AQA – Exponentials and logarithms – A2 Mathematics P1

1. June/2021/Paper_7357/1/No.9

The table below shows the annual global production of plastics, P, measured in millions of tonnes per year, for six selected years.

Year	1980	1985	1990	1995	2000	2005
P	75	94	120	156	206	260

It is thought that P can be modelled by

$$P = A \times 10^{kt}$$

where t is the number of years after 1980 and A and k are constants.

(a) Show algebraically that the graph of $\log_{10} P$ against t should be linear.

[3 marks]

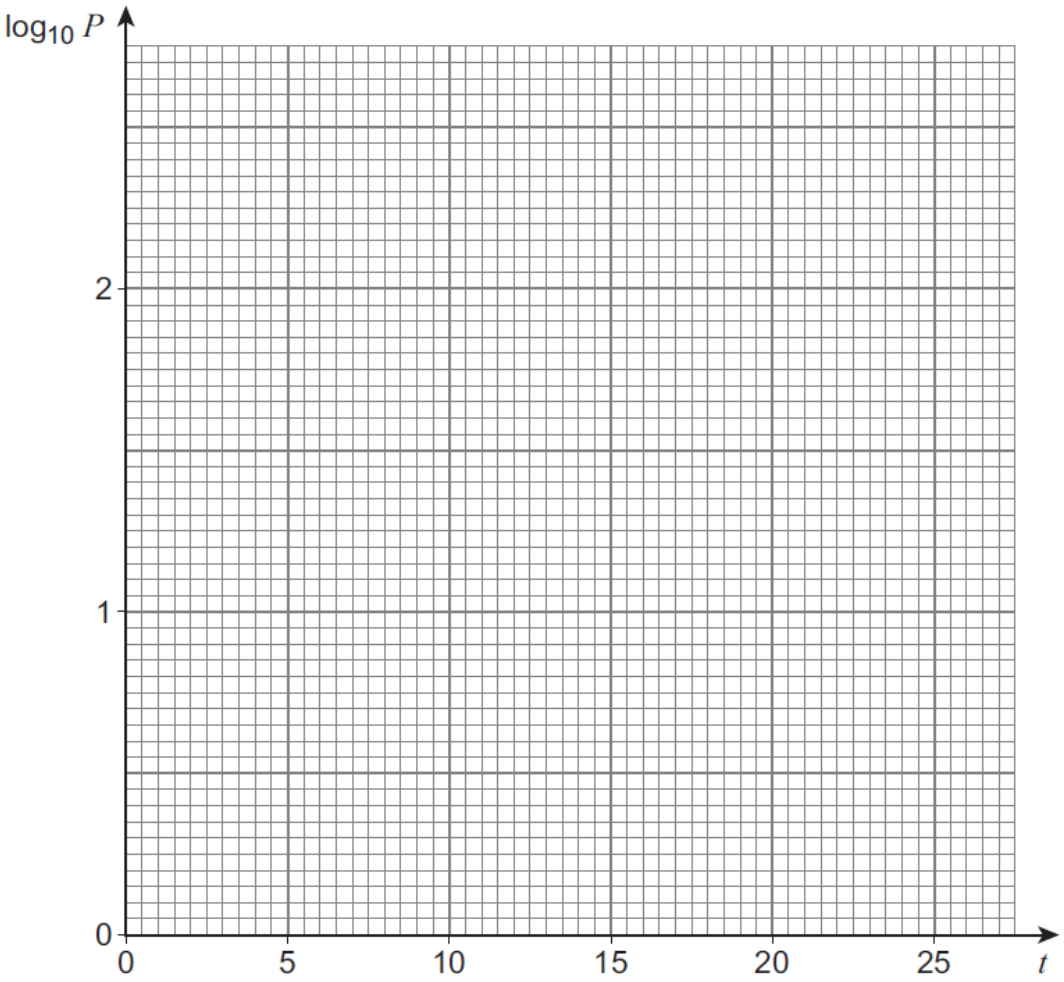
(b) (i) Complete the table below.

t	0	5	10	15	20	25
$\log_{10} P$	1.88	1.97	2.08		2.31	

[1 mark]

(b) (ii) Plot $\log_{10} P$ against t, and draw a line of best fit for the data.

[2 marks]



(c) (i) Hence, show that k is approximately 0.02

[2 marks]

(c) (ii) Find the value of A.

[1 mark]

(d) Using the model with $k = 0.02$ predict the number of tonnes of annual global production of plastics in 2030.

[2 marks]

(e) Using the model with $k = 0.02$ predict the year in which P first exceeds 8000

[3 marks]

(f) Give a reason why it may be inappropriate to use the model to make predictions about future annual global production of plastics.

[1 mark]