

10 David has been investigating the population of rabbits on an island during a three-year period.

Based on data that he has collected, David decides to model the population of rabbits, R , by the formula

$$R = 50e^{0.5t}$$

where t is the time in years after 1 January 2016.

10 (a) Using David's model:

10 (a) (i) state the population of rabbits on the island on 1 January 2016;

[1 mark]

10 (a) (ii) predict the population of rabbits on 1 January 2021.

[1 mark]

10 (b) Use David's model to find the value of t when $R = 150$, giving your answer to three significant figures.

[2 marks]

10 (c) Give **one** reason why David's model may **not** be appropriate.

[1 mark]

10 (d) On the same island, the population of crickets, C , can be modelled by the formula

$$C = 1000e^{0.1t}$$

where t is the time in years after 1 January 2016.

Using the two models, find the year during which the population of rabbits first exceeds the population of crickets.

[3 marks]