

- 6 During some research the size,  $P$ , of a population of insects, at time  $t$  months after the start of the research, is modelled by the following formula.

$$P = 100 e^t$$

- (a) Use this model to answer the following.

(i) Find the value of  $P$  when  $t = 4$ . [1]

(ii) Find the value of  $t$  when the population is 9000. [2]

- (b) It is suspected that a more appropriate model would be the following formula.

$$P = ka^t \text{ where } k \text{ and } a \text{ are constants.}$$

(i) Show that, using this model, the graph of  $\log_{10}P$  against  $t$  would be a straight line. [2]

Some observations of  $t$  and  $P$  gave the following results.

$t$	1	2	3	4	5
$P$	100	500	1800	7000	19 000
$\log_{10}P$	2.00	2.70	3.26	3.85	4.28

(ii) On the grid in the Printed Answer Booklet, draw a line of best fit for the data points  $(t, \log_{10}P)$  given in the table. [2]

(iii) Hence estimate the values of  $k$  and  $a$ . [4]

**6(b)(ii)**

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