Q	Marking Instructions	Marks	Typical Solution
1.	Attempt to factorise numerator. Correctly factorises denominator. Correct final answer.	M1 A1 A1 3 marks	$\frac{3x^2 - 7x + 4}{x^2 - 1} = \frac{(x-1)(3x-4)}{(x+1)(x-1)}$ $= \frac{3x-4}{x+1}$

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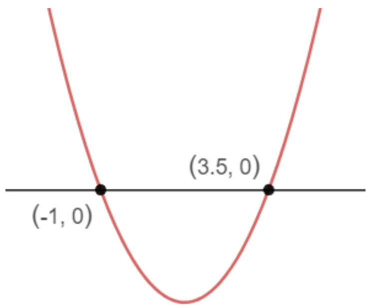
2. (a)	Attempt to expand brackets and collect like terms. Correct answer OE (e.g. $x < 2.8$)	M1 A1 2 marks	$3(x-2) < 8 - 2x$ $3x - 6 < 8 - 2x$ $5x < 14$ $x < \frac{14}{5}$
2. (b)	Obtains critical values. Attempt to obtain correct inequalities by sketching graph. Correct inequality (OE).	B1 M1 A1 3 marks	$(2x-7)(1+x) < 0$ Critical values: $x = \frac{7}{2}, \quad x = -1$ $\therefore \quad -1 < x < \frac{7}{2}$ 
2. (c)	Correct answer from *their* inequalities in (a) and (b)	B1ft 1 mark	$-1 < x < \frac{14}{5}$

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3.	Attempt to substitute for x or y to get an equation in 1 variable only. e.g. $y = 2x + 1$ or $x = \frac{y-1}{2}$	M1*	$x^2 - 3y + 11 = 0 \quad (1)$ $\qquad 2x - y + 1 = 0$ $y = 2x + 1 \quad (2)$ Substitute (2) into (1): $x^2 - 3(2x+1) + 11 = 0$
	Obtain correct 3-term quadratic: $x^2 - 6x + 8 = 0$	A1	$x^2 - 6x - 3 + 11 = 0$
	Valid attempt to solve *their* 3-term quadratic.	dM1	$x^2 - 6x + 8 = 0$
	One pair of correct values for x and y	A1	$(x-2)(x-4) = 0$
	Both pairs of x and y values correct.	A1	$x = 2$ or $x = 4$
	Note: For final A1 mark It must be clear which x and y values are linked together.	5 marks	When $x = 2,\ y = 2(2) + 1 = 5$ When $x = 4,\ y = 2(4) + 1 = 9$ Solutions are $x = 2$ and $y = 5$ or $x = 4$ and $y = 9$

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4. (a)	Correct answer.	B1 1 mark	$10^p = 0.1$ $10^p = \frac{1}{10}$ $p = -1$
4. (b)	Attempt to square root $25k^2$ or square both sides. Obtains $k^2 = 9$ (or $k = 3$ only) Obtains $k = \pm 3$	M1 A1 A1 3 marks	$25k^2 = 225$ $k^2 = 9$ $k = \pm 3$
4. (c)	Attempt to apply power laws. e.g. $t^{\frac{1}{3}} = 2$ or $\frac{1}{t^{\frac{1}{3}}} = \frac{1}{2}$ Correct answer.	M1 A1 2 marks	$t^{-\frac{1}{3}} = \frac{1}{2}$ $t^{\frac{1}{3}} = 2$ $t = 2^3$ $t = 8$

Q	Marking Instructions	Marks	Typical Solution
5.	Attempt to isolate $\sqrt{l^2 - r^2}$ **Note: Award M1 If both sides are correctly squared before isolating $\sqrt{l^2 - r^2}$** Squares both sides to obtain $\frac{9V^2}{\pi^2 r^4} = l^2 - r^2$ Attempts to make l^2 or l the subject. Obtains correct final answer (OE) e.g. $l = \pm\sqrt{\left(\frac{3V}{\pi r^2}\right)^2 + r^2}$ NOTE: *l* represents a length in the question, so could argue *l* > 0	M1* A1 dM1 A1 4 marks	$V = \frac{1}{3}\pi r^2\sqrt{l^2 - r^2}$ $\frac{3V}{\pi r^2} = \sqrt{l^2 - r^2}$ $\frac{9V^2}{\pi^2 r^4} = l^2 - r^2$ $l^2 = \frac{9V^2}{\pi^2 r^4} + r^2$ $l = \pm\sqrt{\frac{9V^2}{\pi^2 r^4} + r^2}$

Q	Marking Instructions	Marks	Typical Solution
6.	Attempt to factorise and complete the square. Given $a(x+b)^2+c$: Obtains $a=5$ Obtains $b=2$ Fully correct answer	M1 B1 B1 A1 **4 marks**	$5x^2+20x+6=5\left[x^2+4x\right]+6$ $=5\left[\left(x+2\right)^2-4\right]+6$ $=5\left(x+2\right)^2-20+6$ $=5\left(x+2\right)^2-14$

Q	Marking Instructions	Marks	Typical Solution
7. (a)	$p = 15$ $q = -3$ Note: Accept $(15, -3)$.	B1 B1 2 marks	$(8,2) = \left(\frac{1+p}{2}, \frac{7+q}{2}\right)$ $\therefore \frac{1+p}{2} = 8 \quad \frac{7+q}{2} = 2$ $p = 15 \quad q = -3$ $C(15, -3)$
7. (b)	Obtains $m_{AC} = -\frac{5}{7}$ (may be implied by later use of $m_{\perp}$) $m_{\perp} = -\frac{1}{their\ m_{AC}}$ Attempt to find equation of l using $y - y_1 = m(x - x_1)$, with $(8,2)$ and *their* $m_{\perp}$. Obtains $y - 2 = \frac{7}{5}(x-8)$ OE. Correct answer in correct form (accept $0 = -7x + 5y + 46$).	B1 M1* dM1 A1 A1 5 marks	$m_{AC} = \frac{-3-2}{15-8} = -\frac{5}{7}$ $\therefore m_{\perp} = \frac{7}{5}$ $\therefore y - 2 = \frac{7}{5}(x-8)$ $5y - 10 = 7x - 56$ $0 = 7x - 5y - 46$
7. (c)	Substitutes $y = 7$ into *their* equation for l. Correct answer OE (e.g. $11\frac{4}{7}$) Note: Do <u>not</u> accept decimal approximations (e.g. 11.57).	M1 A1 2 marks	l meets AB where $0 = 7x - 5y - 46$ intersects $y = 7$ $\therefore 7x - 5(7) - 46 = 0$ $7x = 81$ $x = \frac{81}{7}$

Q	Marking Instructions	Marks	Typical Solution
8	Attempt to simply $a+b+c$ to a single fraction. Obtain $a+b+c=6$ Obtains $bc=\frac{9^2-17}{16}$ (OE) (may be unsimplified) Obtains $abc=6$ from valid working **Note: Check working carefully as it may already be known that the correct value is 6 from $a+b+c$.**	M1 A1 M1 A1 4 marks	$a=\frac{3}{2},\quad b=\frac{9-\sqrt{17}}{4},\quad c=\frac{9+\sqrt{17}}{4}$ $a+b+c=\frac{3}{2}+\frac{9-\sqrt{17}}{4}+\frac{9+\sqrt{17}}{4}$ $=\frac{6+9-\sqrt{17}+9+\sqrt{17}}{4}$ $=\frac{24}{4}$ $=6$ $abc=\frac{3}{2}\times\frac{9-\sqrt{17}}{4}\times\frac{9+\sqrt{17}}{4}$ $=\frac{3\times(9^2-17)}{2\times4\times4}$ $=\frac{3\times64}{32}$ $=6$

Q	Marking Instructions	Marks	Typical Solution
9. (a)	**Note: Answer given in question – check working carefully.** Makes y the subject of the linear equation and substitutes into the second equation. Correctly rearranges to obtain $x^2 + 8kx + k = 0$	M1 A1 2 marks	$x^2 - 4ky + 5k = 0 \quad (2) \qquad 2x + y = 1$ $y = 1 - 2x \quad (2)$ Substituting (2) into (1) gives: $x^2 - 4k(1-2x) + 5k = 0$ $x^2 - 4k + 8kx + 5k = 0$ $x^2 + 8kx + k = 0$
	Use of $b^2 - 4ac = 0$ **Note: Condone errors in substitution but no x's.** Obtains $8k^2 - 4k$ **(Note: need not be an equation at this stage.)** Obtains $k = \frac{1}{16}$ only.	M1 A1 A1 3 marks	Equal roots $\Rightarrow$ $b^2 - 4ac = 0$ $\therefore \quad (8k)^2 - 4(1)(k) = 0$ $64k^2 - 4k = 0$ $16k^2 - k = 0$ $k(16k - 1) = 0$ Since k is non-zero, $k = \frac{1}{16}$
9. (b)	Substitutes *their* value for k into $x^2 + 8kx + k = 0$ Obtains correct x-value. Obtains correct y-value (in addition to correct x-value).	M1 A1 A1 3 marks	$x^2 + 8kx + k = 0$ $x^2 + 8\left(\frac{1}{16}\right)x + \frac{1}{16} = 0$ $x^2 + \frac{1}{2}x + \frac{1}{16} = 0$ $16x^2 + 8k + 1 = 0$ $(4x+1)^2 = 0$ $\therefore x = -\frac{1}{4}$ When $x = -\frac{1}{4}$, $y = 1 + 2\left(\frac{1}{4}\right) = \frac{3}{2}$