Mark Scheme

Q1.

Question	Working	Answer	Notes
(i)		200	B1 cao
(ii)		5.6	B1 For 5.6(2...)

(Q16 1MA1/2H/S2, Specimen papers)

Q2.

Question	Working	Answer	Notes
a		200	B1 200 or 2×10^2
b		3	B1 12 and $\frac{1}{4}$ A1 3 cao
c		−2	M1 $81 = 3^4$ or $\frac{1}{81} = 3^{-4}$ A1 cao

(Q15 1MA1/1H/S2, Specimen papers)

Q3.

Paper 1MA1: 1H			
Question	Working	Answer	Notes
(a)		8	B1
(b)		$\frac{25}{4}$ oe	M1 for correct first step A1

(Q10 1MA1/1H/N, Specimen papers)

Q4.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$81x^{20}y^{24}$	B2	cao	
		(B1	for two of 81, x^{20}, y^{24})	
(b)	$x^3+3x^2-10x-24$	M1	for method to find the product of any two linear expressions (3 out of 4 terms correct or 4 correct terms ignoring signs), eg $x^2+2x-3x-6$ or $x^2+2x+4x+8$ or $x^2+4x-3x-12$	Note that, for example $-x-6$ in expansion of $(x+2)(x-3)$ is regarded as 3 correct terms.
		M1	for a complete method to find all terms, at least half of which are correct (ft their first product), eg $x^3+4x^2+2x^2-3x^2+8x-6x-12x-24$	First product must be quadratic with at least 3 terms but need not be simplified or may be simplified incorrectly
		A1	cao	

(Q14 1MA1/3H, Nov 2022)

Q5.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$2x^3 + x^2 - 7x - 6$	M1	for a method to find the product of two linear expressions eg 3 correct terms out of 4 terms or 4 terms ignoring signs	Note that (eg) $-x-6$ in expansion of $(x-2)(2x+3)$ is to be regarded as 3 correct terms.
		M1	for a complete method to obtain all terms, half of which are correct (ft their first product) eg $2x^3 - x^2 - 6x + 2x^2 - x - 6$	First product must be quadratic but need not be simplified or may be simplified incorrectly
		A1	cao	
(b)	-5	M1	for beginning to combine indices eg $4+n$ or y^{-3+2}	
		A1	cao	
(c)	1.27 and -0.472	M1	for substitution into the formula	Condone one sign error in the substitution Accept -4^2 or $(-4)^2$
		M1	for simplifying to the form $\frac{-b\pm\sqrt{N}}{k}$ eg $\frac{4\pm\sqrt{76}}{10}$ **or** 1.27 to 1.28 **or** -0.48 to -0.47	
		A1	for 1.27 to 1.28 **and** -0.48 to -0.47	

(**Q09 1MA1/3H, Nov 2018**)

Q6.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$y^2 + 5y$	B1	cao	
(b)	$2(2a-3)$	B1	cao	
(c)	2.9	M1	for a correct first stage eg. expanding the brackets, $2 \times 5x - 2 \times 4$ ($= 10x - 8$) **or** division of both sides by 2, eg $\frac{2(5x-4)}{2} = \frac{21}{2}$	
		M1	for isolating terms in x eg $10x = 21 + 8$	
		A1	oe	
(d)	$20\,e^3f^4$	M1	for any two of 4×5 (=20), e^{2+1} ($=e^3$), f^{1+3} ($=f^4$) in a product or written as individual terms	Do not award if there is contradiction
		A1	cao	

(**Q17 1MA1/3F, Nov 2021**)

Q7.

Question	Working	Answer	Mark	Notes
(a)		300	B1	for correct use of indices rules, e.g. sight of 3 from $\sqrt[4]{27\times3}$ or sight of 10^2
			B1	for 300, 3×10^2 oe
(b)		$\frac{25}{9}$	M1	shows understanding of notation by working out one step, e.g. reciprocal or cube root (to both numbers).
			A1	oe

(**Q15 1MA1/1H/M2, Specimen papers**)

Q8.

Paper 1MA1: 2H			
Question	Working	Answer	Notes
(a)		0.4	B1 For 0.4 oe
(b)		0.586	B1 for 3.48207..... or 17.34 or 0.200811... B1 for 0.585 to 0.586

(**Q12 1MA1/2H/S1, Specimen papers**)

Q9.

Paper 1MA1: 1H			
Question	Working	Answer	Notes
		25	B1 cao

(**Q11 1MA1/1H/S1, Specimen papers**)

Q10.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	22	B1	cao	
(b)	8	B1	cao	
(c)	$7 \times (2 + 3) = 35$	B1	for correct placement of brackets	Allow alternative correct statements, eg $[7 \times (2 + 3)] = 35$

(**Q05 1MA1/1F, Nov 2018**)

Q11.

Question	Working	Answer	Mark	Notes
(a)		3^7	M1	for a first step using a rule of indices, e.g. $3^5 \times 3^4 = 3^{5+4}$ $(= 3^9)$ or $3^5 \div 3^2 = 3^{5-2}$ $(= 3^3)$ or $3^4 \div 3^2 = 3^{4-2}$ $(= 3^2)$
			A1	cao
(b)		1	B1	cao
(c)		$\frac{1}{9}$	B1	for $\frac{1}{9}$ (or 0.11…)

(**Q20 1MA1/1F/M3, Specimen papers**)

Q12.

Question	Working	Answer	Mark	Notes
(a)		3^7	M1	for a first step using a rule of indices, e.g. $3^5 \times 3^4 = 3^{5+4}$ $(= 3^9)$ or $3^5 \div 3^2 = 3^{5-2}$ $(= 3^3)$ or $3^4 \div 3^2 = 3^{4-2}$ $(= 3^2)$
			A1	cao
(b)		1	B1	cao
(c)		$\frac{1}{9}$	B1	for $\frac{1}{9}$ (or 0.11…)

(**Q01 1MA1/1H/M3, Specimen papers**)

Q13.

Question	Answer	Mark	Mark scheme	Additional guidance
	9	M1	for a correct first step, using the laws of indices to simplify eg 3^2 or. 3^{7+-2} or 3^{7-3} or 3^{-2-3} OR for using exact values, eg. $2187 \times \frac{1}{9}$ $(= 243)$ or $2187 \div 27$ $(= 81)$ or $\frac{1}{27\times9}$ $(= \frac{1}{243})$	
		A1	cao	

(**Q20 1MA1/1F, Nov 2018**)

Q14.

Question	Answer	Mark	Mark scheme	Additional guidance
	16	M1	for working with square root **or** with reciprocal in $\left(5\frac{4}{9}\right)^{\frac{1}{2}}$ eg $\left(\frac{9}{49}\right)^{\frac{1}{2}}$ or $\frac{1}{\sqrt{\frac{49}{9}}}$ or $\frac{1}{\left(\frac{49}{9}\right)^{\frac{1}{2}}}$ or $\left(\frac{7}{3}\right)^{-1}$ or $\frac{3}{7}$	
		M1	for a full method to simplify the numerator eg $\frac{3}{7}\times\frac{14}{3}$ $(= 2)$	
		M1	for showing $\div 2^{-3}$ as $\times 8$, eg $\frac{3}{7}\times\frac{14}{3}\times 8$ **or** for $2^1 \div 2^{-3}$ $(= 2^4)$ **or** for correctly reducing the expression to a single calculation, eg $\frac{336}{21}$ or $\frac{112}{7}$ or $2 \div \frac{1}{8}$	May be seen at any time during the calculation
		A1	cao	Award 0 marks for a correct answer with no supportive working

(**Q18 1MA1/1H, June 2022**)

Q15.

Question	Answer	Mark	Mark scheme	Additional guidance
	2^6	M1	for the start of a method of simplification, eg 2^{-5+8} $(=2^3)$ or $2^{-5\times2}$ $(=2^{-10})$ or $2^{8\times2}$ $(=2^{16})$	
		A1	cao SC B1 for answer of 64 or 8^2 or 4^3 if M0 scored.	

(**Q03 1MA1/1H, Nov 2022**)

Q16.

Question	Answer	Mark	Mark scheme	Additional guidance
	$\frac{16}{81}$	M1	for showing the cube root of 8 = 2 **and** the cube root of 27 = 3 **or** an intention to find the cube root and raise to power 4 eg $\sqrt[3]{\left(\frac{8}{27}\right)^4}$ or $\left(\sqrt[3]{\frac{8}{27}}\right)^4$ or $\left(\frac{2}{3}\right)^4$	
		A1	cao	

(**Q17 1MA1/1H, Nov 2022**)

Q17.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	4^{-2}	B1	for 4^{-2}	Accept $n=-2$
(b)	5	M1	for $8^{\frac{5}{3}}=\left(\sqrt[3]{8}\right)^5$ or 2^5 or $\sqrt[3]{8^5}$ or $\sqrt[3]{32768}$ **or** $9^{\frac{3}{2}}=\left(\sqrt{9}\right)^3$ or 3^3 or $\sqrt{9^3}$ or $\sqrt{729}$	
		M1	for correctly evaluating $8^{\frac{5}{3}}$ **or** $9^{\frac{3}{2}}$, eg 32 or 27 seen	
		A1	cao	

(**Q14 1MA1/1H, June 2023**)

Q18.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)(i)	1	B1	cao	
(ii)	$\frac{1}{25}$	B1	oe	
(b)	2^6	M1	for a correct first step using a rule of indices, eg 2^{5+4} $(=2^9)$ or 2^{5-3} $(=2^2)$ or 2^{4-3} $(=2^1)$ **or** for $2\times2\times2\times2\times2\times2$ or 64	
		A1	for 2^6	Accept $n=6$

(**Q19 1MA1/1F, Nov 2023**)

Q19.

Question	Answer	Mark	Mark scheme	Additional guidance
	17	M1	for $27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2$ or 3^2 or $\sqrt[3]{27^2}$ or $\sqrt[3]{729}$ or $\left(\frac{1}{2}\right)^{-3} = \frac{1}{\left(\frac{1}{2}\right)^3}$ or 2^3	
		M1	for a full method eg "3^2" + "2^3" or for correctly evaluating $27^{\frac{2}{3}}$ or $\left(\frac{1}{2}\right)^{-3}$ eg 9 or 8 seen	
		A1	cao	

(**Q14 1MA1/1H, Nov 2023**)

Q20.

Question	Answer	Mark	Mark scheme	Additional guidance
	1	B1	cao	

(**Q18 1MA1/1F, June 2024**)

Q21.

Question	Answer	Mark	Mark scheme	Additional guidance
	$5\frac{5}{6}$	P1	for $2^x = 2^{n-\frac{1}{3}}$ **or** $2^y = 2^{\frac{5}{2}}$ **or** $x = n - \frac{1}{3}$ oe **or** $y = \frac{5}{2}$ oe **or** for $(2^{x+y} =) \frac{2^n}{\sqrt[3]{2}} \times \left(\sqrt{2}\right)^5$	
		P1	for $2^{x+y} = 2^{n-\frac{1}{3}+\frac{5}{2}}$ **or** $x + y = n - \frac{1}{3} + \frac{5}{2}$ oe **or** $\frac{11}{2} = n - \frac{1}{3}$ oe	
		A1	oe eg $\frac{35}{6}$	

(**Q20 1MA1/1H, June 2024**)

Q22.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	10	M1	for $25^{\frac{1}{2}} = 5$ **or** $8^{\frac{1}{3}} = 2$	Accept $25^{\frac{1}{2}} = -5$ for M1 only
		A1	cao	
(b)	$\frac{1}{8}$	M1	for $\left(\frac{1}{\sqrt[5]{32}}\right)^3$ **or** $\left(\frac{1}{2}\right)^3$ **or** $\sqrt[5]{\frac{1}{32^3}}$ **or** $\sqrt[5]{\frac{1}{32768}}$	
		A1	for $\frac{1}{8}$ oe SCB1 for answer of 8 if M0 scored	

(**Q10 1MA1/1H, Nov 2024**)

Q23.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$14x^5y^6$	B2	cao	
		(B1	for correct simplification of two terms ax^5y^6 **or** $14x^by^6$ **or** $14x^5y^c$ where $a \neq 14$, $b \neq 5$, $c \neq 6$)	Where a, x^b, y^c can be made up of two products Condone inclusion of multiplication signs for B1
(b)	m^{-6}	B1	for m^{-6} or $\frac{1}{m^6}$	

(**Q25 1MA1/3F, Nov 2024**)

Q24.

Question	Answer	Mark	Mark scheme	Additional guidance
	$\frac{3}{4}$ oe	P1	for a first step to converting to a common base with one correct conversion, eg. $9^{-\frac{1}{2}} = 3^{-1}$ or $\frac{1}{3}$ or $27^{\frac{1}{4}} = 3^{\frac{3}{4}}$ oe	$9^{-\frac{1}{2}} = 3^{-1}$ (or $\frac{1}{3}$) oe or $27^{\frac{1}{4}} = 3^{\frac{3}{4}}$ oe seen alone gets the P1
		P1	(dep) for $3^{-1} = 3^{\frac{3}{4}} \div 3^{x+1}$ oe	
		A1	cao	

(**Q19 1MA1/1H, Nov 2019**)

Q25.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	$\frac{8}{27}$	M1	for showing the 4th root of 16 as 2 **and** the 4th root of 81 as 3 **or** $\frac{8}{n}$ $(n \neq 27)$ **or** $\frac{n}{27}$ $(n \neq 8)$ **or** an intention to find the 4th root and cube, eg. $\sqrt[4]{\left(\frac{16}{81}\right)^3}$ or $\left(\sqrt[4]{\frac{16}{81}}\right)^3$ oe	
		A1	cao	
(b)	0	M1	for writing $\frac{1}{9} = 3^{-2}$, $9\sqrt{3} = 3^{2.5}$, $\frac{1}{\sqrt{3}} = 3^{-0.5}$ as powers of 3, with at least 2 correct **or** for working out $\frac{1}{9} \times 9\sqrt{3} \times \frac{1}{\sqrt{3}} = 1$	
		A1	cao	

(**Q14 1MA1/1H, Nov 2018**)

Q26.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	x^{15}	B1	cao	
(b)	$40 - 10x$	M1	for method to expand one bracket or collect like terms, eg $4 \times x + 4 \times 3$ (= $4x + 12$) **or** $7 \times 4 - 7 \times 2x$ (= $28 - 14x$) **or** $4 \times x - 7 \times 2x$ (= $4x - 14x$) **and** $4 \times 3 + 7 \times 4$ (= $12 + 28$)	
		A1	oe	
(c)	$3x^2(5x + y)$	M1	for $3(5x^3 + x^2y)$ **or** $x(15x^2 + 3xy)$ **or** $3x(5x^2 + xy)$ **or** $x^2(15x + 3y)$ **or** $3x^2(ax + by)$	Where $a \geq 1$ and $b \geq 1$
		A1	cao	

(**Q21 1MA1/2F, June 2022**)

Q27.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	m^6	B1	cao	
(b)	x^{13}	B1	cao	
(c)	$4p^3 + 12p^2$	B2	for $4p^3 + 12p^2$	
		(B1	for expanding the bracket to get $p^3 + 3p^2$ **or** $4p^3$ **or** $12p^2$)	

(**Q01 1MA1/3H, June 2023**)

Q28.

Question	Answer	Mark	Mark scheme	Additional guidance
	16	M1	for simplifying using a correct rule of indices as a first step eg 4^{9-6} (= 4^3 oe) or 4^{-6-1} (= 4^{-7} oe) or 4^{9-1} (= 4^8 oe) **or** $\frac{4\times4\times4\times4\times4\times4\times4\times4\times4}{4\times4\times4\times4\times4\times4 \times 4}$ **or** 4^2	
		A1	cao	

(**Q29 1MA1/1F, June 2023**)

Q29.

Question	Answer	Mark	Mark scheme	Additional guidance
	$3x^7y^2$	M1	for full evaluation of numerator or denominator with at least 2 of 3 terms correct in a product, eg $36x^{10}y^6$ **or** $12x^3y^4$ or full evaluation of $\frac{6x^5y^3}{3x^2y^7}$ or $\frac{6x^5y^3}{4xy^{-3}}$ with at least 2 of 3 terms correct in a product, eg $2x^3y^{-4}$ **or** $1.5x^4y^6$	
		M1	for correct evaluation of numerator and denominator, eg $36x^{10}y^6$ **and** $12x^3y^4$ or for full evaluation of numerator and denominator with no more than one error **and** a final answer of the form ax^by^c with two of a, b and c correct or for correct evaluation of $\frac{6x^5y^3}{3x^2y^7}$ and $\frac{6x^5y^3}{4xy^{-3}}$ eg $2x^3y^{-4}$ **and** $1.5x^4y^6$ or for full evaluation of $\frac{6x^5y^3}{3x^2y^7}$ and $\frac{6x^5y^3}{4xy^{-3}}$ with no more than one error **and** a final answer of the form ax^by^c with two of a, b and c correct	
		A1	for $3x^7y^2$ oe	Accept $a = 3$, $b = 7$, $c = 2$

(**Q11 1MA1/1H, June 2023**)

Q30.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	n^8	B1	cao	
(b)	cd^3	M1	for partial simplification, eg c or d^3	May be seen as simplification in original fraction
		A1	for cd^3	Accept c^1d^3
(c)	$x > \frac{14}{5}$	M1	for $5x > 14$ or $5x = 14$ or critical value, $\frac{14}{5}$ oe	Must see carried out correctly, ie at least $5x > 7 \times 2$ not just intention seen. Allow other signs for this mark.
		A1	$x > \frac{14}{5}$ or $x > 2\frac{4}{5}$ or $x > 2.8$	

(**Q01 1MA1/3H, Nov 2020**)

Q31.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	10^{60}	M1	for a correct first step using one of the rules of indices, eg. $10^{150} \times 10^{90} = 10^{240}$ or $10^{360} \div 10^{150} = 10^{210}$ or $10^{360} \div 10^{90} = 10^{270}$ or $\sqrt{10^{360}} = 10^{180}$ or $\sqrt{10^{150}} = 10^{75}$ or $\sqrt{10^{90}} = 10^{45}$	
		M1	for correct use of rules of indices leading as far as $\sqrt{10^{120}}$ or $\frac{10^{180}}{10^{120}}$	
		A1	cao	
(b)	reason	C1	for correct reasoning **Acceptable examples** eg should do 50×2 (not 50^2) because $(12^{50})^2 = 12^{100}$ because when you have a power inside and outside the bracket you times them because $(a^b)^c = a^{bc}$ (not a^{b^c}) **Not acceptable examples** because you need to multiply everything in the brackets by 2 because he should have squared 12 as well you add the powers instead of timesing	

(**Q09 1MA1/3H, June 2022**)

Q32.

Question	Answer	Mark	Mark scheme	Additional guidance
	2^6	M1	for the start of a method of simplification, eg 2^{-5+8} $(= 2^3)$ or $2^{-5\times2}$ $(= 2^{-10})$ or $2^{8\times2}$ $(= 2^{16})$	
		A1	cao SC B1 for answer of 64 or 8^2 or 4^3 if M0 scored.	

(**Q21 1MA1/1F, Nov 2022**)

Q33.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	m^6	B1	cao	
(b)	x^{13}	B1	cao	
(c)	$4p^3 + 12p^2$	B2	for $4p^3 + 12p^2$	
		(B1	for expanding the bracket to get $p^3 + 3p^2$ **or** $4p^3$ **or** $12p^2$)	

(**Q20 1MA1/3F, June 2023**)

Q34.

Question	Answer	Mark	Mark scheme	Additional guidance
	49, 2	P1	for setting up $6 \div n = 3$ oe or $7^n = a$ oe or one correct answer	
		A1	cao	Accept the figures written as a complete statement eg $\left(49x^6\right)^{\frac{1}{2}}$

(**Q12 1MA1/3H, Nov 2021**)

Q35.

Question	Working	Answer	Mark	Notes
		1.45	P1	for converting to a common base with at least one correct conversion, eg. $(16 =) 2^4$ or $(8 =) 2^3$
			P1	(dep) for correct use of index laws to derive an equation, eg. $4 \times \frac{1}{5} + x = 3 \times \frac{3}{4}$ oe
			A1	for 1.45 oe (accept $2^{1.45}$)
				OR
			P1	for a process to find the value of 2^x, eg. $8^{\frac{3}{4}} \div 16^{\frac{1}{5}} = 2.73\ldots$
			A2	for 1.45 oe (accept $2^{1.45}$)

(**Q18 1MA1/2H, June 2017**)

Q36.

Question	Working	Answer	Mark	Notes
		625	2	M1 for 3^{4n} or 5^4 or $(3^{-n})^{-4}$ or 0.2^{-4} A1 625

(**Q14 1MA1/2H/M1, Specimen papers**)

Q37.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	1	B1	cao	
(b)	3	B1	cao	
(c)	$\frac{1}{16}$	B1	oe	
(d)	3	B1	cao	

(**Q09 1MA1/1H, Nov 2021**)

Q38.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	c^3	B1	cao	
(b)	d^{12}	B1	cao	

(Q20 1MA1/2F, Nov 2021)

Q39.

Question	Working	Answer	Mark	Notes
(a)		10	B1	accept ±10
(b)		25	M1	for $(\sqrt[3]{125})^2$ **or** $\sqrt[3]{125} = 5$ **or** $125^2 = 15625$ **or** $\sqrt[3]{125^2}$
			A1	cao

(Q10 1MA1/1H, Nov 2017)

Q40.

Question	Working	Answer	Mark	Notes
(a)		6	B1	cao
(b)		5	B1	cao
(c)		Shown	M1	for writing 100^a or 1000^b as a power of 10 ($=10^{2a}$ or 10^{3b}) or 10^{2a+3b} or $100 = 10^2$ and $1000 = 10^3$
			C1	for complete chain of reasoning leading to conclusion

(Q21 1MA1/2F, Nov 2017)

Q41.

Question		Working	Answer	Mark	Notes
			$\frac{1}{16}$	1	cao

(Q10 1MA1/1H/M1, Specimen papers)

Q42.

Question	Working	Answer	Mark	Notes
(a)		$\frac{1}{9}$	M1	for showing a method using either reciprocal or square root e.g. $\frac{1}{n}$ or 9 seen
			A1	cao Accept $\pm\frac{1}{9}$ or 0.1 recurring
(b)		$\frac{16}{25}$	M1	for showing cube root of 64 as 4 and the cube root of 125 as 5 or $\frac{16}{n}$ $(n \neq 25)$ or $\frac{n}{25}$ $(n \neq 16)$ or an intention to find the cube root and square.
			A1	cao Accept 0.64

(**Q12 1MA1/1H, June 2017**)

Q43.

Question	Answer	Mark	Mark scheme	Additional guidance
	243	B1	cao	

(**Q03 1MA1/2F, June 2018**)

Q44.

Question	Answer	Mark	Mark scheme	Additional guidance
(a)	6	B1	cao	Accept ±6
(b)	1	B1	cao	
(c)	$\frac{1}{9}$	M1	for evidence of working with a cube root eg $\sqrt[3]{27}$ or $\sqrt[3]{729}$ **OR** evidence of working with a reciprocal eg $\frac{1}{27^{2/3}}$ or $\left(\frac{1}{27}\right)^{\frac{2}{3}}$	
		A1	cao	

(**Q09 1MA1/1H, June 2018**)