

Issues from P3

Which sections of the specification do students need to know to do the question?

Is the question suitable (with rigorous wording etc) for a written examination.

Is the question better suited to classroom use.

Avoid this question!

**1** Draw a sketch of the graphs of  $y = 3 - |4-x|$  and of  $y = 3 - x/2$

Write down the coordinates of any points where the graphs cut the axes.

Use your completed graphs to

(i) help solve  $3 - |4-x| > y = 3 - x/2$

(ii) decide for what values of  $k$  the equation  $3 - |4-x| = k$  has 2 real solutions.

**2** For fitting straight lines to data of the form  $y = ax^n$  and  $y = ab^x$  is it preferable to use log (base 10) or  $\ln$ ?

Why?

**3** This is a generalisation of a question from June 17 C34.

Let  $N$  be the number of individuals in a population.

Consider an equation of the form  $N = p - \frac{e^{kt}}{a + be^{\lambda t}}$  with  $p, a, b, k, \lambda > 0$

Under what conditions on  $k$  and  $\lambda$  does  $N$  have a minimum?

**4** Find these integrals.

(a)  $\int \frac{1 - \tan x}{1 + \tan x} dx$

(b)  $\int \frac{\sin x}{\cos^2 x} dx$

(c)  $\int_0^\pi \cos^3 x dx$

(d)  $\int \frac{4x}{1+x^2} \ln(1+x^2) dx$

## 5 (From the specimen paper)

8. In a controlled experiment, the number of microbes,  $N$ , present in a culture  $T$  days after the start of the experiment were counted.

$N$  and  $T$  are expected to satisfy a relationship of the form

$$N = aT^b \quad \text{where } a \text{ and } b \text{ are constants}$$

- (a) Show that this relationship can be expressed in the form

$$\log_{10} N = m \log_{10} T + c$$

giving  $m$  and  $c$  in terms of the constants  $a$  and/or  $b$ .

(2)

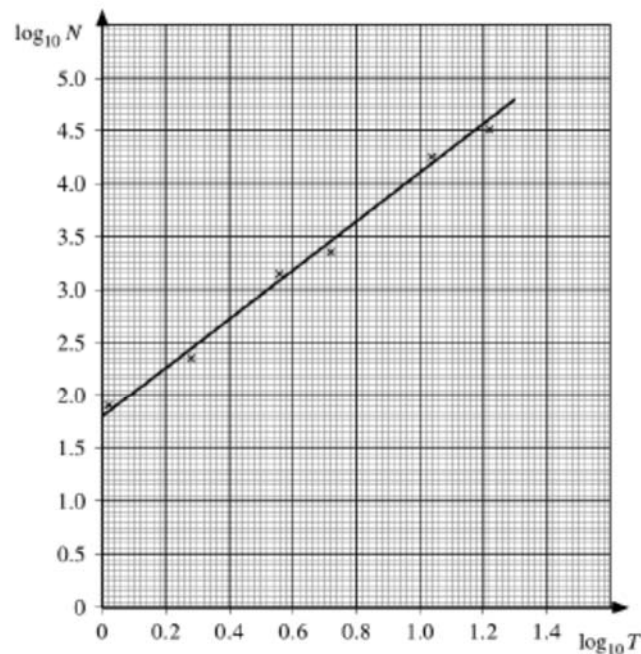


Figure 2

Figure 2 shows the line of best fit for values of  $\log_{10} N$  plotted against values of  $\log_{10} T$

- (b) Use the information provided to estimate the number of microbes present in the culture 3 days after the start of the experiment.

(4)

- (c) With reference to the model, interpret the value of the constant  $a$ .

(1)