

4	b	E.g. $\frac{3(2x+1)+4(x-2)}{12}$ or $\frac{3(2x+1)}{12} + \frac{4(x-2)}{12}$		3	M1 for expressing both fractions correctly with a common denominator. Allow as two separate fractions.
		E.g. $\frac{6x+3+4x-8}{12}$			M1 for removing brackets correctly in a correct single fraction
			$\frac{10x-5}{12}$		A1 accept $\frac{5(2x-1)}{12}$

5		$\frac{5}{x+2} + \frac{3}{x(x+2)} (=2)$ or $\frac{5x}{x^2+2x} + \frac{3}{x^2+2x} (=2)$		5	M1 Factorising $x^2 + 2x$ in correct expression on LHS or for writing the two fractions over a common denominator.
		$\frac{5x+3}{x(x+2)} = 2$ or $\frac{5x+3}{x^2+2x} = 2$ or $5x+3 = 2x(x+2)$ oe or $5x+3 = 2x^2+4x$ oe			M1 Correct simplified single fraction = 2 or correct equation with no fractions.
		$2x^2 - x - 3 (=0)$			M1 Correct 3 term quadratic
		$(2x-3)(x+1) (=0)$ or $\frac{- -1 \pm \sqrt{(-1)^2 - 4 \times 2 \times (-3)}}{2 \times 2}$ or $\left(x - \frac{1}{4}\right)^2 - \frac{1}{16} - \frac{3}{2} = 0$ oe			M1ft independent For solving <i>their</i> 3 term quadratic equation using any correct method. If factorising, allow brackets which expanded give 2 out of 3 terms correct (if using formula or completing the square allow one sign error and some simplification – allow as far as eg $\frac{1 \pm \sqrt{1+24}}{4}$ or eg $\left(x - \frac{1}{4}\right)^2 = \frac{25}{16}$ oe
			1.5 and -1		A1 oe dep on M3
Total 5 marks					

Alternative Mark Scheme for question 5 (obtaining a cubic)					
5		$\frac{5(x^2+2x)+3(x+2)}{(x^2+2x)(x+2)} (=2)$ oe		5	M1 Correct fraction over a common denominator (may be 2 separate fractions)
		eg $5(x^2+2x)+3(x+2) = 2(x^2+2x)(x+2)$ oe			M1 Correct equation with no fractions.
		$2x^3+3x^2-5x-6 (=0)$			M1 Correct cubic
		$(x+1)(2x-3)(x+2) (=0)$			M1 For product of 3 correct linear factors.
			1.5 and -1		A1 oe dep on M3 Do not award A mark if extra solution (-2) given.
Total 5 marks					

6	(a)	$\frac{4(x+1)-3(x-2)}{(x-2)(x+1)}$ or $\frac{4(x+1)}{(x-2)(x+1)} - \frac{3(x-2)}{(x-2)(x+1)}$		3	M1 for expressing both fractions correctly with a common denominator.
		$\frac{4x+4-3x+6}{(x-2)(x+1)}$ or $\frac{4x+4-3x+6}{x^2-x-2}$			M1 for removing brackets in a single fraction with a correct denominator. Allow denominator to be expanded. Allow one error in the expansion of the numerator.
			$\frac{x+10}{(x-2)(x+1)}$		A1 accept $\frac{x+10}{x^2-x-2}$ oe

7	(a)	eg $20 \times \frac{9a-7}{5} - 20 \times \frac{3a-7}{4} = 20 \times 4.55 (= 91)$ or eg $4(9a-7) - 5(3a-7) = 20 \times 4.55$ or eg $\frac{4(9a-7)}{20} - \frac{5(3a-7)}{20} (= 4.55)$ or eg $\frac{4(9a-7) - 5(3a-7)}{20} (= 4.55)$		3	M1 For clear intention to multiply all terms by 20 (or 4×5) or a multiple of 20 oe or to express LHS as two fractions over 20 (or 4×5) or a multiple of 20 oe or as a single fraction with a denominator of 20 (or 4×5) or a multiple of 20 oe if expanded numerator, allow one error
		eg $36a - 28 - 15a + 35 = 20 \times 4.55$ or $21a = 84$ oe			M1 Expanding brackets and multiplying by denominator with no more than one sign error
			4		A1 dep on M1
	(b)	$p^2 = \frac{ac+8}{3+c}$		4	M1 for removing square root
		$3p^2 + cp^2 = ac + 8$			M1 for multiplying by denominator and expanding in a correct equation
		$cp^2 - ac = 8 - 3p^2$ or $3p^2 - 8 = ac - cp^2$			M1ft for gathering terms in c on one side and other terms the other side ft their equation dep on 2 terms in c and two other terms
			$c = \frac{8-3p^2}{p^2-a}$		A1 or $c = \frac{3p^2-8}{a-p^2}$
Total 7 marks					

8		$\frac{(5x-8)(5x+8)}{(5x+2)(x-3)} \times \frac{(x-5)(x-3)}{5x+8}$ or eg $\frac{(5x-8)(x-5)}{(5x+2)}(-x-7)$		4	M2 For factorising at least 2 of the quadratics correctly – could be implied by 2 factors cancelled correctly (M1 For factorising at least 1 of the 3 quadratics correctly)
		$\frac{(5x-8)(x-5) - (x-7)(5x+2)}{5x+2}$ oe or $\frac{5x^2 - 25x - 8x + 40 - (5x^2 - 35x + 2x - 14)}{5x+2}$ oe or $\frac{(25x^2 - 64)(x^2 - 8x + 15) - (x-7)(5x^2 - 13x - 6)(5x+8)}{(5x^2 - 13x - 6)(5x+8)}$ oe or $\frac{(5x-8)(x^2 - 8x + 15) - (x-7)(5x+2)(x-3)}{(5x+2)(x-3)}$ oe or $\frac{(25x^2 - 64)(x-5) - (x-7)(5x+2)(5x+8)}{(5x+2)(5x+8)}$ oe			M1 (indep (ft if M2 awarded)) For writing the fractions over a common denominator with or without brackets removed – need not be in simplest form Could be written as 2 separate fractions over a common denominator
			$\frac{54}{5x+2}$		A1 dep on M3
Total 4 marks					

9		eg $\frac{20}{x^2-36} - \frac{2(x+6)}{x^2-36}$ oe or $\frac{20}{(x-6)(x+6)} - \frac{2(x+6)}{(x-6)(x+6)}$ oe or $\frac{20(x-6)}{(x^2-36)(x-6)} - \frac{2(x+6)(x-6)}{(x^2-36)(x-6)}$ or $\frac{20-2(x+6)}{(x^2-36)(4-x)}$ oe		3	M1 for writing the first two fractions with a common denominator (may be a single denominator) or multiplying both fractions by $\frac{1}{4-x}$ and writing over a common denominator
		eg $\frac{8-2x}{x^2-36} \times \frac{1}{4-x}$ or $\frac{8-2x}{(x-6)(x+6)} \times \frac{1}{4-x}$ or $\frac{20x-2x^2-48}{(x^2-36)(x-6)} \times \frac{1}{4-x}$ oe $\frac{8-2x}{(x^2-36)(4-x)}$ oe			M1 for simplifying first 2 fractions to a single fraction and expanding and simplifying numerator – must be correct, and showing intention to multiply by $\frac{1}{4-x}$ or expanding the numerator of the full solution and writing as a single fraction
			$\frac{2}{x^2-36}$		A1 oe eg $\frac{2}{(x-6)(x+6)}$
Total 3 marks					

10	eg $\frac{(4x+3)(x-5)}{2x-1} \times \frac{(2x-1)(x-3)}{(x+5)(x-5)}$ or eg $\frac{(4x+3)(x-3)}{x+5} (+ (29-4x))$		4	M2 for factorising at least 2 of the quadratics correctly – could be implied by 2 factors cancelled correctly (M1 for factorising at least 1 of the 3 quadratics correctly)
	eg $\frac{(4x+3)(x-3) + (29-4x)(x+5)}{x+5}$ oe or eg $\frac{4x^2 - 9x - 9 + 145 + 9x - 4x^2}{x+5}$ oe			M1 for writing the correct fractions over a common denominator of $(x+5)$ with or without brackets removed – need not be in simplest form. Could be written as 2 separate fractions.
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{136}{x+5}$		A1
				Total 4 marks