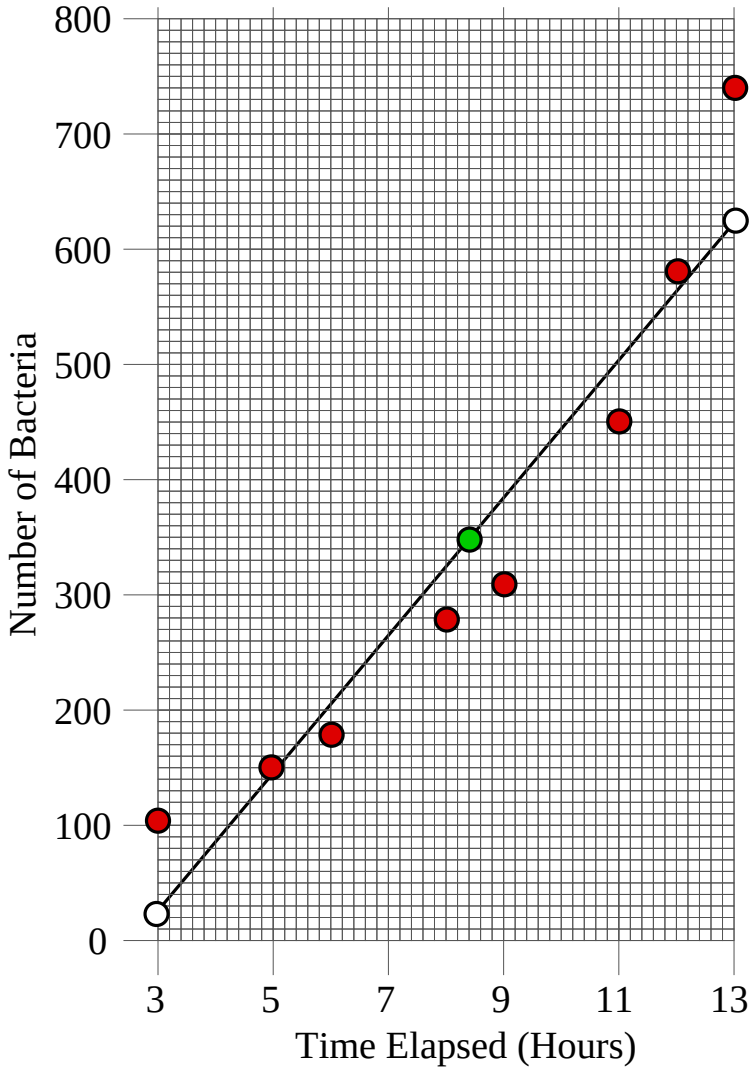
7.3 Solution to 7.2 Example

(i) Here are the raw data points are plotted as red spots on a scattergraph,



[4 marks]

(ii) (Mean x, Mean y) = (8.375, 346.875)
This point is plotted on the above graph (in green).
The line of best fit has been added by eye.

[2 marks]

(iii) Obtaining the equation of the straight line of best fit from a calculator is part of the Year 2 applied mathematics (statistics) course: $y = -158.7 + 60.36x$
Here, having drawn the line by eye, making sure it goes through the point (Mean x, Mean y), the idea is to pick two far apart points on the line, say those plotted in white on the above graph, and so obtain the equation,

$$b = \frac{\Delta y}{\Delta x}$$

$$= \frac{626 - 22.4}{13 - 3}$$

$$= 60.36$$

$$y = a + bx$$

$$346.875 = a + 60.36 \times 8.375$$

$$a = -158.7$$

$$\therefore\ y = -158.7 + 60.36x$$

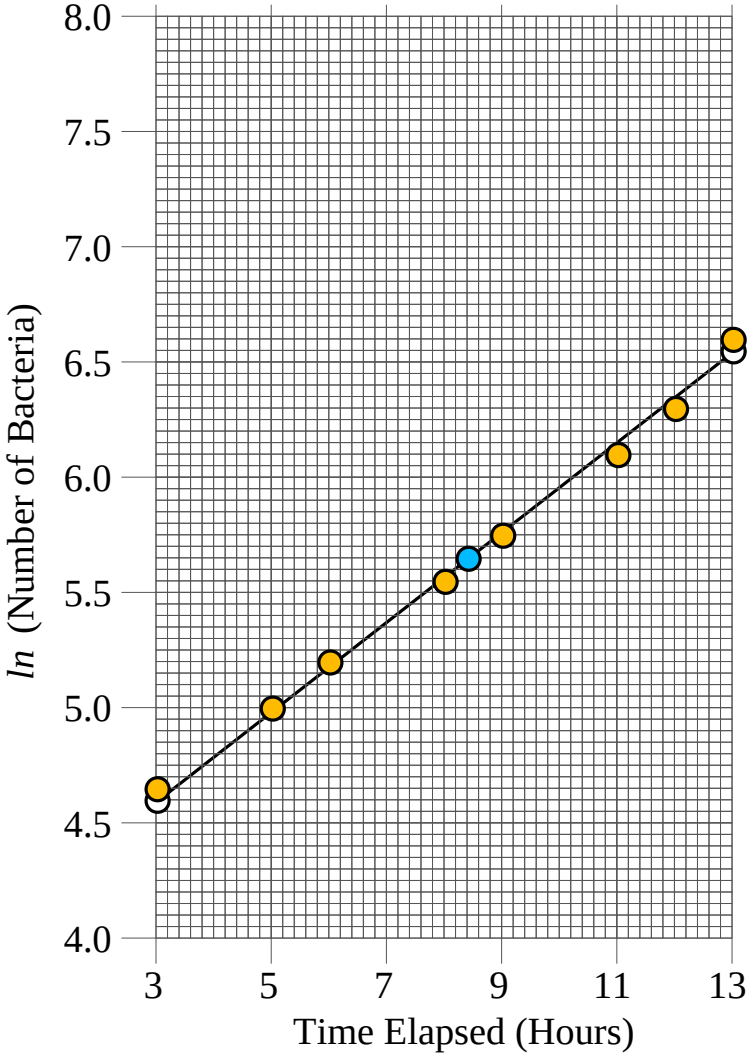
[2 marks]

(iv)

X	3	5	6	8	9	11	12	13
$Y = ln\ y$	4.65	5.01	5.19	5.56	5.74	6.11	6.36	6.61

[2 marks]

(v) Here are the coded data points are plotted as orange spots on a scattergraph,



[4 marks]

(vi) Yes, a straight line relationship has been found in the coded data.

[1 mark]

(vii) (Mean x, Mean $ln\ y$) = (8.375, 5.654)
This point is plotted on the above graph (in blue).
The line of best fit has been added by eye.

[2 marks]

(viii) Obtaining the equation of the straight line of best fit from a calculator is part of the Year 2 applied mathematics (statistics) course: $y = 4.04 + 0.193x$
Here, having drawn the line by eye, making sure it goes through the point (Mean x, Mean $ln\ y$), the idea is to pick two far apart points on the line, say those plotted in white on the above graph, and so obtain the equation,

$$b = \frac{\Delta Y}{\Delta X}$$
$$= \frac{6.55 - 4.62}{13 - 3}$$
$$= 0.193$$
$$Y = a + bX$$
$$5.654 = a + 0.193 \times 8.375$$
$$a = 4.04$$
$$\therefore\ Y = 4.04 + 0.193X$$

[2 marks]

(ix) The coded scatter graph's straight line of best fit has the points much closer (on average) to it than was the case with the raw data scattergraph and its straight line of best fit.

[1 mark]

(x) Using the claimed decoding procedure,

$$a = e^{4.04} \qquad b = e^{0.193}$$
$$= 56.8 \qquad = 1.21$$
$$\therefore\ y = 56.8 \times 1.21^{x}$$

[3 marks]

(xi) This curve is so good that when plotted on the raw data scatter graph it very nearly passes through all of the original raw data points.

[1 mark]