

Surds Mark Scheme:		
1(a)	$\frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$	[1]
1(b)	$\frac{\sqrt{7}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{21}}{3}$	[1]
1(c)	$\frac{\sqrt{3} + 1}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{3\sqrt{2} + \sqrt{6}}{6}$	[1]
1(d)	$\frac{\sqrt{18} + 8}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$	[1] Correct choice of multiplication
	$\frac{3\sqrt{6} + 8\sqrt{3}}{3}$	[1] Correct simplification with correct answer
2(a)	$\frac{1}{3 - \sqrt{2}} \times \frac{3 + \sqrt{2}}{3 + \sqrt{2}} = \frac{3 + \sqrt{2}}{3^2 - (\sqrt{2})^2}$	[1] Correct choice of multiplication
	$\frac{3 + \sqrt{2}}{7}$	[1] Correct answer
2(b)	$\frac{3}{\sqrt{6} + 3} \times \frac{-\sqrt{6} + 3}{-\sqrt{6} + 3}$	[1] Correct choice of multiplication
	$\frac{9 - 3\sqrt{6}}{-6 + 9} = \frac{9 - 3\sqrt{6}}{3} = 3 - \sqrt{6}$	[1] Simplifying and correct answer
2(c)	$\frac{10}{\sqrt{7} - 6} \times \frac{-\sqrt{7} - 6}{-\sqrt{7} - 6}$	[1] Correct choice of multiplication
	$\frac{-60 - 10\sqrt{7}}{-7 + 36} = \frac{-60 - 10\sqrt{7}}{29}$	[1] Simplifying and correct answer
3(a)	$\frac{\sqrt{3} + 1}{\sqrt{5} + 2} \times \frac{-\sqrt{5} + 2}{-\sqrt{5} + 2} = \frac{-\sqrt{15} - \sqrt{5} + 2\sqrt{3} + 2}{-5 + 4}$	[1] Correct choice of multiplication
	$= \sqrt{15} + \sqrt{5} - 2\sqrt{3} - 2$	[1] Simplifying and correct answer
3(b)	$\frac{3 + \sqrt{2}}{\sqrt{6} + 3} \times \frac{-\sqrt{6} + 3}{-\sqrt{6} + 3} = \frac{-3\sqrt{6} + 9 + 3\sqrt{2} - 2\sqrt{3}}{-6 + 9}$	[1] Correct choice of multiplication
	$-\sqrt{6} + 3 + \sqrt{2} - \frac{2}{3}\sqrt{3}$	[1] Simplifying and correct answer
3(c)	$\frac{\sqrt{21} + 7}{\sqrt{21} - 7} \times \frac{\sqrt{21} + 7}{\sqrt{21} + 7}$	[1] Correct choice of multiplication
	$= \frac{(\sqrt{21})^2 + 2 \times 7 \times \sqrt{21} + 7^2}{(\sqrt{21})^2 - 7^2} = \frac{70 + 14\sqrt{21}}{-28}$	[1] Simplifying
	$= -\frac{5 + \sqrt{21}}{2}$	[1] Correct answer

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4(a)	$\frac{8 + \sqrt{5}}{4 - \sqrt{5}} \times \frac{4 + \sqrt{5}}{4 + \sqrt{5}}$	[1] Correct choice of multiplication
	$= \frac{32 + 12\sqrt{5} + (\sqrt{5})^2}{(4)^2 - (\sqrt{5})^2} = -\frac{37 + 12\sqrt{5}}{11}$	[1] Simplifying
4(b)	$\frac{1}{(5 - \sqrt{2})^2} \times \frac{(5 + \sqrt{2})^2}{(5 + \sqrt{2})^2}$	[1] Correct choice of multiplication (Alternatively multiply out the brackets then rationalise)
	$= \frac{5^2 + 2 \times 5 \times \sqrt{2} + (\sqrt{2})^2}{(5^2 - (\sqrt{2})^2)^2} = \frac{27 + 10\sqrt{2}}{(25 - 2)^2}$	[1] Simplifying
	$= \frac{27 + 10\sqrt{2}}{529}$	[1] Correct answer
5	$\frac{6 - 5\sqrt{5}}{3\sqrt{5} - 2} \times \frac{3\sqrt{5} + 2}{3\sqrt{5} + 2}$	[1] Correct choice of multiplication
	$\frac{18\sqrt{5} + 12 - 10\sqrt{5} - 15 \times 5}{(3\sqrt{5})^2 - 2^2}$	[1] Simplifying
	$\frac{-63 + 8\sqrt{5}}{41}$	[1] Expansion of brackets and simplifying
	$-\frac{63}{41} + \frac{8}{41}\sqrt{5}$	[1] Answer must be in this format for the final mark.
6	$\frac{4}{3} \sqrt{\frac{300}{4}} + \frac{10}{\sqrt{3}} = \frac{4}{3} \sqrt{75} + \frac{10}{\sqrt{3}}$	[1] Division
	$\frac{4}{3} \sqrt{75} + \frac{10}{\sqrt{3}} = \frac{4}{3} \sqrt{25 \times 3} + \frac{10}{\sqrt{3}}$	[1] Simplifying the surd
	$= \frac{4 \times 5}{3} \sqrt{3} + \frac{10}{\sqrt{3}} = \frac{20}{3} \sqrt{3} + \frac{10}{\sqrt{3}} = \frac{20\sqrt{3}}{3} + \frac{10\sqrt{3}}{3}$	[1] Simplifying
	$= 10\sqrt{3}$	[1] Correct answer
7	$\left(\frac{4}{3}\right)^{\frac{1}{2}} + \left(\frac{1}{3}\right)^{-\frac{1}{2}} = \frac{\sqrt{4}}{\sqrt{3}} + \frac{\sqrt{3}}{\sqrt{1}} = \frac{\sqrt{4}}{\sqrt{3}} + \left(\frac{\sqrt{3}}{\sqrt{1}} \times \frac{\sqrt{3}}{\sqrt{3}}\right)$	[1] Fractional powers written in surd form and simplification
	$\frac{\sqrt{4}}{\sqrt{3}} + \frac{3}{\sqrt{3}} = \frac{2}{\sqrt{3}} + \frac{3}{\sqrt{3}} = \frac{5}{\sqrt{3}}$	[1] Simplifying
	$= \frac{5}{3}\sqrt{3}$	[1] Correct answer

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8	$\sqrt{4 \frac{12}{9}} = \sqrt{\frac{48}{9}}$	[1] Fractional surd created
	$\left(\frac{1}{3}\right)^{\frac{1}{2}} = \sqrt{\frac{1}{3}}$	[1] Fractional surd created
	$\sqrt{\frac{48}{9}} + \sqrt{\frac{1}{3}} = \frac{\sqrt{48}}{\sqrt{9}} + \frac{1}{\sqrt{3}} = \frac{4\sqrt{3}}{3} + \frac{1}{\sqrt{3}}$	[1] Simplifying
	$\frac{4\sqrt{3}}{3} + \frac{1}{\sqrt{3}} = \frac{4\sqrt{3}}{3} + \frac{\sqrt{3}}{3} = \frac{5\sqrt{3}}{3}$	[1] Rationalising denominator and collecting like terms

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