

- 12** Trees in a forest may be affected by one of two types of fungal disease, but not by both.

The number of trees affected by disease A,  $n_A$ , can be modelled by the formula

$$n_A = ae^{0.1t}$$

where  $t$  is the time in years after 1 January 2017.

The number of trees affected by disease B,  $n_B$ , can be modelled by the formula

$$n_B = be^{0.2t}$$

On 1 January 2017 a **total** of 290 trees were affected by a fungal disease.

On 1 January 2018 a **total** of 331 trees were affected by a fungal disease.

- 12 (a)** Show that  $b = 90$ , to the nearest integer, and find the value of  $a$ . **[3 marks]**
- 12 (b)** Estimate the total number of trees that will be affected by a fungal disease on 1 January 2020. **[1 mark]**
- 12 (c)** Find the year in which the number of trees affected by disease B will first exceed the number affected by disease A. **[3 marks]**
- 12 (d)** Comment on the long-term accuracy of the model. **[1 mark]**