MARKSCHEME

1. $4^{3x-1} = 1.5625 \times 10^{-2}$

$(3x - 1)\log_{10} 4 = \log_{10} 1.5625 - 2$ (M1)

$\Rightarrow 3x - 1 = \dfrac{\log_{10} 1.5625 - 2}{\log_{10} 4}$ (A1)

$\Rightarrow 3x - 1 = -3$ (A1)

$\Rightarrow x = -\dfrac{2}{3}$ (A1) (C4)

[4]

2. $(5a + b)^7 = ...+ \begin{pmatrix}7\\4\end{pmatrix}(5a)^3(b)^4 + ...$ (M1)

$= \dfrac{7\times6\times5\times4}{1\times2\times3\times4} \times 5^3 \times (a^3b^4) = 35 \times 5^3 \times a^3b^4$ (M1)(A1)

So the coefficient is 4375 (A1) (C4)

[4]

3. $S_5 = \dfrac{5}{2}\{2 + 32\}$ (M1)(A1)(A1)

$S_5 = 85$ (A1)

OR

$a = 2$, $a + 4d = 32$ (M1)

$\Rightarrow 4d = 30$

$d = 7.5$ (A1)

$S_5 = \dfrac{5}{2}(4 + 4(7.5))$ (M1)

$= \dfrac{5}{2}(4 + 30)$

$S_5 = 85$ (A1) (C4)

[4]

4. Required term is $\begin{pmatrix}8\\5\end{pmatrix}(3x)^5(-2)^3$ (A1)(A1)(A1)

Therefore the coefficient of x^5 is $56 \times 243 \times -8$

$= -108864$ (A1) (C4)

[4]

5. $9^{x-1} = \left(\dfrac{1}{3}\right)^{2x}$

$3^{2x-2} = 3^{-2x}$ (M1) (A1)

$2x - 2 = -2x$ (A1)

$x = \dfrac{1}{2}$ (A1) (C4)

[4]

6. (a) $\$1000 \times 1.075^{10} = \$2061$ (nearest dollar) (A1) (C1)

(b) $1000(1.075^{10} + 1.075^{9} + ... + 1.075)$ (M1)

$= \dfrac{1000(1.075)(1.075^{10} - 1)}{1.075 - 1}$ (M1)

$= \$15208$ (nearest dollar) (A1) (C3)

[4]

7. (a) attempt to find d (M1)

e.g. $\dfrac{u_3 - u_1}{2}$, $8 = 2 + 2d$

$d = 3$ A1 N2 2

(b) correct substitution (A1)

e.g. $u_{20} = 2 + (20 - 1)3$, $u_{20} = 3 \times 20 - 1$

$u_{20} = 59$ A1 N2 2

(c) correct substitution (A1)

e.g. $S_{20} = \dfrac{20}{2}(2 + 59)$, $S_{20} = \dfrac{20}{2}(2 \times 2 + 19 \times 3)$

$S_{20} = 610$ A1 N2 2

[6]

8. (a) attempt to apply rules of logarithms (M1)

e.g. $\ln a^b = b\ln a$, $\ln ab = \ln a + \ln b$

correct application of $\ln a^b = b\ln a$ (seen anywhere) A1

e.g. $3\ln x = \ln x^3$

correct application of $\ln ab = \ln a + \ln b$ (seen anywhere) A1

e.g. $\ln 5x^3 = \ln 5 + \ln x^3$

so $\ln 5x^3 = \ln 5 + 3\ln x$

$g(x) = f(x) + \ln 5$ (accept $g(x) = 3\ln x + \ln 5$) A1 N1 4

(b) transformation with correct name, direction, and value A3

e.g. translation by $\begin{pmatrix} 0 \\ \ln 5 \end{pmatrix}$, shift up by ln 5, vertical translation of ln 5 3

[7]

9. recognizing $\log a + \log b = \log ab$ (seen anywhere) (A1)

e.g. $\log_2(x(x - 2))$, $x^2 - 2x$

recognizing $\log_a b = x \Leftrightarrow a^x = b$ (seen anywhere) (A1)

e.g. $2^3 = 8$

correct simplification A1

e.g. $x(x - 2) = 2^3$, $x^2 - 2x - 8$

evidence of correct approach to solve (M1)
e.g. factorizing, quadratic formula

correct working A1

e.g. $(x-4)(x+2)$, $\frac{2\pm\sqrt{36}}{2}$

$x = 4$ A2 N3

[7]

10. (a) Plan A: 1000, 1080, 1160... Plan B: 1000, 1000(1.06), $1000(1.06)^2\ldots$
2nd month: \$1060, 3rd month: \$1123.60 (A1)(A1) 2

(b) For Plan A, $T_{12} = a + 11d$
$= 1000 + 11(80)$ (M1)
$= \$1880$ (A1)

For Plan B, $T_{12} = 1000(1.06)^{11}$ (M1)
$= \$1898$ (to the nearest dollar) (A1) 4

(c) (i) For Plan A, $S_{12} = \frac{12}{2}[2000 + 11(80)]$ (M1)
$= 6(2880)$
$= \$17280$ (to the nearest dollar) (A1)

(ii) For Plan B, $S_{12} = \frac{1000(1.06^{12}-1)}{1.06-1}$ (M1)
$= \$16870$ (to the nearest dollar) (A1) 4

[10]