1)

$\log_{27}(x(x-0.4))=1$ *(M1)(A1)*

$x^2-0.4x=27$ *(M1)*

$x=5.4$ or $x=-5$ *(G2)*

$x=5.4$ *(A1)* *(C6)*

M02/520/S(1)

2)

(a) $\log_5 x^2=2\log_5 x$ *(M1)*

$=2y$ *(A1)* *(C2)*

(b) $\log_5\left(\frac{1}{x}\right)=-\log_5 x$ *(M1)*

$=-y$ *(A1)* *(C2)*

(c) $\log_{25} x=\frac{\log_5 x}{\log_5 25}$ *(M1)*

$=\frac{1}{2}y$ *(A1)* *(C2)*

M03/520/S(1)

3)

METHOD 1

$\log_{10}\left(\frac{x}{y^2\sqrt{z}}\right)=\log_{10}x-\log_{10}y^2-\log_{10}\sqrt{z}$ *(A1)(A1)(A1)*

$\log_{10}y^2=2\log_{10}y$ *(A1)*

$\log_{10}\sqrt{z}=\frac{1}{2}\log z$ *(A1)*

$\log_{10}\left(\frac{x}{y^2\sqrt{z}}\right)=\log_{10}x-2\log_{10}y-\frac{1}{2}\log z$

$=p-2q-\frac{1}{2}r$ *(A1)* *(C2)(C2)(C2)*

METHOD 2

$x=10^p,\ y^2=10^{2q},\ \sqrt{z}=10^{\frac{r}{2}}$ *(A1)(A1)(A1)*

$\log_{10}\left(\frac{x}{y^2\sqrt{z}}\right)=\log_{10}\left(\frac{10^p}{10^{2q}10^{\frac{r}{2}}}\right)$ *(A1)*

$=\log_{10}\left(10^{p-2q-\frac{r}{2}}\right)\left(=p-2q-\frac{r}{2}\right)$ *(A2)* *(C2)(C2)(C2)*

M04/521/S(1)M+

4) (a) x *(A1)* *(C1)*

(b) $e^{\ln xy}$ or $e^{\ln x}e^{\ln y}$ *(A1)*
$= xy$ *(A1)* *(C2)*

(c) **METHOD 1**

$2\ln(e^{x+y})$ *(A1)*
$= 2(x+y)\ln e$ *(A1)*
$= 2(x+y)\ \ (= 2x+2y)$ *(A1)* *(C3)*

METHOD 2

$\ln e^{2(x+y)}$ *(A2)*
$= 2(x+y)\ \ (= 2x+2y)$ *(A1)* *(C3)*

M04/522/S(1)

5) **METHOD 1**

$\log x^2 = 2\log x$ *(A1)*

$\log\sqrt{y} = \frac{1}{2}\log y$ *(A1)*

$\log z^3 = 3\log z$ *(A1)*

$2\log x + \frac{1}{2}\log y - 3\log z$ *(A1)(A1)*

$2a + \frac{1}{2}b - 3c$ *(A1)* *(C6)*

METHOD 2

$x^2 = 10^{2a},\ \ \sqrt{y} = 10^{\frac{b}{2}},\ \ z^3 = 10^{3c}$ *(A1)(A1)(A1)*

$\log_{10}\left(\frac{x^2\sqrt{y}}{z^3}\right) = \log_{10}\left(\frac{10^{2a}\times 10^{\frac{b}{2}}}{10^{3c}}\right)$ *(A1)*

$= \log_{10}\left(10^{2a+\frac{b}{2}-3c}\right)\ \ \left(= 2a + \frac{b}{2} - 3c\right)$ *(A2)*

N04/5/MATME/SP1/ENG/TZ0/XX

6)

(a) $\log_3 x - \log_3 (x-5) = \log_3\left(\frac{x}{x-5}\right)$ *(A1)*

$A = \frac{x}{x-5}$ *(A1)* *(C2)*

Note: If candidates have an incorrect or no answer to part (a) award ***(A1)(A0)*** if $\log\left(\frac{x}{x-5}\right)$ seen in part (b).

(b) **EITHER**

$\log_3\left(\frac{x}{x-5}\right) = 1$

$\frac{x}{x-5} = 3^1 (=3)$ *(M1)(A1)(A1)*

$x = 3x - 15$

$-2x = -15$

$x = \frac{15}{2}$ *(A1)* *(C4)*

OR

$\frac{\log_{10}\left(\frac{x}{x-5}\right)}{\log_{10} 3} = 1$ *(M1)(A1)*

$\log_{10}\left(\frac{x}{x-5}\right) = \log_{10} 3$ *(A1)*

$x = 7.5$ *(A1)* *(C4)*

M05/5/MATME/SP1/ENG/TZ0/XX/M+

7)

(a) (i) $\log_c 15 = \log_c 3 + \log_c 5$ *(A1)*

$= p + q$ *A1* *N2*

(ii) $\log_c 25 = 2\log_c 5$ *(A1)*

$= 2q$ *A1* *N2*

(b) **METHOD 1**

$d^{\frac{1}{2}} = 6$ *M1*

$d = 36$ *A1* *N1*

METHOD 2

For changing base *M1*

e.g. $\frac{\log_{10} 6}{\log_{10} d} = \frac{1}{2}$, $2\log_{10} 6 = \log_{10} d$

$d = 36$ *A1* *N1*

M06/5/MATME/SP1/ENG/TZ1/XX+