

## FP1 Linear Laws Questions

6 [Figure 1 and Figure 2, printed on the insert, are provided for use in this question.]

The variables  $x$  and  $y$  are known to be related by an equation of the form

$$y = kx^n$$

where  $k$  and  $n$  are constants.

Experimental evidence has provided the following approximate values:

$x$	4	17	150	300
$y$	1.8	5.0	30	50

(a) Complete the table in **Figure 1**, showing values of  $X$  and  $Y$ , where

$$X = \log_{10}x \quad \text{and} \quad Y = \log_{10}y$$

Give each value to two decimal places. (3 marks)

(b) Show that if  $y = kx^n$ , then  $X$  and  $Y$  must satisfy an equation of the form

$$Y = aX + b \quad (3 \text{ marks})$$

(c) Draw on **Figure 2** a linear graph relating  $X$  and  $Y$ . (3 marks)

(d) Find an estimate for the value of  $n$ . (2 marks)

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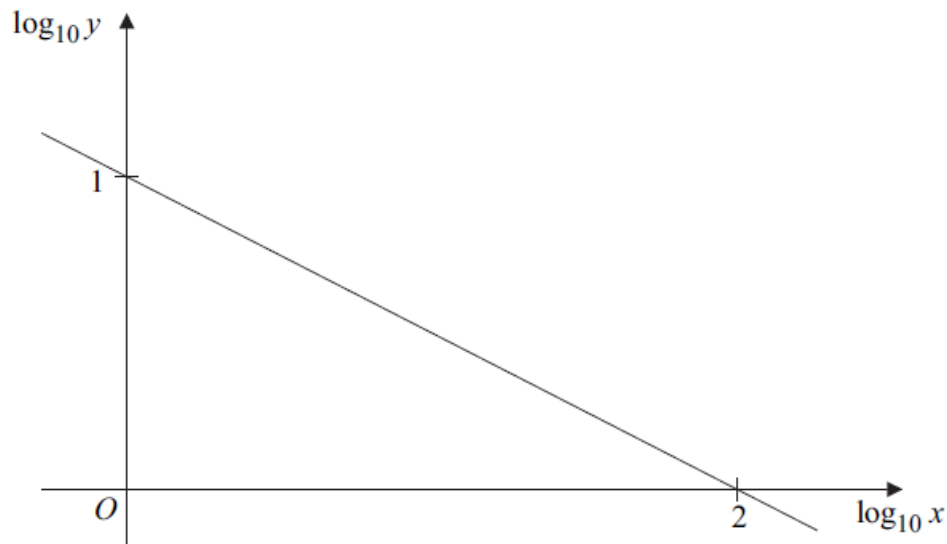
4 The variables  $x$  and  $y$  are related by an equation of the form

$$y = ax^b$$

where  $a$  and  $b$  are constants.

(a) Using logarithms to base 10, reduce the relation  $y = ax^b$  to a linear law connecting  $\log_{10}x$  and  $\log_{10}y$ . (2 marks)

(b) The diagram shows the linear graph that results from plotting  $\log_{10}y$  against  $\log_{10}x$ .



Find the values of  $a$  and  $b$ .

(4 marks)

5 [Figure 1 and Figure 2, printed on the insert, are provided for use in this question.]

The variables  $x$  and  $y$  are known to be related by an equation of the form

$$y = ab^x$$

where  $a$  and  $b$  are constants.

The following approximate values of  $x$  and  $y$  have been found.

$x$	1	2	3	4
$y$	3.84	6.14	9.82	15.7

(a) Complete the table in **Figure 1**, showing values of  $x$  and  $Y$ , where  $Y = \log_{10} y$ .  
Give each value of  $Y$  to three decimal places. (2 marks)

(b) Show that, if  $y = ab^x$ , then  $x$  and  $Y$  must satisfy an equation of the form

$$Y = mx + c \quad (3 \text{ marks})$$

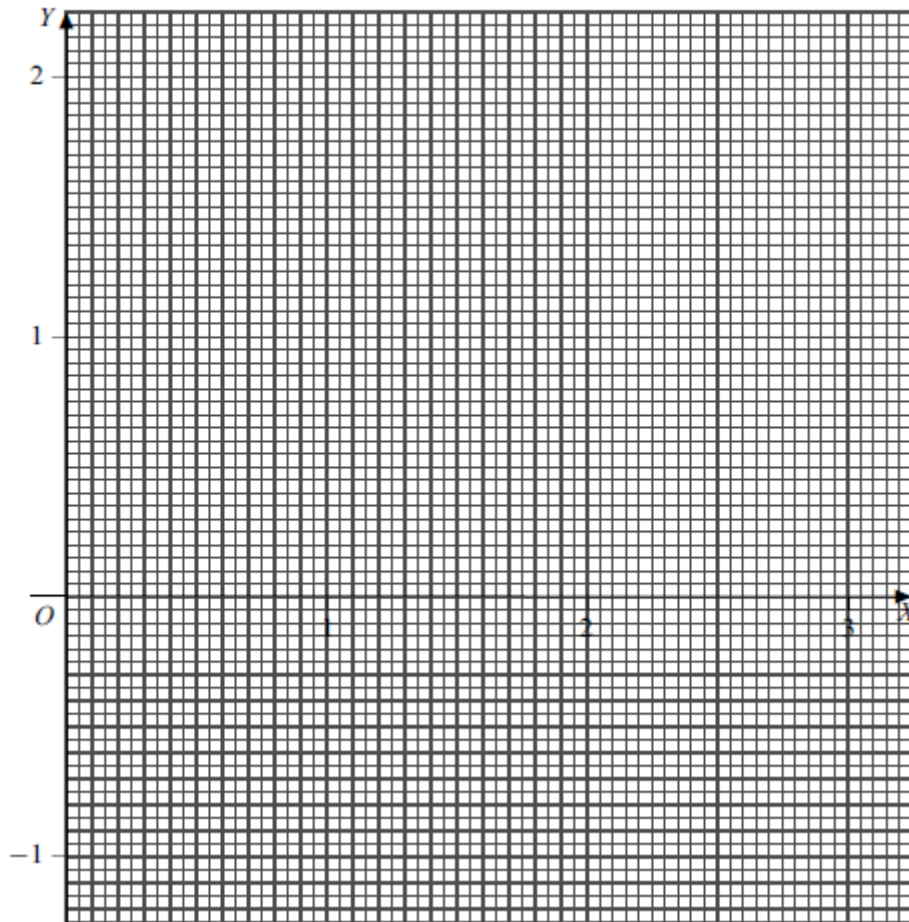
(c) Draw on **Figure 2** a linear graph relating  $x$  and  $Y$ . (2 marks)

(d) Hence find estimates for the values of  $a$  and  $b$ . (4 marks)

**Figure 1 (for use in Question 6)**

$X$	0.60			2.48
$Y$	0.26			1.70

**Figure 2 (for use in Question 6)**



**Figure 1 (for use in Question 5)**

$x$	1	2	3	4
$Y$	0.584			

**Figure 2 (for use in Question 5)**

