Question number	Scheme		Marks	
3.	$\frac{(5-\sqrt{3})}{(2+\sqrt{3})} \times \frac{(2-\sqrt{3})}{(2-\sqrt{3})}$		M1	
	$= \frac{10-2\sqrt{3}-5\sqrt{3}+(\sqrt{3})^2}{\dots}$ $\left(= \frac{10-7\sqrt{3}+3}{\dots} \right)$		M1	
	$(=13-7\sqrt{3})$ $\left(\text{Allow } \frac{13-7\sqrt{3}}{1}\right)$	13 (a = 13)	A1	
		$-7\sqrt{3}$ ($b = -7$)	A1	(4)
				4

1[st] M: Multiplying top and bottom by $(2-\sqrt{3})$. (As shown above is sufficient).

2[nd] M: Attempt to multiply out numerator $(5-\sqrt{3})(2-\sqrt{3})$. Must have at least 3 terms correct.

Final answer: Although 'denominator = 1' may be implied, the $13-7\sqrt{3}$ must obviously be the final answer (not an intermediate step), to score full marks. (Also M0 M1 A1 A1 is not an option).

The A marks cannot be scored unless the 1[st] M mark has been scored, but this 1[st] M mark could be implied by correct expansions of both numerator and denominator.

It is possible to score M1 M0 A1 A0 or M1 M0 A0 A1 (after 2 correct terms in the numerator).

Special case: If numerator is multiplied by $(2+\sqrt{3})$ instead of $(2-\sqrt{3})$, the 2[nd] M can still be scored for at least 3 of these terms correct:
$10-2\sqrt{3}+5\sqrt{3}-(\sqrt{3})^2$.
The maximum score in the special case is 1 mark: M0 M1 A0 A0.

Answer only: Scores no marks.

Alternative method:

$5-\sqrt{3} = (a+b\sqrt{3})(2+\sqrt{3})$

$(a+b\sqrt{3})(2+\sqrt{3}) = 2a + a\sqrt{3} + 2b\sqrt{3} + 3$ M1: At least 3 terms correct.

$5 = 2a + 3b$

$-1 = a + 2b$ $a = \dots$ or $b = \dots$ M1: Form and attempt to solve simultaneous equations.

$a = 13,\quad b = -7$ A1, A1

Question Number	Scheme	Marks
3	$\sqrt{7}^2 + 2\sqrt{7} - 2\sqrt{7} - 2^2$, or $7 - 4$ or an exact equivalent such as $\sqrt{49} - 2^2$ $= \mathbf{3}$	M1 A1 **[2]**
	M1 for an expanded expression. At worst, there can be <u>one wrong term</u> and <u>one wrong sign</u>, or <u>two wrong signs</u>. e .g. $7 + 2\sqrt{7} - 2\sqrt{7} - 2$ is M1 (one wrong term -2) $7 + 2\sqrt{7} + 2\sqrt{7} + 4$ is M1 (two wrong signs $+2\sqrt{7}$ and $+4$) $7 + 2\sqrt{7} + 2\sqrt{7} + 2$ is M1 (one wrong term $+2$, one wrong sign $+2\sqrt{7}$) $\sqrt{7} + 2\sqrt{7} - 2\sqrt{7} + 4$ is M1 (one wrong term $\sqrt{7}$, one wrong sign $+4$) $\sqrt{7} + 2\sqrt{7} - 2\sqrt{7} - 2$ is M0 (two wrong terms $\sqrt{7}$ and -2) $7 + \sqrt{14} - \sqrt{14} - 4$ is M0 (two wrong terms $\sqrt{14}$ and $-\sqrt{14}$) If only 2 terms are given, they must be correct, i.e. (7 – 4) or an equivalent unsimplified version to score M1. The terms can be seen <u>separately</u> for the M1. Correct answer with <u>no working</u> scores both marks.	

June 2009
6663 Core Mathematics C1
Mark Scheme

Question Number	Scheme	Marks
Q1 (a)	$(3\sqrt{7})^2 = 63$	B1 (1)
(b)	$(8+\sqrt{5})(2-\sqrt{5}) = 16 - 5 + 2\sqrt{5} - 8\sqrt{5}$	M1
	$= 11, \ -6\sqrt{5}$	A1, A1 (3) **[4]**
(a) (b)	B1 for 63 only M1 for an attempt to expand their brackets with $\geq$ 3 terms correct. They may collect the $\sqrt{5}$ terms to get $16-5-6\sqrt{5}$ Allow $-\sqrt{5}\times\sqrt{5}$ or $-\left(\sqrt{5}\right)^2$ or $-\sqrt{25}$ instead of the -5 These 4 values may appear in a list or table but they should have minus signs included **The next two marks should be awarded for the final answer but check that correct values follow from correct working. Do not use ISW rule** 1st A1 for 11 from 16 – 5 or $-6\sqrt{5}$ from $-8\sqrt{5}+2\sqrt{5}$ 2nd A1 for both 11 and $-6\sqrt{5}$. S.C - Double sign error in expansion For $16-5-2\sqrt{5}+8\sqrt{5}$ leading to 11 + … allow one mark	

<table>
<tr><th>Question number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>Q2</td><td>(a) $(7+\sqrt{5})(3-\sqrt{5}) = 21-5+3\sqrt{5}-7\sqrt{5}$ Expand to get 3 or 4 terms
$=16, \ -4\sqrt{5}$ (1st A for 16, 2nd A for $-4\sqrt{5}$)
(i.s.w. if necessary, e.g. $16-4\sqrt{5} \rightarrow 4-\sqrt{5}$)</td><td>M1
A1, A1
(3)</td></tr>
<tr><td></td><td>(b) $\frac{7+\sqrt{5}}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}}$ (This is sufficient for the M mark)
Correct denominator without surds, i.e. $9-5$ or 4
$4-\sqrt{5}$ or $4-1\sqrt{5}$</td><td>M1
A1
A1
(3)
[6]</td></tr>
<tr><td></td><td>(a) M1: Allowed for an attempt giving 3 or 4 terms, with at least 2 correct (even if unsimplified).
e.g. $21-\sqrt{5}^2+\sqrt{15}$ scores M1.
Answer only: $16-4\sqrt{5}$ scores full marks
One term correct scores the M mark by implication,
e.g. $26-4\sqrt{5}$ scores M1 A0 A1

(b) Answer only: $4-\sqrt{5}$ scores full marks
One term correct scores the M mark by implication,
e.g. $4+\sqrt{5}$ scores M1 A0 A0
$16-\sqrt{5}$ scores M1 A0 A0

Ignore subsequent working, e.g. $4-\sqrt{5}$ so $a=4$, $b=1$

Note that, as always, A marks are dependent upon the preceding M mark,
so that, for example, $\frac{7+\sqrt{5}}{3+\sqrt{5}} \times \frac{3+\sqrt{5}}{3-\sqrt{5}} = \frac{........}{4}$ is M0 A0.

<u>Alternative</u>
$(a+b\sqrt{5})(3+\sqrt{5}) = 7+\sqrt{5}$, then form simultaneous equations in a and b. M1
Correct equations: $3a+5b=7$ and $3b+a=1$ A1
$a=4$ and $b=-1$ A1</td><td></td></tr>
</table>

June 2010
Core Mathematics C1 6663
Mark Scheme

Question Number	Scheme	Marks
1.	$\left(\sqrt{75}-\sqrt{27}\right)=5\sqrt{3}-3\sqrt{3}$	M1
	$=2\sqrt{3}$	A1 **2**
	Notes	
	M1 for $5\sqrt{3}$ from $\sqrt{75}$ or $3\sqrt{3}$ from $\sqrt{27}$ seen anywhere A1 for $2\sqrt{3}$; allow $\sqrt{12}$ or $k=2, x=3$ or allow $k=1, x=12$ Some Common errors $\sqrt{75}-\sqrt{27}=\sqrt{48}$ leading to $4\sqrt{3}$ is M0A0 $25\sqrt{3}-9\sqrt{3}=16\sqrt{3}$ is M0A0	