Linear Law 2 ANSWERS

1)

11 (i) $\ln s = n \ln t + \ln k$

$\ln t$	1.6	2.7	3.4	4.2	4.6
$\ln s$	7.2	5.9	5	4	3.6

Plot $\ln s$ against $\ln t$

M1, A1 — M1 for attempt to take logs; A1 for correct form
M1 — M1 for attempt to plot correct graph
A1 — A1 for a reasonable straight line
[4]

(ii) grad $n = -1.2$ (-1.4 to -1.0)
Intercept $= \ln k$, leading to
$k = 7900 - 10\,000$

M1, A1 — M1 for use of grad $= n$
M1, A1 — M1 for use of intercept $= \ln k$
[4]

(iii) when $t = 50$, $\ln t = 4.4$
leading to $s = 80$ (72 – 92)

M1 — M1 for attempt to obtain s
A1
[2]

Alternative method

(i) $\lg s = n \lg t + \lg k$

$\lg t$	0.7	1.2	1.5	1.8	2
$\lg s$	3.1	2.5	2.2	1.7	1.6

Same scheme applies

2)

0606/01/M/J/09

(i) plot xy against $1/x$ with linear scales — M1

xy	4.5	3.24	2.82	2.64
$1/x$	0.5	0.25	0.17	0.125

A2, 1, 0

(ii) attempt at gradient using plotted points — DM1
5 ± 0.2 — A1
intercept 2 ± 0.1 — B1
(or A1 if calculated from $y = mx + c$)
use $Y = mX + c$ in correct way — M1
$y = \frac{5}{x^2} + \frac{2}{x}$ or $y = \frac{5+2x}{x^2}$ or $y = \frac{1}{x}\left(\frac{5}{x} + 2\right)$ — A1√

(iii) read from graph or substitute in formula to find x — M1
$x = 2.5 \pm 0.2$ — A1
$y = 1.6 \pm 0.1$ — A1

0606/02/O/N/08

[11]

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3)

4	**(i)** gradient = 2, equation of line of form $Y = mX + c$, where $c = 0.6$ $\therefore e^y = 0.6$	M1 A1 [2]	M1 for attempt to get equation of straight line
	(ii) $e^y = 2x^2 + 0.6$	A1	A1 for correct form (allow if seen in **(i)**)
	$\therefore y = \ln(2x^2 + 0.6)$	M1 A1 [3]	M1 for attempt to take ln 0606/01/M/J/08

4)

9 (i)

x	2	4	6	8	10
y	14.4	10.8	11.2	12.6	14.4
xy	29	43	67	101	144
x^2	4	16	36	64	100

	M1 A1 [2]	Knows what to do. Mark from graph – 5 points are in line.
(ii) Gradient 1.2 (±0.1) 'y' intercept (±2)	B1 B1	co co
$\rightarrow y = 1.2x + \frac{24}{x}$	M1 A1 [4]	xy = (their grad)x + (their intercept)
(iii) From graph $xy = 83 \rightarrow x^2 = 49$ Valid method to obtain y $y = 11.6 - 12.2$	M1 M1 A1 [3]	Reads on vertical axis at 83 Valid method to obtain y co 0606/01/O/N/07

5)

9. (i)

$1/x$	10	8	6.25	5	2.5
$1/y$	20	15.6	11.8	9.0	3.5

	M1 A2,1,0 [3]	Knows what to do. Accuracy.
(ii) Gradient 2.2 (±0.05) Intercept = −2(±0.1)	B1 B1	Within given range – graph needed
$\frac{1}{y} = 2.2.\frac{1}{x} - 2$	M1	Uses $Y = mX + c$
$\rightarrow \quad y = \frac{x}{2.2 - 2x}$	A1√ [4]	Correct form with his m and c.
(iii) $y = 0.15 \quad 1/y = 6.7 \rightarrow 1/x = 4$	M1	Uses $1/y$ and $1/x$ correctly – or solves equation from part (ii).
$\rightarrow x = 0.254$ (±0.010)	A1 [2]	co within range. 0606/01/M/J/07

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6)

11	**(i)**	plot xy against $1/x$ with linear scales xy 4.5 3.24 2.82 2.64 $1/x$ 0.5 0.25 0.17 0.125	M1 A2, 1, 0	
	(ii)	attempt at gradient using plotted points 5 ± 0.2 intercept 2 ± 0.1 (or A1 if calculated from $y = mx + c$) use $Y = mX + c$ in correct way $y = \frac{5}{x^2} + \frac{2}{x}$ or $y = \frac{5+2x}{x^2}$ or $y = \frac{1}{x}\left(\frac{5}{x} + 2\right)$	DM1 A1 B1 M1 A1√	
	(iii)	read from graph or substitute in formula to find x $x = 2.5 \pm 0.2$ $y = 1.6 \pm 0.1$	M1 A1 A1	**[11]**