Q1. Solve

$$\frac{x}{x+4} = \frac{x+7}{x+3}$$

x = ...

(Total 4 marks)

Q2. (a) Show that the equation

$$\frac{5}{x+2} = \frac{4-3x}{x-1}$$

can be rearranged to give $3x^2 + 7x - 13 = 0$

(3)

(b) Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

x = ... or x = ...

(3)
(Total 6 marks)

M1.

Working	Answer	Mark	Additional Guidance
$x(x + 3) = (x + 7)(x + 4)$	–3.5	4	**M1** for multiplying through by LCD = $(x + 4)(x + 3)$ **A1** for $x^2 + 3x = x^2 + 11x + 28$ **B1** for $-28 = 8$ **A1** cao
			Total for Question: 4 marks

M2.

	Working	Answer	Mark	Additional Guidance
(a)	$5(x - 1) = (4 - 3x)(x + 2)$ $5x - 5 = 4x + 8 - 3x^2 - 6x$ $(= 8 - 2x - 3x^2)$ $(3x^2 + 6x + 5x - 4x - 5 - 8 = 0)$ $3x^2 + 7x - 13 = 0$	Proof	3	**M1** multiply through by $(x - 1)(x + 2)$ and cancel correctly M1 expand $5(x - 1)$ and $(4 - 3x)(x + 2)$ correctly, need not be simplified **A1** rearrange to give required equation (dep on both Ms and fully correct algebra)
(b)	$a = 3, b = 7, c = -13$ $x = \frac{-7 \pm \sqrt{(7^2 + 4 \times 3 \times 13)}}{6}$ $= \frac{-7 \pm \sqrt{(49 + 156)}}{6}$ $= \frac{-7 \pm \sqrt{205}}{6}$ $x = 1.2196\ldots$ or $-3.55297\ldots$	1.22 –3.55	3	**M1** correct substitution in formula of $a = 3$, $b = 7$ and $c = \pm 13$ **M1** reduction to $\frac{-7 \pm \sqrt{205}}{6}$ **A1** 1.215 to 1.22 and –3.55 to –3.555 Or **M1** $\left(x + \frac{7}{6}\right)^2$

	Or $\left(x+\frac{7}{6}\right)^2-\left(\frac{7}{6}\right)^2-\frac{13}{3}=0$ $\left(x+\frac{7}{6}\right)=\pm\sqrt{\left(\frac{7}{6}\right)^2+\frac{13}{3}}$ x = 1.2196… or –3.55297….			**M1** $-\frac{7}{6}\pm\sqrt{\frac{205}{36}}$ **A1** 1.215 to 1.22 and –3.55 to –3.555 SC T&I 1 mark for 1 correct root, 3 marks for both correct roots
Total for Question: 6 marks				

E2. Responses to this question usually scored either full marks or zero marks. The usual correct methods seen were to multiply through directly by $(x - 1)(x + 2)$, cancel, expand and collect terms. The equivalent cross multiplication was also seen correctly carried out. A few candidates collected terms on the left hand side and then lost track of the signs or never got round to dealing with the denominator. An all too common error was to write $4 - 3x(x + 2)$ before expanding the brackets. Sometimes this was expanded correctly and other times as $4 - 3x^2 - 6x$.

Part (b) was a standard quadratic equation solution by formula. The most common errors included the detachment of the –7 term from the denominator to give the equivalent of $-b \pm \frac{\sqrt{b^2 - 4ac}}{2a}$ and the incorrect evaluation of the discriminant to give a value of –107 instead of the correct 205.

Some candidates got through to $\frac{-7 \pm \sqrt{205}}{6}$ but then misused their calculator and worked out the answers to $-7 \pm \frac{\sqrt{205}}{6}$.

A few enterprising students attempted the solution by completing the square. Even if carried through to a conclusion these candidates often lost marks through premature approximation.