

10 David, a conservationist, is studying a population of newts which he released into a newly created lake.

David models the relationship between N , the number of newts in the lake, and t , the number of years after the newts were released, using the formula

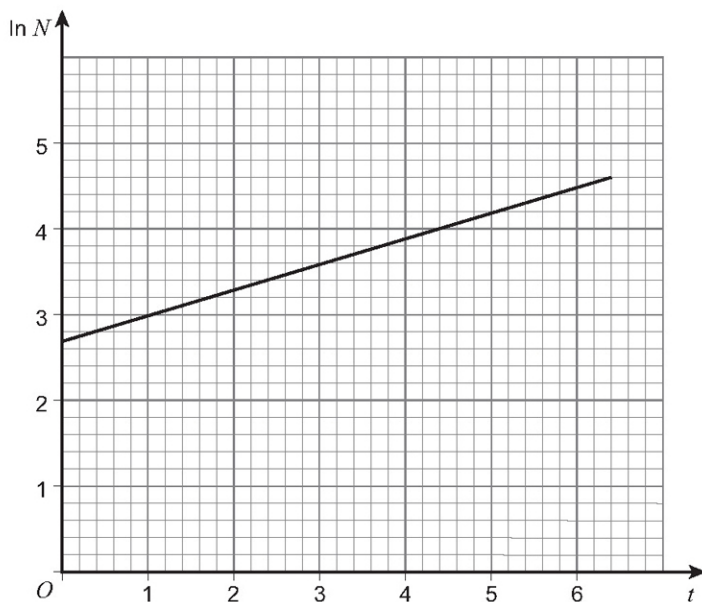
$$N = A \times B^t$$

where A and B are constants.

10 (a) According to this model, show algebraically that there is a linear relationship between $\ln N$ and t

[3 marks]

10 (b) David used the data he collected to produce the following graph.



10 (b) (i) Find the gradient of the graph, using the points where $t = 1$ and $t = 5$

[1 mark]

10 (b) (ii) Hence find the value of B

Give your answer to three significant figures.

[2 marks]

10 (b) (iii) Find an estimate for the number of newts that were released.

[3 marks]

10 (b) (iv) Use the model to estimate the number of complete years needed for the population of newts to exceed 10 times its initial size.

[2 marks]

10 (c) David's model for exponential growth will become unrealistic in the long term.

State **one** additional factor that David could include in a refined model.

[1 mark]