

Surds Exam Questions MS (from OCR 4721)

Q1, (OCR Jan 2007, Q1)

$$\frac{5}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$$

$$= \frac{5(2+\sqrt{3})}{4-3}$$

$$= 10+5\sqrt{3}$$

M1		Multiply top and bottom by $\pm(2+\sqrt{3})$
A1		$(2+\sqrt{3})(2-\sqrt{3}) = 1$ (may be implied)
A1	3 3	$10+5\sqrt{3}$

Q2, (Jan 2009, Q1)

$$3\sqrt{5} + \frac{20\sqrt{5}}{5}$$

$$= 7\sqrt{5}$$

B1		$3\sqrt{5}$ soi
M1		Attempt to rationalise $\frac{20}{\sqrt{5}}$
A1	3 3	cao

Q3, (Jun 2009, Q2)

$$\frac{(8+\sqrt{7})(2-\sqrt{7})}{(2+\sqrt{7})(2-\sqrt{7})}$$

$$= \frac{9-6\sqrt{7}}{4-7}$$

$$= -3+2\sqrt{7}$$

M1		Multiply numerator and denominator by conjugate
A1		Numerator correct and simplified
A1		Denominator correct and simplified
A1	4 4	cao

Q4, (Jun 2010, Q3)

(i) $\frac{12(3-\sqrt{5})}{(3+\sqrt{5})(3-\sqrt{5})}$

$$= \frac{12(3-\sqrt{5})}{9-5}$$

$$= 9-3\sqrt{5}$$

M1		Multiply numerator and denom by $3-\sqrt{5}$
A1		$(3+\sqrt{5})(3-\sqrt{5}) = 9-5$
A1	3	

(ii) $3\sqrt{2}-\sqrt{2}$

$$= 2\sqrt{2}$$

M1		Attempt to express $\sqrt{18}$ as $k\sqrt{2}$
A1	2 5	

Q5, (Jun 2011, Q5)

<p>(i) $10\sqrt{3} - 4\sqrt{3}$</p> <p>$= 6\sqrt{3}$</p>	<p>M1 Attempt to express both surds in terms of $\sqrt{3}$</p> <p>B1 One term correct</p> <p>A1 3 Fully correct (not $\pm 6\sqrt{3}$)</p>
<p>(ii) $\frac{\sqrt{5}(15 + \sqrt{40})}{5}$</p> <p>$= \frac{15\sqrt{5} + 10\sqrt{2}}{5}$</p> <p>$= 3\sqrt{5} + 2\sqrt{2}$</p>	<p>M1 Multiply numerator and denominator by $\sqrt{5}$ or $-\sqrt{5}$ or attempt to express both terms of numerator in terms of $\sqrt{5}$ (e.g. dividing both terms by $\sqrt{5}$)</p> <p>B1 One of a, b correctly obtained</p> <p>A1 3 Both a = 3 and b=2 correctly obtained</p> <p>6</p>

Q6, (Jan 2012, Q1)

<p>$\frac{15 + \sqrt{3}}{3 - \sqrt{3}} \times \frac{3 + \sqrt{3}}{3 + \sqrt{3}}$</p> <p>$= \frac{48 + 18\sqrt{3}}{9 - 3}$</p> <p>$= 8 + 3\sqrt{3}$</p>	<p>M1 Multiply top and bottom by $\pm(3 + \sqrt{3})$</p> <p>A1 Numerator correct and simplified</p> <p>A1 Denominator correct and simplified to 6</p> <p>A1 cao</p> <p>[4]</p>
---	--

Q7, (Jun 2016, Q2)

<p>$\frac{3 + \sqrt{20}}{3 + \sqrt{5}} \times \frac{3 - \sqrt{5}}{3 - \sqrt{5}}$</p> <p>$\frac{-1 + 3\sqrt{5}}{9 - 5}$</p> <p>$-\frac{1}{4} + \frac{3}{4}\sqrt{5}$</p>	<p>M1 Attempt to rationalise the denominator – must attempt to multiply</p> <p>B1 $\sqrt{20} = 2\sqrt{5}$ soi</p> <p>A1 Either numerator or denominator correct and simplified to no more than two terms</p> <p>A1 Fully correct and fully simplified. Allow $\frac{-1 + 3\sqrt{5}}{4}$, order reversed etc.</p> <p>[4] Do not ISW if then multiplied by 4 etc.</p>
---	---