10 Solve the equation

(i) $\lg(2x) - \lg(x-3) = 1,$ [3]

(ii) $\log_3 y + 4\log_y 3 = 4.$ [4]

9 Solve

(i) $\log_4 2 + \log_9 (2x+5) = \log_8 64,$ [4]

(ii) $9^y + 5(3^y - 10) = 0.$ [4]

8 Solve

(i) $\log_3(2x+1) = 2 + \log_3(3x-11),$ [4]

(ii) $\log_4 y + \log_2 y = 9.$ [4]

7 **(a)** Variables l and t are related by the equation $l = l_0(1+\alpha)^t$ where l_0 and α are constants.

Given that $l_0 = 0.64$ and $\alpha = 2.5 \times 10^{-3}$, find the value of t for which $l = 0.66$. [3]

(b) Solve the equation $1 + \lg(8-x) = \lg(3x+2)$. [4]

9 **(a)** Given that $u = \log_4 x$, find, in simplest form in terms of u,

(i) $x,$

(ii) $\log_4\left(\dfrac{16}{x}\right),$

(iii) $\log_x 8.$

[5]

(b) Solve the equation $(\log_3 y)^2 + \log_3(y^2) = 8.$ [4]

5 **(i)** Express $\dfrac{\ }{\sqrt{32}}$ as a power of 2. [1]

(ii) Express $(64)^{\frac{1}{x}}$ as a power of 2. [1]

(iii) Hence solve the equation $\dfrac{(64)^{\frac{1}{x}}}{2^x} = \dfrac{1}{\sqrt{32}}.$ [3]

8 **(i)** Given that $\log_9 x = a\log_3 x$, find a. [1]

(ii) Given that $\log_{27} y = b\log_3 y$, find b. [1]

(iii) Hence solve, for x and y, the simultaneous equations

$$6\log_9 x + 3\log_{27} y = 8,$$
$$\log_3 x + 2\log_9 y = 2.$$

[4]

8 Solve the equation

(i) $2^{2x+1} = 20$, [3]

(ii) $\dfrac{5^{4y-1}}{25^{y}} = \dfrac{125^{y+3}}{25^{2-y}}$. [4]

5 **(a)** Solve the equation $9^{2x-1} = 27^{x}$. [3]

(b) Given that $\dfrac{a^{-\frac{1}{2}}b^{\frac{2}{3}}}{\sqrt{a^{3}b^{-\frac{2}{3}}}} = a^{p}b^{q}$, find the value of p and of q. [2]

10 **(a)** Given that $\log_p X = 6$ and $\log_p Y = 4$, find the value of

(i) $\log_p \left(\dfrac{X^2}{Y}\right)$, [2]

(ii) $\log_Y X$. [2]

(b) Find the value of 2^{z}, where $z = 5 + \log_2 3$. [3]

(c) Express $\sqrt{512}$ as a power of 4. [2]

7 Given that $\log_p X = 9$ and $\log_p Y = 6$, find

(i) $\log_p \sqrt{X}$, [1]

(ii) $\log_p \left(\frac{1}{X}\right)$, [1]

(iii) $\log_p (XY)$, [2]

(iv) $\log_Y X$. [2]

6 Given that $\log_8 p = x$ and $\log_8 q = y$, express in terms of x and/or y

(i) $\log_8 \sqrt{p} + \log_8 q^2$, [2]

(ii) $\log_8 \left(\frac{q}{8}\right)$, [2]

(iii) $\log_2 (64p)$. [3]

8 **(a)** Solve the equation $(2^{3-4x})(4^{x+4}) = 2$. [3]

(b) **(i)** Simplify $\sqrt{108} - \frac{12}{\sqrt{3}}$, giving your answer in the form $k\sqrt{3}$, where k is an integer. [2]

(ii) Simplify $\frac{\sqrt{5}+3}{\sqrt{5}-2}$, giving your answer in the form $a\sqrt{5} + b$, where a and b are integers. [3]

where n is a positive integer and $\begin{pmatrix} \\ r \end{pmatrix} = \frac{n!}{(n-r)!r!}$.