

Year 11 to Year 12 Transition Paper

Algebraic Expressions

Mark Scheme

Question	Scheme	Marks
1	for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs	M1
	$12x^2 - 5x - 3$	A1
(2 marks)		

Question	Scheme	Marks
2(a)	For expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs	M1
	$2x^2 - 7x - 4$	A1
		(2)
(b)	for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs	M1
	$9x^2 - 30xy + 25y^2$	A1
		(2)
(4 marks)		

Question	Scheme	Marks
3(a)	for expanding bracket to obtain 4 terms with all 4 correct without considering signs or for 3 terms out of 4 correct with correct signs	M1
	$x^2 + xy - 2y^2$	A1
		(2)
(b)	for correct factorisation (B1 for a partial correct factorisation which shows a product of 3 or 4 factors) $6ut^2(2u + 3t)$	B2
		(2)
(4 marks)		

Question	Scheme	Marks
4(a)	$\sqrt{50} - \sqrt{18} = 5\sqrt{2} - 3\sqrt{2}$	M1
	$= 2\sqrt{2}$	A1
		(2)
(b)	$\frac{12\sqrt{3}}{\sqrt{50} - \sqrt{18}} = \frac{12\sqrt{3}}{"2"\sqrt{2}}$	M1
	$= \frac{12\sqrt{3}}{"2"\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{12\sqrt{6}}{4}$	dM1
	$= 3\sqrt{6}$ or $b = 3, c = 6$	A1
		(3)
(5 marks)		

Question	Scheme	Marks
5	$\frac{7+\sqrt{5}}{\sqrt{5}-1} \times \frac{(\sqrt{5}+1)}{(\sqrt{5}+1)}$	M1
	$= \frac{\dots}{4}$	A1 cso
	$(7+\sqrt{5})(\sqrt{5}+1) = 7\sqrt{5} + 5 + 7 + \sqrt{5}$	M1
	$3 + 2\sqrt{5}$	A1 cso
(4 marks)		

Question	Scheme	Marks
6(a)	20	B1
		(1)
(b)	$\frac{\sqrt{2}}{2\sqrt{5}-3\sqrt{2}} \times \frac{2\sqrt{5}+3\sqrt{2}}{2\sqrt{5}+3\sqrt{2}}$	M1
	$= \frac{\dots}{2}$	A1
	Numerator = $\sqrt{2}(2\sqrt{5} \pm 3\sqrt{2}) = 2\sqrt{10} \pm 6$	M1
	$\frac{\sqrt{2}}{2\sqrt{5}-3\sqrt{2}} = \frac{2\sqrt{10}+6}{2} = 3+\sqrt{10}$	A1
		(4)
(5 marks)		

Question	Scheme	Marks
7(a)	$8wy^2(3wy - 1)$ (B1 for a partial correct factorisation which shows a product of at least 3 factors, eg $8wy(3wy^2 - y)$, $4y(6w^2y^2 - 2wy)$)	B2cao
		(2)
(b)	for $3e(f - 1)$ and $2(f - 1)$ or $f(3e + 2)$ and $-1(3e + 2)$	M1
	$(3e + 2)(f - 1)$	A1oe
		(2)
(c)	$(5 - 2x)(5 + 2x)$ for $(5 - 2x)(5 + 2x)$ oe, eg $-(2x - 5)(2x + 5)$	B1
		(1)
(5 marks)		

Question	Scheme		Marks
8(a)	$(3\sqrt{7})^2 = 63$	Cao	B1
			(1)
(b)	$\frac{\sqrt{3}}{5\sqrt{3} + 6\sqrt{2}} \times \frac{5\sqrt{3} - 6\sqrt{2}}{5\sqrt{3} - 6\sqrt{2}}$	For rationalising the denominator by a correct method (i.e. multiply numerator and denominator by $5\sqrt{3} - 6\sqrt{2}$). This statement is sufficient.	M1
	$= \frac{15 - 6\sqrt{6}}{\dots} \text{ or } = \frac{\dots}{75 - 72}$	For $15 - 6\sqrt{6}$ (or $3 \times 5 - 6\sqrt{6}$) in the numerator or $75 - 72$ (or 3 from correct work) in the denominator seen at some point i.e. apply isw	A1
	$= \frac{15 - 6\sqrt{6}}{\dots} \text{ and } = \frac{\dots}{75 - 72}$	For $15 - 6\sqrt{6}$ (or $3 \times 5 - 6\sqrt{6}$) in the numerator and $75 - 72$ (or 3 from correct work) in the denominator seen at some point i.e. apply isw	A1
	$5 - 2\sqrt{6}$	Fully correct expression. Allow $a = 5$ $b = -2$, $c = 6$ but apply isw e.g. $5 - 2\sqrt{6}$ followed by $a = 5$ $b = 2$, $c = 6$	A1
			(4)
			(5 marks)

Question	Scheme		Marks
9(a)	$8^{\frac{1}{3}} = 2$ or $8^5 = 32768$		M1
	$\left(8^{\frac{5}{3}} = \right) 32$		A1 cao
			(2)
(b)	$\left(2x^{\frac{1}{2}}\right)^3 = 2^3 x^{\frac{3}{2}}$		M1
	$\frac{8x^{\frac{3}{2}}}{4x^2} = 2x^{-\frac{1}{2}}$ or $\frac{2}{\sqrt{x}}$		dM1A1
			(3)
			(5 marks)

Question	Scheme	Marks
10(a)	$3x^2$	B1cao
		(1)
(b)	a^{10}	B1cao
		(1)
(c)	x^6	B1cao
		(1)
(d)	a correct first step eg $4q^2$ or $\frac{7}{2} - 2$	M1oe
	for $d = 4$	A1
	for $f = \frac{3}{2}$ oe	A1oe
		(3)
		(6 marks)

Question	Scheme	Marks
11(a)	B2 cao (B1 for a partial correct factorisation which shows a product of at least 3 factors) $9xd(7x + d)$	B2
		(2)
(b)	for start to method of factorisation e.g. $4b(a - 2)$ and $2(a - 2)$	M1
	for factorisation as product of 1 factor in terms of a and 1 factor in terms of b e.g. $(4b + 2)(a - 2)$	M1
	$2(a - 2)(2b + 1)$	A1
		(3)
(c)	$(x - 3t)(x + 3t)$	B1
		(1)
		(6 marks)

Question	Scheme	Marks
12(a)	$\sqrt{32} = 4\sqrt{2}$ or $\sqrt{18} = 3\sqrt{2}$	B1
	$(\sqrt{32} + \sqrt{18}) = \underline{7\sqrt{2}}$	B1
		(2)
(b)	$\times \frac{3-\sqrt{2}}{3-\sqrt{2}}$ or $\times \frac{-3+\sqrt{2}}{-3+\sqrt{2}}$ seen	M1
	$\left[\frac{\sqrt{32} + \sqrt{18}}{3+\sqrt{2}} \times \frac{3-\sqrt{2}}{3-\sqrt{2}} = \right] \frac{a\sqrt{2}(3-\sqrt{2})}{[9-2]} \rightarrow \frac{3a\sqrt{2}-2a}{[9-2]}$ (or better)	M1
	$= \underline{3\sqrt{2}, -2}$	A1, A1
		(4)
(6 marks)		

Question	Scheme	Marks
13(a)	p^8	B1cao
		(1)
(b)	$64t^3$ (B1 for $64t^n, n \neq 3$ or $ct^3, c \neq 64$)	B2cao
		(2)
(3 marks)		

Question	Scheme	Marks
14(a)	$32^{\frac{1}{5}} = 2$	B1
		(1)
(b)	For 2^{-2} or $\frac{1}{4}$ or $\left(\frac{1}{2}\right)^2$ or 0.25 as coefficient of x^k , for any value of k including $k = 0$	M1
	Correct index for x so Ax^{-2} or $\frac{A}{x^2}$ o.e. for any value of A	B1
	$= \frac{1}{4x^2}$ or $0.25x^{-2}$	A1 cao
		(3)
(4 marks)		

Question	Scheme			Marks
15(i)	$(5 - \sqrt{8})(1 + \sqrt{2})$			
	$= 5 + 5\sqrt{2} - \sqrt{8} - 4$			M1
	$= 5 + 5\sqrt{2} - 2\sqrt{2} - 4$			B1
	$= 1 + 3\sqrt{2}$			A1
				(3)
(ii)	Method 1	Method 2	Method 3	
	Either $\sqrt{80} + \frac{30}{\sqrt{5}} \left(\frac{\sqrt{5}}{\sqrt{5}} \right)$	Or $\left(\frac{\sqrt{400} + 30}{\sqrt{5}} \right) \frac{\sqrt{5}}{\sqrt{5}}$	$\sqrt{80} + \frac{\sqrt{900}}{\sqrt{5}} = \sqrt{80} + \sqrt{180}$	M1
	$= 4\sqrt{5} + \dots$	$= \left(\frac{20 + \dots}{\dots} \right) \dots$	$= 4\sqrt{5} + \dots$	B1
	$= 4\sqrt{5} + 6\sqrt{5}$	$= \left(\frac{50\sqrt{5}}{5} \right)$	$= 4\sqrt{5} + 6\sqrt{5}$	
	$= 10\sqrt{5}$			A1
(6 marks)				

Question	Scheme	Marks
16(a)	$\left\{ (32)^{\frac{3}{5}} \right\} = (\sqrt[5]{32})^3 \text{ or } \sqrt[5]{(32)^3} \text{ or } 2^3 \text{ or } \sqrt[5]{32768}$	M1
	$= 8$	A1
		(2)
(b)	$\left\{ \left(\frac{25x^4}{4} \right)^{-\frac{1}{2}} \right\} = \left(\frac{4}{25x^4} \right)^{\frac{1}{2}} \text{ or } \left(\frac{5x^2}{2} \right)^{-1} \text{ or } \frac{1}{\left(\frac{25x^4}{4} \right)^{\frac{1}{2}}}$	M1
	$= \frac{2}{5x^2} \text{ or } \frac{2}{5}x^{-2}$	A1
		(2)
		(4 mark)

Question	Scheme	Marks	
17	$\left\{ \frac{2}{\sqrt{12} - \sqrt{8}} \right\} = \frac{2}{(\sqrt{12} - \sqrt{8})} \times \frac{(\sqrt{12} + \sqrt{8})}{(\sqrt{12} + \sqrt{8})}$	Writing this is sufficient for M1.	M1
	$= \frac{2(\sqrt{12} + \sqrt{8})}{12 - 8}$	For 12 - 8. This mark can be implied.	A1
	$= \frac{2(2\sqrt{3} + 2\sqrt{2})}{12 - 8}$		B1 B1
	$= \sqrt{3} + \sqrt{2}$		A1 cso
		(5 marks)	

Question	Scheme	Marks
18	$64x^2$ for $64x^2$ (B1 for 64 or x^2)	B2
		(2 marks)

Question	Scheme	Marks
19(a)	x^2	B1cao
		(1)
(b)	for $4^3(=64)$ or $y^3 \times \frac{2}{3} (=y^2)$	M1
	$64y^2$	A1cao
		(2)
(c)	$a = 3, b = -2, n = 4$ for all 3 correct values (B1 for 2 correct values)	B2
		(2)
(d)	for one correct expansion or use of difference of 2 squares	M1
	$24y$	A1cao
		(2)
		(7 marks)

Question	Scheme	Marks	
20(i) Way 1	$\sqrt{48} = \sqrt{16}\sqrt{3}$ or $\frac{6}{\sqrt{3}} = 6\frac{\sqrt{3}}{3}$	Writes one of the terms of the given expression correctly in terms of $\sqrt{3}$	M1
	$\Rightarrow \sqrt{48} - \frac{6}{\sqrt{3}} = 2\sqrt{3}$	A correct answer of $2\sqrt{3}$. A correct answer with no working implies both marks.	A1
			(2)
(i) Way 2	$\sqrt{48} = 2\sqrt{12}$ or $\frac{6}{\sqrt{3}} = \sqrt{12}$	Writes one of the terms of the given expression correctly in terms of $\sqrt{12}$	M1
	$2\sqrt{12} - \sqrt{12} = \sqrt{12} = 2\sqrt{3}$	A correct answer of $2\sqrt{3}$. A correct answer with no working implies both marks.	A1
			(2)
(i) Way 3	$\sqrt{48} = \frac{12}{\sqrt{3}}$ or $\sqrt{48} = \frac{\sqrt{144}}{\sqrt{3}}$	Writes $\sqrt{48}$ correctly as $\frac{12}{\sqrt{3}}$ or $\frac{\sqrt{144}}{\sqrt{3}}$	M1
	$\frac{12}{\sqrt{3}} - \frac{6}{\sqrt{3}} = \frac{6}{\sqrt{3}} = 2\sqrt{3}$	A correct answer of $2\sqrt{3}$. A correct answer with no working implies both marks.	A1
			(2)
(i) Way 4	$\sqrt{48} - \frac{6}{\sqrt{3}} = \frac{\sqrt{3}\sqrt{48} - \dots}{\sqrt{3}} = \frac{12 - \dots}{\sqrt{3}}$ or $\sqrt{48} - \frac{6}{\sqrt{3}} = \frac{\sqrt{3}\sqrt{48} - \dots}{\sqrt{3}} = \frac{\sqrt{144} - \dots}{\sqrt{3}}$	Writes $\sqrt{48}$ correctly as $\frac{12}{\sqrt{3}}$ or $\frac{\sqrt{144}}{\sqrt{3}}$	M1
	$\frac{12 - 6}{\sqrt{3}} = \frac{6}{\sqrt{3}} = 2\sqrt{3}$	A correct answer of $2\sqrt{3}$. A correct answer with no working implies both marks.	A1
			(2)

Question	Scheme	Marks	
(ii) Way 1	$81=3^4$ or $\log_3 81=6x-3$	For $81=3^4$ or $\log_3 81=6x-3$. This may be implied by subsequent work.	B1
	$3^{6x-3}=3^4$ or $\log_3 81=6x-3$ $\Rightarrow 4=6x-3 \Rightarrow x=...$	Solves an equation of the form $6x-3=k$ where k is their power of 3.	M1
	$\Rightarrow x=\frac{4+3}{6}=\frac{7}{6}$	$\frac{7}{6}$ or $1\frac{1}{6}$ or 1.16 with a dot over the 6	A1
			(3)
Way 2	$3=81^{\frac{1}{4}}$	For $3=81^{\frac{1}{4}}$. This may be implied by subsequent work.	B1
	$81^{\frac{6x-3}{4}}=81 \Rightarrow \frac{6x-3}{4}=1 \Rightarrow x=...$	Solves an equation of the form $k(6x-3)=1$ where k is their power of 81.	M1
	$\Rightarrow x=\frac{4+3}{6}=\frac{7}{6}$	$\frac{7}{6}$ or $1\frac{1}{6}$ or 1.16 with a dot over the 6	A1
			(3)
Way 3	$81=9^2$ and $3=9^{\frac{1}{2}}$	For $81=9^2$ and $3=9^{\frac{1}{2}}$. This may be implied by subsequent work.	B1
	$9^{\frac{6x-3}{2}}=9^2 \Rightarrow \frac{6x-3}{2}=2 \Rightarrow x=...$	Solves an equation of the form $p(6x-3)=q$ where p is their power of 9 for the 3 and q is their power of 9 for the 81.	M1
	$\Rightarrow x=\frac{4+3}{6}=\frac{7}{6}$	$\frac{7}{6}$ or $1\frac{1}{6}$ or 1.16 with a dot over the 6	A1
			(3)
Way 4	$3^{6x-3}=3^{6x} \times 3^{-3}$	For writing 3^{6x-3} correctly in terms of 3^{6x}	B1
	$3^{6x}=81 \times 3^3=3^7$ $\Rightarrow 6x=7 \Rightarrow x=...$	Solves an equation of the form $6x=k$ where k is their $3^3 \times 81$ written as a power of 3.	M1
	$\Rightarrow x=\frac{7}{6}$	$\frac{7}{6}$ or $1\frac{1}{6}$ or 1.16 with a dot over the 6	A1
			(3)
Way 5	$\log 3^{6x-3}=\log 81$	Takes logs of both sides	B1
	$6x-3=\frac{\log 81}{\log 3}$ $6x-3=4 \Rightarrow x=...$	Solves an equation of the form $6x-3=k$ where k is their $\frac{\log 81}{\log 3}$	M1
	$\Rightarrow x=\frac{7}{6}$	$\frac{7}{6}$ or $1\frac{1}{6}$ or 1.16 with a dot over the 6	A1
			(3)
(5 marks)			

