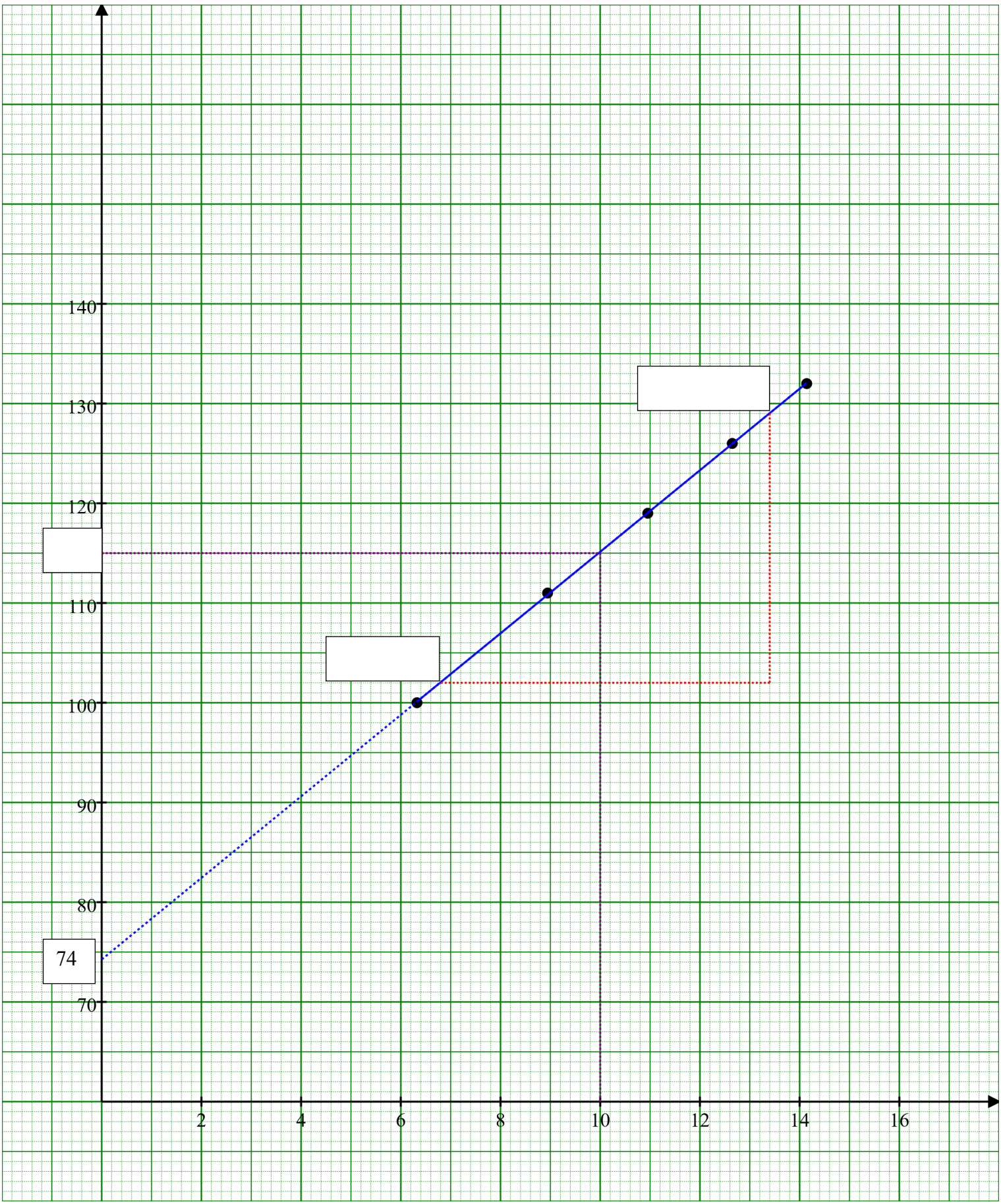
2021 and 2022 Edited Revision Paper Marking Scheme

1(i)	Let and then $Y = aX + b$ $a = \dfrac{112000 - 47500}{\ln 11 - \ln 75}$ $= -33601$ (5 s.f) $= -33600$ (3 s.f) Substitute $X = \ln 11$ and $Y = 112\ 000$, $112\ 000 = -33601 \ln 11 + b$ $b = 192\ 570$ (5 s.f) $b = 193\ 000$ (3 s.f)
(ii)	$P = -33601 \ln m + 193570$ When $P = 90\ 000$, $90\ 000 = -33\ 601 \ln m + 193\ 270$ $33\ 601 \ln m = 103\ 570$ $\ln m = \dfrac{102\ 570}{33\ 601}$ $m = e^{\frac{102\ 570}{33\ 601}}$ $m = 21.2$ months (3 s.f)


140
130
120
110
100
90
80
74
70
2
4
6
8
10
12
14
16

2(i)	<table><tr><td></td><td>6.325</td><td>8.944</td><td>10.954</td><td>12.649</td><td>14.142</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>
2(ii)	When , . From the graph the vertical intercept is . Answer 74 kg/acre
2(iii)	From the graph $a = \frac{129-102}{13.4-6.8}$ $= 4.09$ (3 s.f)
2(iv)	When , . From graph, kg/acre.

3)

$$f(x) = \frac{3(3-4x)^2}{2\sqrt{3-4x}}$$
$$= \frac{3}{2}(3-4x)^{\frac{3}{2}}$$

$$f'(x) = \left(\frac{3}{2}\right)\left(\frac{3}{2}\right)(3-4x)^{\frac{1}{2}}(-4)$$
$$= -9(3-4x)^{\frac{1}{2}}$$
$$= -9\sqrt{3-4x}$$

4) $y = (2x+3)(x-3)^4$

$$\frac{dy}{dx} = (2x+3)(4)(x-3)^3 + (x-3)^4(2)$$
$$= 4(2x+3)(x-3)^3 + 2(x-3)^4$$
$$= 2(x-3)^3\left[2(2x+3)+(x-3)\right]$$
$$= 2(x-3)^3(4x+6+x-3)$$
$$= 2(x-3)^3(5x+3)$$

5)

$$y = \frac{3x^2}{\sqrt{4x-3}}$$
$$= \frac{3x^2}{(4x-3)^{\frac{1}{2}}}$$

$$\frac{dy}{dx} = \frac{(4x-3)^{\frac{1}{2}}(3)(2x) - \left(3x^2\right)\left(\frac{1}{2}\right)(4x-3)^{-\frac{1}{2}}(4)}{\left[(4x-3)^{\frac{1}{2}}\right]^2}$$

$$= \frac{6x(4x-3)^{\frac{1}{2}} - 6x^2(4x-3)^{-\frac{1}{2}}}{(4x-3)}$$

$$= \frac{6x(4x-3)^{-\frac{1}{2}}[4x-3-x]}{(4x-3)}$$

$$= \frac{6x(4x-3)^{-\frac{1}{2}}(3x-3)}{(4x-3)}$$

$$= \frac{18x(x-1)}{(4x-3)^{\frac{3}{2}}}$$

$$= \frac{18x(x-1)}{\sqrt{(4x-3)^3}}$$