(14) (a) $\log_{10} 4 + 2\log_{10} 5$

$= \log_{10} 4 + \log_{10} 5^2$

$= \log_{10} 4 + \log_{10} 25$

$= \log_{10} 100$

$= 2$

(b) $\log_2 (7x-2) - \log_2 3 = 5$

$\log_2 \left(\frac{7x-2}{3}\right) = 5$

$\frac{7x-2}{3} = 2^5$

$\frac{7x-2}{3} = 32$

$7x - 2 = 96$

$7x = 98$

$x = 14$

Question			Generic scheme	Illustrative scheme	Max mark
14.	(a)		•1 apply $m\log_n x = \log_n x^m$ •2 apply $\log_a x + \log_a y = \log_a xy$ •3 evaluate logarithm	•1 $\ldots\log_{10} 5^2$ stated or implied by •2 •2 $\log_{10}\left(4\times5^2\right)$ •3 2	**3**

Notes:

1. Each line of working must be equivalent to the line above within a valid strategy, however see Candidate A.
2. Do not penalise the omission of the base of the logarithm at •1 or •2.
3. Correct answer with no working, award 0/3.

Commonly Observed Responses:

Candidate A

$2\log_{10}(4\times5)$ •2 ✖

$2\log_{10}(20)$

$\log_{10}(20)^2$ •1 ✓ 1 •3 ^

Question			Generic scheme	Illustrative scheme	Max mark
	(b)		**Method 1** •4 apply $\log_a x - \log_a y = \log_a \frac{x}{y}$ •5 express in exponential form •6 solve for x	**Method 1** •4 $\log_2 \frac{7x-2}{3} = \ldots$ •5 $\frac{7x-2}{3} = 2^5$ •6 14	3
			Method 2 •4 apply $m \log_n x = \log_n x^m$ •5 simplify •6 solve for x	**Method 2** •4 $\ldots = \log_2 2^5$ •5 eg $\log_2 \frac{7x-2}{3} = \ldots$ or $\log_2 (7x-2) = \log_2 (3 \times 2^5)$ •6 14	

Notes:

4. •6 is only awarded if each line of working is equivalent to the line above within a valid strategy.

Commonly Observed Responses:

Candidate A - invalid working leading to solution

$\log_2 \frac{7x-2}{3} = \log_2 5^2$ •4 ✓ •5 ✗

$x = 11$ •6 ✓ 2

Candidate B - invalid working leading to solution

$\log_2 \frac{7x-2}{3} = \log_2 5 \times 2$ •4 ✓ •5 ✗

$x = \frac{32}{7}$ •6 ✓ 2

Candidate C

$\log_2 \left(\frac{7x-2}{3} \right) = 5 \log_2 2$ •5 ✓

$\log_2 \frac{7x}{3} - \frac{2}{3} = \log_2 2^5$ •4 ✓

Candidate D

$\log_2 (7x-2) - \log_2 3 = \log_2 2^5$ •4 ✓

$\log_2 \left(\frac{7x-2}{3} \right) = \log_2 25$ •5 ✓