

Topic: Linear Law

Question 1 [2008 EOY, Q4]	marks
Two variables x and y are such that when $\lg y$ is drawn against $\lg x$, a straight line of gradient -3 is obtained, passing through the point $(-2, 9)$. (i) Express y in terms of x.	[4]
(ii) Find the value of x when $y = -1$.	[2]

Question 2 [2009 EOY, Q15]	marks												
Answer the whole of this question on a sheet of graph paper. The table shows experimental values of two variables, x and y, which are known to be related by the equation $y - 1 = px + \frac{q}{x}$. <table><tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y</td><td>2.4</td><td>1.1</td><td>0.2</td><td>-0.5</td><td>-1.1</td></tr></table> (i) Choosing a suitable scale, plot $(xy - x)$ against x^2 and draw a straight line.		1	2	3	4	5	y	2.4	1.1	0.2	-0.5	-1.1	[5]
	1	2	3	4	5								
y	2.4	1.1	0.2	-0.5	-1.1								
(ii) Use your graph to estimate the values of p and q.	[2]												
(iii) Explain how you would use your graph to determine if the set of experimental values $x = 10$ and $y = -4$ are related by the equation $y - 1 = px + \frac{q}{x}$.	[1]												

Question 3 [2010 EOY, Q8]

marks

The table below shows experimental readings of y for given values of x such that $xy = ay + b\sqrt{x}$ where a and b are real constants.

x	0	1	2	3	4	5	6
y	0	2.21	1.96	-8.95	-3.88	-2.67	-2.11

By drawing a straight line graph of $\sqrt{x}y$ against $\frac{y}{\sqrt{x}}$, identify the incorrect reading,

[4]

(ii) estimate the values of a and b .	[2]
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Question 4 [2012 EOY, Q12]	marks
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The table shows experimental values of two variables, x and y , which are known to be related by the equation $\sqrt{y}(x^b) = a$, where a and b are constants.

x	1.0	1.5	2.0	2.5	3.0
y	7.3	3.5	2.0	1.3	0.9

(i)

Express this equation in a form suitable for drawing a straight line graph.

[2]

(ii)

Using a suitable scale, plot a straight line graph of $\lg y$ against $\lg x$.

Use your graph to estimate the value of a and of b .

[6]

Question 5 [2013 EOY, Q15]

marks

The table shows the experimental values of two variables x and y .

x	1	2	3	4	5
y	3.8	11.2	20.5	33.2	50.6
$\frac{y}{x}$	3.8	5.6		8.3	

It is known that x and y are related by the equation $y = ax + bx^2$

Plot $\frac{y}{x}$ against x and draw a suitable straight line.

(a)

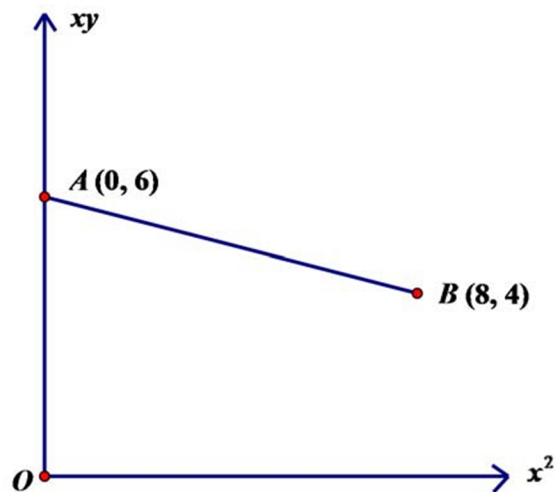
Use the graph to estimate the value of a and of b ,

[4]

(ii) the value of x when $y = 8x$.

[1]

(b) The diagram shows the straight line graph of xy against x^2 passing through the points $A(0, 6)$ and $B(8, 4)$. Express y in terms of x .



[3]

Question 6 [2014 EOY, Q10]						marks														
Answer the whole of this question on a sheet of graph paper. The table shows experimental values of two variables x and y. It is known that x and y are related by an equation $y = ae^{-bx}$, and that one of these values of y given in the table is subject to an abnormally large error. <table><tr><td>x</td><td>1.5</td><td>2.5</td><td>3.5</td><td>4.5</td><td>5.0</td><td>6.0</td></tr><tr><td>y</td><td>9.9</td><td>6.0</td><td>3.6</td><td>2.2</td><td>1.7</td><td>1.4</td></tr></table> (i) Draw a straight line graph of $\ln y$ against x, using a scale of 2 cm to 1 unit on the x-axis and 1 cm to 0.2 units on the $\ln y$-axis.						x	1.5	2.5	3.5	4.5	5.0	6.0	y	9.9	6.0	3.6	2.2	1.7	1.4	
x	1.5	2.5	3.5	4.5	5.0	6.0														
y	9.9	6.0	3.6	2.2	1.7	1.4														
						[4]														
(ii) Use your graph to estimate the value of a and of b.						[3]														

(iii)

Identify the abnormal reading of y and estimate its correct value.

[2]

Question 7 [2015 EOY, Q8]

marks

Answer the whole of this question on a sheet of graph paper.

Two variables x and y are related such that $y^2 = ax^2 + bx$, where a and b are unknown constants. In an experiment, values of y are found for several values of x and the values are tabulated as shown below. It is also found that one particular value of y is incorrectly recorded.

x	1	2	3	4	5	6
y	2.07	3.77	5.45	6.81	8.81	10.48

(i)

Using a scale of 2 cm to 1 unit for the horizontal axis and 1 cm to 1 unit for the vertical axes, plot $\frac{y^2}{x}$ against x and draw a straight line graph, and use it to identify the incorrect value of y recorded.

[4]

(ii)

Use your graph to estimate, to one decimal place, the values of a and b , and hence estimate, to two decimal places, the correct value of y in (i).

[4]