Algebraic Fractions

Mark Scheme 1

Level	IGCSE
Subject	Maths
Exam Board	Edexcel
Topic	Equations, Formulae and Identities
Sub Topic	Algebraic Fractions(Algebraic manipulation)
Booklet	Mark Scheme 1

Time Allowed: **50 minutes**

Score: **/42**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	70%	60%	55%	50%	<50%

Question Number	Working	Answer	Mark	Notes
1.	$\frac{4(2-x)+3x}{x(2-x)}$ oe $\frac{8-4x+3x}{x(2-x)}$	$\frac{8-x}{x(2-x)}$	3	M1 M1 A1 Accept $\frac{8-x}{2x-x^2}$ Single fraction needed as final answer.
				Total 3 marks

2.	$\frac{14x+8}{(x-2)(x+2)}$ (=2) $2x^2 - 14x - 16$ (= 0) oe $x^2 - 7x - 8$ (= 0) oe $(x + 1)(x - 8)$ (= 0) oe	$x = -1,\ x = 8$	5	M1 correct expression with correct common denominator or $5(x - 2) + 9(x + 2) = 2(x + 2)(x - 2)$ M1 gather terms correctly. Accept $x^2 - 4$ for $(x + 2)(x - 2)$ A1 correct 3 part quadratic M1 or $\frac{7\pm\sqrt{7^2-4x1x-8}}{2}$ oe condone 1 sign error A1 dep on previous M1
				Total 5 marks

3.	$\frac{(2x-5)(2x+5)}{(2x+5)(3x-1)}$	$\frac{(2x-5)}{(3x-1)}$	3	M2 If not M2 then M1 for numerator or denominator correct A1
				Total 3 marks

4.	$\frac{y(x+4)}{x(x+4)}+\frac{2xy}{x(x+4)}=3$ **or** $\frac{y(x+4)}{x(x+4)}+\frac{2xy}{x(x+4)}=\frac{3x(x+4)}{x(x+4)}$		5	M1	LHS may be two separate fractions or one single fraction (brackets may or may not be removed on RHS and denominator)
	$y(x + 4) + 2xy = 3x(x + 4)$ **or** $\frac{xy+4y}{x(x+4)}+\frac{2xy}{x(x+4)}=3$ **or** $\frac{xy+4y}{x(x+4)}+\frac{2xy}{x(x+4)}=\frac{3x(x+4)}{x(x+4)}$			M1	LHS may be two separate fractions or one single fraction; if one fraction, numerator on LHS may or may not be simplified **(implies previous M1)** (brackets may or may not be removed on RHS and denominator)
	$xy+4y+2xy=3x^2+12x$ **or** $xy+4y\_2xy=3x(x+4)$ **or** $3xy+4y=3x^2+12x$ **or** $3xy+4y=3x(x+4)$			M1	(brackets may or may not be removed on RHS) **(implies previous two M1s)**
	$y(3x+4)=3x(x+4)$ **or** $y(3x+4)=3x^2+12x$			M1	LHS factorised correctly - expression in bracket on LHS may or may not be simplified
		$\frac{3x(x+4)}{3x+4}$		A1	$\frac{3x(x+4)}{3x+4}$ or $\frac{3x^2+12x}{3x+4}$ a fully correct method must be seen in order to award full marks
					Total 5 marks

5.	$\frac{3(2x-3)+2(x+1)}{(x+1)(2x-3)}$ (=1) $8x - 7 = (x + 1)(2x - 3)$ oe $2x^2 - 9x + 4$ (= 0) $(2x - 1)(x - 4)$ (=0)	x = ½ or 4	5	M1 or $3(2x - 3) + 2(x + 1) = (x+1)(2x - 3)$ M1 $8x - 7 =$ "$(x + 1)(2x - 3)$" A1 oe correct 3-part quadratic in the form $ax^2 + bx + c$ (=0) M1 or $\frac{--9 \pm \sqrt{(-9)^2 - 4\times 2\times 4}}{2\times 2}$ A1 dep on previous M1
				Total 5 marks

Question	Working	Answer	Mark	Notes
6.	$\frac{(x+4)(x-4)}{(x-4)(x-2)}$		3	M1 for $(x+4)(x-4)$ M1 for $(x-4)(x-2)$
		$\frac{x+4}{x-2}$		A1 cao
				Total 3 marks

7.	$\frac{4(x+1)-3(x-1)}{(x+1)(x-1)}$ $\frac{4x+4-3x+3}{(x+1)(x-1)}$	$\frac{x+7}{x^2-1}$	3	M1 For expressing both fractions correctly with a common denominator. Allow as two separate fractions. M1 For removing brackets correctly in a correct single fraction. Allow $x^2 - 1$ in denominator. A1 Allow $\frac{x+7}{(x+1)(x-1)}$

Total 3 marks

Question	Working	Answer	Mark	Notes
8.	$\frac{3(x-3)+4(x+2)}{(x+2)(x-3)}$ or $\frac{3(x-3)}{(x+2)(x-3)}+\frac{4(x+2)}{(x+2)(x-3)}$ (=2) $3(x-3)+4(x+2)=2(x+2)(x-3)$ $7x-1=2(x^2-x-6)$ oe $2x^2-9x-11$ (= 0) $(2x-11)(x+1)$ (=0)	$x=-1$ $x=5.5$ oe	5	M1 correct single fraction M1 correct removal of denominator to give a correct equation A1 correct 3 part quadratic (eg $2x^2-9x-11$ (= 0) or $2x^2-9x=11$ or $2x^2=9x+11$ oe) M1 for $(2x-11)(x+1)$ (=0) or a fully correct substitution into the quadratic formula *eg* $\frac{--9\pm\sqrt{(-9)^2-4\times2\times-11}}{2\times2}$ condone no brackets around – 9 or $\frac{9\pm\sqrt{169}}{4}$ A1 dep on last M1
				Total 5 marks

Question	Working	Answer	Mark	Notes
9.	$\frac{5}{2(x-3)}-\frac{x+2}{(x-3)(x-1)}$ **or** $\frac{5}{2x-6}-\frac{x+2}{(x-3)(x-1)}$			M1 $x^2 - 4x + 3$ factorised correctly
	$\frac{5(x-1)}{2(x-3)(x-1)}-\frac{2(x+2)}{2(x-3)(x-1)}$			M1 a correct common denominator – may be a single fraction or two fractions with correct numerators; denominator may be expanded correctly
	$\frac{5x-5-2x-4}{2(x-3)(x-1)}$			M1 correct single fraction with numerator expanded correctly; denominator may be expanded correctly
	$\frac{3(x-3)}{2(x-3)(x-1)}$			M1 correct factorisation of numerator ; denominator may be expanded correctly
		$\frac{3}{2(x-1)}$	5	A1 Accept $\frac{3}{2x-2}$
	Alternative $\frac{5(x^2-4x+3)}{(2x-6)(x^2-4x+3)}-\frac{(2x-6)(x+2)}{(2x-6)(x^2-4x+3)}$			M1 a correct common denominator – may be a single fraction or two fractions with correct numerators; denominator may be expanded correctly
	$\frac{5x^2-20x+15-2x^2-4x+6x+12}{(2x-6)(x^2-4x+3)}$			M1 correct single fraction with numerator expanded correctly; denominator may be expanded correctly;
	$\frac{3x^2-18x+27}{(2x-6)(x-3)(x-1)}$			M1 $x^2 - 4x + 3$ factorised correctly – could occur earlier
	$\frac{3(x-3)^2}{2(x-3)(x-3)(x-1)}$			M1 correct fully factorised numerator and denominator
		$\frac{3}{2(x-1)}$	5	A1 Accept $\frac{3}{2x-2}$
				Total 3 marks

Question	Working	Answer	Mark	Notes
10. (a)		$4x^2y$	2	B2 (B1 for ax^ny^m with two of $a = 4$; $n = 2$; $m = 1$)
(b)	$2(x-2)(x+2)$ **or** $(2x-4)(x+2)$ **or** $(x-2)(2x+4)$			M1 for numerator factorised
	$4x(x-2)$ **or** $2x(2x-4)$			M1 for denominator factorised
		$\frac{x+2}{2x}$	3	A1 accept $\frac{1}{2}+\frac{1}{x}$
	Alternative to (b): $\frac{2x^2-8}{4x^2-8x}=\frac{x^2-4}{2x^2-4x}=\frac{(x-2)(x+2)}{2x(x-2)}$	$\frac{x+2}{2x}$	3	**In order to use this mark scheme, correct simplification of the original fraction must be seen** M1 $(x-2)(x+2)$ M1 $2x(x-2)$ A1 accept $\frac{1}{2}+\frac{1}{x}$
				Total 5 marks