Question	Scheme	Marks
7(a)	$\left(1+\frac{5}{16}x\right)^{10} = 1+10\left(\frac{5}{16}x\right)+\frac{10\times 9}{2}\left(\frac{5}{16}x\right)^2+\ldots$	M1 A1
	$\frac{25}{8}x$ or $\frac{1125}{256}x^2$	A1
	$=1+\frac{25}{8}x+\frac{1125}{256}x^2$	A1
		(4)
(b)	$x=\frac{1}{10} \Rightarrow \left(1+\frac{5}{16}x\right)^{10} = \left(1+\frac{5}{16}\times\frac{1}{10}\right)^{10} = \left(\frac{33}{32}\right)^{10}$	B1
	So $\left(\frac{33}{32}\right)^{10} \approx 1+\frac{25}{80}+\frac{1125}{25600}$	M1
	$=\frac{1389}{1024}$	A1
		(3)
(c)	$\left(\frac{33}{32}\right)^{10} \approx \frac{1389}{1024} \Rightarrow \sqrt[10]{1389} \approx \frac{33}{32}\times \sqrt[10]{1024}$	M1
	$=\frac{33}{16}$	A1
		(2)
		(9 marks)

(a)

M1: Correct binomial coefficient linked with correct power of $\frac{5}{16}x$ for the second or third term of their expansion. Accept alternative notation, such as ${}^{10}C_1$ or just 10 etc, for the coefficients. (The power 1 need not be seen.) Allow if the brackets are omitted. Condone a misread on $\frac{5}{16}x$, e.g. $\frac{5}{6}x$

Look for either of the following

- a second term of $10\times\frac{5}{16}x$ or unsimplified version such as $\binom{10}{1}\times\frac{5}{16}x$
- a third term of $\frac{10\times 9}{2}\times\left(\frac{5}{16}x\right)^2$ condoning unsimplified versions with bracketing slips such as ${}^{10}C_2\times\frac{5}{16}x^2$

A1: A correct unsimplified expansion with correct bracketing and no combination notation. See main scheme. Condone a list for this mark.

A1: Correct simplified second or third term.

A1: Fully correct and **simplified expansion**. A list is insufficient but award this mark if the

correct expansion is seen or implied in part (b). Ignore any extra terms in x^3 etc even if they are incorrect. If they go on to multiply by 256 withhold this mark.

It may be awarded without sight of working, and/or with the **EXACT** decimal equivalents for $\frac{25}{8}$ and $\frac{1125}{256}$

Note: M1A0A1A0 is possible (e.g. if the 5/16 is not squared after a correct expression).

(b) Score (b) and (c) together

B1: Substitutes $x = \frac{1}{10}$ into $\left(1+\frac{5}{16}x\right)^{10}$ **AND SHOW** that it gives $\left(\frac{33}{32}\right)^{10}$.

Some may achieve $x = \frac{1}{10}$ by solving $1+\frac{5}{16}x = \frac{33}{32}$ which is fine as long as it is followed by the $\left(\frac{33}{32}\right)^{10}$ which may be seen in (c)

Look for $\left(1+\frac{5}{16}\times\frac{1}{10}\right)^{10}$ or $\left(1+\frac{5}{16}\times\frac{1}{10}\right)=\frac{33}{32}$ followed by $\left(\frac{33}{32}\right)^{10}$ which may be seen in (c)

M1: Substitutes $x = \frac{1}{10}$ into their $1+\frac{25}{8}x+\frac{1125}{256}x^2$ which may contain more terms

Score for sight of $1+\frac{25}{8}\times\frac{1}{10}+\frac{1125}{256}\times\left(\frac{1}{10}\right)^2$

A1: Simplifies to the correct fraction, $\frac{1389}{1024}$. This is dependent upon the M only

So $\left(\frac{33}{32}\right)^{10} = 1+\frac{25}{8}\times\frac{1}{10}+\frac{1125}{256}\times\left(\frac{1}{10}\right)^2 = \frac{1389}{1024}$ scores B0, M1, A1

(c) Marks in part (c) cannot be scored unless the fraction is of the form 1389/*k*

M1: Takes the 10th root of both sides and multiplies by the denominator.

Award for $\left(\frac{33}{32}\right)^{10} = \frac{1389}{'k'} \Rightarrow \sqrt[10]{1389} = \frac{33}{32}\times\sqrt[10]{k}$.

A1: Correct answer $\frac{33}{16}$ but $\frac{66}{32}$ is acceptable.

If part (b) is correct we can award the correct answer both marks in part (c)

Question	Scheme	Marks
8(a)	$(x \pm 4)^2 ..(y \pm 6)^2 = ..$	**M1**
	Centre is $(4,-6)$	**A1**
	$r = \sqrt{16+36-27} = 5$	**A1**
		(3)
(b)	Deduces that the x coordinate of B is 8	**B1ft**
	$\frac{dy}{dx} = 0$ at $x = '8' \Rightarrow 2ax - \frac{3}{2} = 0 \Rightarrow 16a - \frac{3}{2} = 0$	**M1**
	$a = \frac{3}{32}$ *	**A1***
		(3)
(c)	$\int \frac{3}{32}x^2 - \frac{3}{2}x - 3\,dx = ..x^3 + ..x^2 + ..x$	**M1**
	$\int_0^{'8'} \frac{3}{32}x^2 - \frac{3}{2}x - 3\,dx = \left[\frac{1}{32}x^3 - \frac{3}{4}x^2 - 3x\right]_0^{'8'} = \left[\frac{8^3}{32} - \frac{3}{4}\times 8^2 - 3\times 8\right] - (0)$	**dM1**
	$= -56$	**A1**
	$X = (8,0)$, Area trapezium $OABX = \frac{1}{2}(3 + '9') \times '8' = ...$	**M1**
	Area semi-circle = $\frac{1}{2}\pi \times '5'^2 = \frac{'25'\pi}{2}$	**B1ft**
	Area R = $'56' - '48' + '\frac{25\pi}{2}'$	**dM1**
	$= 8 + \frac{25\pi}{2}$	**A1**
		(7)
		(13 marks)

(a)

M1: Attempt to complete the square witnessed by sight of $(x \pm 4)^2 ..(y \pm 6)^2 = ..$

Implied by a centre given as $(\pm 4, \pm 6)$

A1: Centre is $(4,-6)$ o.e. Condone brackets not being present

A1: Radius is 5, not $\sqrt{25}$. M1 must be awarded but may be scored following an incorrect centre $(\pm 4, \pm 6)$

(b)

B1ft: States or implies the correct x coordinate for point B.

Follow through on twice their x coordinate for their centre. It may be awarded from work in (c) or on the graph. It is implied by their top limit in their integral

M1: Differentiates, sets equal to 0 and substitutes their x at B to set up an equation in a.

Alternatives exist: