Q	Marking Instructions	Marks	Typical Solution
1.	Obtains $c^2 = \frac{a+b}{2}$ Valid attempt to rearrange to make a the subject. Obtains correct final answer.	B1 M1 A1 3 marks	$c = \sqrt{\frac{a+b}{2}}$ $c^2 = \frac{a+b}{2}$ $2c^2 = a+b$ $a = 2c^2 - b$

Q2.

Multiplies numerator and denominator by the conjugate surd of the denominator	AO1.1a	M1	$\frac{(5\sqrt{2}+2)(3\sqrt{2}-4)}{(3\sqrt{2}+4)(3\sqrt{2}-4)}$
Obtains **either** numerator **or** denominator correctly, in expanded or simplified form	AO1.1b	A1	$= \frac{30-20\sqrt{2}+6\sqrt{2}-8}{2}$ $= \frac{22-14\sqrt{2}}{2}$
Constructs rigorous mathematical argument to show the required result Only award if they have a completely correct solution, which is clear, easy to follow and contains no slips NMS = 0	AO2.1	R1	$= 11-7\sqrt{2}$
Total		**3**	

NMS means No Method Shown.

This question is a 'show that' question so you MUST show your method. If you have just stated the correct answer but with no working e.g. you just typed it into you calculator then you score no marks.

YEAR 1 | MATHEMATICS | MIXED EXAM QUESTIONS – WEEK 3| MARK SCHEME

Q	Marking Instructions	Marks	Typical Solution
3. (a)	Correct answer (Accept $7^{0.25}$).	B1 1 mark	$\sqrt[4]{7} = 7^{\frac{1}{4}}$
3. (b)	Clear attempt to use indices rules. • E.g. $7 \times 7^{\frac{1}{2}} = 7^{\frac{3}{2}}$ or $\frac{1}{7^a} = 7^{-a}$ Correct final answer (accept $7^{-1.5}$).	M1 A1 2 marks	$\frac{1}{7\sqrt{7}} = \frac{1}{7 \times 7^{\frac{1}{2}}} = \frac{1}{7^{\frac{3}{2}}} = 7^{-\frac{3}{2}}$
3. (c)	Attempt to change base of 7 or 49 and simplify. • e.g. $49^{10} = (7^2)^{10} = 7^{20}$ Correct final answer.	M1 A1 2 marks	$7^4 \times 49^{10} = 7^4 \times \left(7^2\right)^{10} = 7^4 \times 7^{20} = 7^{24}$

Q	Marking Instructions	Marks	Typical Solution
4. (a) (i)	Correct answer.	B1 1 mark	$\overrightarrow{AB} = \overrightarrow{OB} - \overrightarrow{OA} = 5\mathbf{b} - 5\mathbf{a}$
4. (a) (ii)	$\mathbf{a} + \frac{2}{5} \times$ their answer to (a)(ii) Correct final answer.	M1 A1 2 marks	$\overrightarrow{PQ} = \overrightarrow{PA} + \overrightarrow{AQ}$ $= \mathbf{a} + \frac{2}{5}\overrightarrow{AB}$ $= \mathbf{a} + \frac{2}{5}(5\mathbf{b} - 5\mathbf{a})$ $= \mathbf{a} + 2\mathbf{b} - 2\mathbf{a}$ $= 2\mathbf{b} - \mathbf{a}$
4. (b)	Attempt to write $\overrightarrow{PR}$ in terms of $\mathbf{a}$ and $\mathbf{b}$. Obtains $\overrightarrow{PR} = -4\mathbf{a} + 8\mathbf{b}$ States that $\overrightarrow{PR} = 4\overrightarrow{PQ}$ (or $\overrightarrow{PQ} = \frac{1}{4}\overrightarrow{PR}$) and implies that this demonstrates they are on a straight line. *Note: This may be seen numerically, e.g.* $8\mathbf{b} - 4\mathbf{a} = 4(2\mathbf{b} - \mathbf{a})$	M1 A1 A1 3 marks	$\overrightarrow{PQ} = 2\mathbf{b} - \mathbf{a}$ $\overrightarrow{PR} = -\overrightarrow{OP} + \overrightarrow{OR}$ $= -4\mathbf{a} + 8\mathbf{b}$ $\therefore \quad \overrightarrow{PR} = 4\overrightarrow{PQ}$ Since $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ are parallel and share a common point, they must lie on a straight line.

YEAR 1 | MATHEMATICS | MIXED EXAM QUESTIONS – WEEK 3 | MARK SCHEME

Q	Marking Instructions	Marks	Typical Solution
5. (a)	Obtains correct coefficient of 32. Obtains correct final answer	B1 B1 2 marks	$\frac{(4x)^2 \times 2x^3}{x} = \frac{16x^2 \times 2x^3}{x} = \frac{32x^5}{x} = 32x^4$
5. (b)	Sight of 6 or $\frac{1}{36^{\frac{1}{2}}}$ or $\frac{1}{\sqrt{36}}$ $\frac{1}{6}$ seen in final answer. Fully correct answer.	M1 A1 A1 3 marks	$\left(36x^{-2}\right)^{-\frac{1}{2}} = 36^{-\frac{1}{2}} \times \left(x^{-2}\right)^{-\frac{1}{2}} = \frac{1}{36^{\frac{1}{2}}} \times x = \frac{1}{6}x$
5. (c)	Obtains coefficient of 4. Correctly applies indices laws to either numerator or denominator. • e.g. $(4x^5y)^3 = 4^3 \times (x^5)^3 \times y^3$ or $(2xy^2) \times (8x^{10}y^4) = 16x^{11}y^6$ Correct final answer (OE) (Accept $\frac{4x^4}{y^3}$)	B1 M1 A1 3 marks	$\frac{(4x^5y)^3}{(2xy^2) \times (8x^{10}y^4)} = \frac{4^3 \times (x^5)^3 \times y^3}{16x^{11}y^6}$ $= \frac{64x^{15}y^3}{16x^{11}y^6}$ $= 4x^4y^{-3}$

Q6.

Marking Instructions	AO	Marks	Typical Solution
Forms an equation for gradient of CD = ¼ or –¼ of the form difference in y over difference in x (or vice versa = 4 or -4)	AO3.1a	M1	$\frac{d-2}{6-c}=\frac{1}{4}$
Obtains a correct equation for c & d	AO1.1b	A1	$4d-8=6-c$ $c+4d=14$
Forms an equation for the mid-point of CD lying on $y + 4x = 11$	AO3.1a	M1	$\frac{2+d}{2}+4\left(\frac{c+6}{2}\right)=11$
Obtains correct equation for c & d (any correct form)	AO1.1b	A1	$4c+d=-4$
Solves for c and d CAO	AO1.1b	A1	$c = -2 \quad d = 4$
Total		**5**	

Q	Marking Instructions	Marks	Typical Solution
7.	Attempt to simplify to a single fraction Must see evidence of: • Simplification of indices (numerator and denominator) • Attempt to manipulate $\div\frac{4}{15a^3}$ into $\times\frac{15a^3}{4}$ (OE) Attempt to factorise using $(a+2)$ on both numerator and denominator. Correct final answer (OE) (accept $16\frac{2}{3}a^2$)	M1 M1 A1 3 marks	$\frac{8a}{3a+6}\times\frac{5a+10}{3a^2}\div\frac{4}{15a^3}=\frac{8a}{3a+6}\times\frac{5a+10}{3a^2}\times\frac{15a^3}{4}$ $=\frac{120a^4(5a+10)}{12a^2(3a+6)}$ $=\frac{10a^2(5a+10)}{3a+6}$ $=\frac{50a^2(a+2)}{3(a+2)}$ $=\frac{50a^2}{3}$

Q	Marking Instructions	Marks	Typical Solution
8. (a)	Attempt to calculate QR using $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ Obtains $a\sqrt{5}=\sqrt{(7-1)^2+(0-3)^2}$ (OE) Correct final answer.	M1 A1 A1 3 marks	Length of QR: $a\sqrt{5}=\sqrt{(7-1)^2+(0-3)^2}$ $a\sqrt{5}=\sqrt{45}$ $a\sqrt{5}=3\sqrt{5}$ $\therefore \quad a=3$
8. (b)	Attempt to calculate gradient of QR using $\frac{y_2-y_1}{x_2-x_1}$ Correctly calculates gradient of QR. Attempt to calculate gradient of l_2 using $-\frac{1}{m_{QR}}$ for *their* gradient of QR. Attempt to form equation for l_2 using $(1,3)$ and *their* gradient for l_2 . Correct equation for l_2 in any form. **Note: Other possible forms include** $y=2x+1$, $2x-y+1=0$	M1 A1 M1* dM1 A1 5 marks	$m_{QR}=\frac{0-3}{7-1}=-\frac{1}{2}$ $\therefore \quad m_{\perp}=2$ $\therefore$ Using $Q(1,3)$: $y-3=2(x-1)$
8. (c)	Correct coordinates for P.	B1 1 mark	When $x=0$, $y-3=2(-1)$ $y=1$ $P(0,1)$
8. (d)	Attempt to calculate PQ using *their* value for $P(0,1)$. Obtains $PQ=\sqrt{5}$ Attempt to calculate area using $\frac{1}{2}\times$ *their* $PQ\times$ *their* $3\sqrt{5}$ Correct final answer from correct working.	M1 A1 M1 A1 4 marks	$\lvert PQ\rvert=\sqrt{(1-0)^2+(3-1)^2}=\sqrt{5}$ Area $=\frac{1}{2}\times 3\sqrt{5}\times\sqrt{5}=7.5$