M1	This mark is given for finding a numerator
	$= \frac{3x^2 - 6x + x^2 + x - 4x^2 + 4x + 8}{x(x+1)(x-2)}$ $= \frac{-x+8}{x(x+1)(x-2)}$	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
	$2x^2 + x - 15 = (2x-5)(x+3)$ $3x^2 + 9x = 3x(x+3)$	M1	This mark is given for factorising the denominators of the fractions
	$\frac{1}{(2x-5)(x+3)} \times \frac{3x(x+3)}{1}$	M1	This mark is given for inverting one fraction and multiplying
	$\frac{3x}{2x-5}$ ($a = 3, b = 2, c = -5$)	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
	$\frac{3(x+2)}{(x-5)(x+2)} \quad (= \frac{3}{(x-5)})$	M1	Factorising numerator and denominator of first fraction
	$\frac{x+5}{x(x+5)(x-5)} \quad (= \frac{1}{x(x-5)})$	M1	Factorising denominator of second fraction
	$\frac{3(x+2)}{(x-5)(x+2)} \times \frac{x(x+5)(x-5)}{(x+5)}$	M1	Multiplication by reciprocal
	$3x$	A1	Completing algebra to reach $3x$

Question 13 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$\frac{a(b+1) - a}{(b+1)^2}$ or $\frac{a(b+1)^2 - a(b+1)}{(b+1)^3}$	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
	$(x+3)(x+2)$	B1	This mark is given for factorising
		M1	This mark is given for dealing with the division of $(x+3)$ by $\frac{x^2+5x+6}{x-2}$
		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

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Performance data:

Q	Taken from			Total Marks available	TOPIC	Spec Ref	AO	% Mean marks	Edexcel mean averages Marks 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