Question Number	Scheme	Marks
7. (i)	$\log_a\left(\frac{\sqrt{a}}{b}\right)=\frac{1}{2}\log_a a-\log_a b=\frac{1}{2}-k$	M1 A1 **(2)**
(ii)	$\frac{\log_a a^2b}{\log_a b^3}=\frac{2\log_a a+\log_a b}{3\log_a b}=\frac{2+k}{3k}$	M1 A1 **(2)**
(iii)	$\sum_{n=1}^{50}\left(k+\log_a b^n\right)=50k+\left(1k+2k+3k+...+50k\right)$ or $\left(2k+3k+4k+...+51k\right)$	
	Uses the sum formula an AP with $n=50, d=k$	M1
	$S=50k+\frac{50}{2}\left(2k+49k\right)$ $\quad$ $S=\frac{50}{2}\left(2k+51k\right)$	A1
	$=1325k$	A1 **(3)** **(7 marks)**

(i)

M1 Uses log laws to achieve $\frac{1}{2}\log a-\log b$ or eg $0.5\log a-\log b$

A1 $\frac{1}{2}-k$ oe

(ii)

M1 Uses correct log laws on the numerator or denominator. Score for $\frac{...}{3\log b}$ or $\frac{...}{3k}$ or sight of the numerator $2\log a+\log b$ which does not have to be part of a fraction (May be implied by $2+k$)

A1 $\frac{2+k}{3k}$ or $\frac{2}{3k}+\frac{1}{3}$ do not isw

(iii)

M1 **Either** uses the sum formula for an AP in terms of *k* on part or all of the expression with $n=50, d=k, a=k$ or $n=50, d=k, a=2k$. It is sufficient to see the terms substituted in for this mark.

$\sum_{n=1}^{50}nk=\frac{50}{2}\left(2k+49k\right)$ or $\sum_{n=1}^{50}(k+nk)=\frac{50}{2}(2k+51k)$.

You may see the equivalent sum $\frac{n}{2}(a+L)$ eg $\frac{50}{2}(k+50k)$

Or uses the sum formula for an AP in terms of $\log_a b$ on part of the expression with

$n=50, d=\log b, a=\log b$

$\sum_{n=1}^{50}\log b^n=\frac{50}{2}\left(2\log b+49\log b\right)$

You may see the equivalent sum $\frac{n}{2}(a+L)=\sum_{n=1}^{50}\log b^n=\frac{50}{2}\left(\log b+50\log b\right)$

A1 A correct unsimplified answer in terms of k.

Eg. $S = 50k + \frac{50}{2}(2k + 49k)$ or $S = \frac{50}{2}(2k + 51k)$

A1 $1325k$

Question Number	Scheme	Marks
8 (i)	$\int \frac{8\sqrt{x}-5}{2x^2}\,\mathrm{d}x = \int 4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}\,\mathrm{d}x$	B1
	$= -8x^{-\frac{1}{2}} + \frac{5}{2}x^{-1}\ (+C)$	M1 A1
	$\int_2^4 \left(4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}\right)\mathrm{d}x = \left(-4+\frac{5}{8}\right) - \left(-4\sqrt{2}+\frac{5}{4}\right) = 4\sqrt{2} - \frac{37}{8}$	dM1 A1
		(5)
(ii)	$\int \left(\frac{1}{2}x^2 + k\right)\mathrm{d}x = \left[\frac{1}{6}x^3 + kx\right]$	M1 A1
	$\int_{-3}^{6}\left(\frac{1}{2}x^2+k\right)\mathrm{d}x = 55 \Rightarrow \left[\frac{1}{6}x^3+kx\right]_{-3}^{6} = 55 \Rightarrow (36+6k) - \left(-\frac{9}{2}-3k\right) = 55 \Rightarrow k = \ldots$	dM1
	$k = \frac{29}{18}$	A1
		(4)
		(9 marks)

(i)

B1 For $\frac{8\sqrt{x}-5}{2x^2} \to 4x^{-\frac{3}{2}} - \frac{5}{2}x^{-2}$ (seen or implied). Ignore any $+C$

You may also see a factor of ½ taken out eg $\frac{8\sqrt{x}-5}{2x^2} \to \frac{1}{2}\left(8x^{-\frac{3}{2}} - 5x^{-2}\right)$

M1 For raising any index by one on one of their terms. Follow through on incorrect indices but do not allow for candidates who attempt to integrate the numerator and denominators separately.

A1 Correct terms (may be unsimplified but the indices must be processed)

dM1 Substitutes 4 and 2 into an integrated function and subtracts either way round. Dependent on the previous method mark. awrt 1.03 following B1M1A1 is sufficient evidence to award this mark.

A1 $4\sqrt{2} - \frac{37}{8}$ or exact equivalent (eg $4\sqrt{2} - 4.625$ or $\frac{32\sqrt{2}-37}{8}$)

Note: Answer only scores 0 marks.

(ii)

M1 Attempts to integrate $\left(\frac{1}{2}x^2 + k\right)$ with one term correct unsimplified so allow eg $\frac{\frac{1}{2}x^3}{3}$ or kx^1 but the index must be processed.

A1 $\frac{1}{6}x^3 + kx$ (allow unsimplified equivalent expressions as above)

dM1 Substitutes 6 and -3 into $Ax^3 + kx$, subtracts, sets $= 55$ and proceeds to $k = \ldots$. Do not be concerned with the mechanics of their rearrangement.

A1 $k = \frac{29}{18}$ or exact equivalent eg $1.61\dot{1}$ but do not allow 1.6 or 1.61 or 1.61….