Straight Lines: Coordinates and Lengths 1ii

A Level

Part A Find coordinate

The line segment joining the points $(-2, 7)$ and $(-4, p)$ has gradient 4. Find the value of p.

The following symbols may be useful: `p`

Part B Find coordinates and midpoint

The line segment joining the points $(-2, 7)$ and $(6, q)$ has midpoint $(m, 5)$. Find m and q. Enter the values of m and q below.

Enter the value of m:

The following symbols may be useful: `m`

Enter the value of q:

The following symbols may be useful: `q`

Part C Find coordinate from length

The line segment joining the points $(-2, 7)$ and $(d, 3)$ has length $2\sqrt{13}$. Find the two possible values of of d. Enter the greatest possible value of d.

The following symbols may be useful: d

Used with permission from UCLES, A Level, January 2013, Paper 4721, Question 6.

Straight Lines: Coordinates and Lengths 2i

A Level

The points A, B, and C have coordinates $(5, 1)$, $(p, 7)$, and $(8, 2)$ respectively.

Part A Possible values of p

Given that the distance between the points A and B is twice the distance between points A and C, calculate the possible values of p. Enter the smallest possible value of p.

The following symbols may be useful: p

Part B Midpoint of AB

Given also that the line passing through A and B has equation $y = 3x - 14$, find the coordinates of the midpoint of AB. Enter the x and y coordinates below.

Enter the x coordinate:

The following symbols may be useful: x

Enter the y coordinate:

The following symbols may be useful: y

Used with permission from UCLES, A Level, January 2006, Paper 4721, Question 9.

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Straight lines: gradients and normals 4ii

A Level

P P P

The points A and B have coordinates $(6, 1)$ and $(-2, 7)$ respectively.

Part A Length of AB

Find the length of AB.

Part B Gradient of AB

Find the gradient of the line AB.

Part C Compare gradients

Determine whether the line $4x - 3y - 10 = 0$ is perpendicular to AB.

- The lines are perpendicular
- The lines are not perpendicular

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Straight lines: gradients and normals 2i

A Level

P P P

A is the point $(2, 7)$ and B is the point $(-1, -2)$.

Part A Equation of line

Find the equation of the line through A parallel to the line $y = 4x - 5$, giving your answer in the form $y = mx + c$.

The following symbols may be useful: `x, y`

Part B Length of AB

Calculate the length of AB, giving your answer in simplified surd form.

Part C Find equation of line

Find the equation of the line which passes through the midpoint of AB, and which is perpendicular to AB. Give your answer in the form $ax + by + c = 0$, where a, b, and c are integers.

The following symbols may be useful: `x, y`

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Straight lines: gradients and normals 4i

A Level

The points A and B have coordinates $(-5, -2)$ and $(3, 1)$ respectively.

Part A Equation of line

Find the equation of the line AB, giving your answer in the form $ax + by + c = 0$.

The following symbols may be useful: `x, y`

Part B Find coordinate

Find the coordinates of the midpoint of AB. Enter the x and y coordinates below.

Enter the x coordinate:

The following symbols may be useful: `x`

Enter the y coordinate:

The following symbols may be useful: `y`

Part C Length of line

The point C has coordinates $(-3, 4)$.

Calculate the length of AC, giving your answer in simplified surd form.

Determine whether the line AC is perpendicular to the line BC.

- ○ The lines are perpendicular
- ○ The lines are not perpendicular

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Straight lines: gradients and normals 1ii

A Level

P P P

A is the point $(-2, 6)$ and B is the point $(3, -8)$. The line l is perpendicular to the line $x - 3y + 15 = 0$, and passes through the midpoint of AB. Find the equation of l, giving your answer in the form $ax + by + c = 0$ where a, b, and c are integers.

The following symbols may be useful: `x, y`

Used with permission from UCLES, A level, June 2009, Paper 4721, Question 9.

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Straight lines: gradients and normals 3ii

A Level

The points $A(1, 3)$, $B(7, 1)$, and $C(-3, -9)$ are joined to form a triangle.

Part A Show right angle

Show that this triangle is right angled, and determine whether the right angle is located at A, B, or C.

- A
- C
- B

Part B Triangle in circle

The points A, B and C lie on the circumference of a circle.

Find the x coordinate of the centre of the circle.

The following symbols may be useful: x

Find the y coordinate of the centre of the circle.

The following symbols may be useful: y

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Logarithmic Plots 1

A Level

The logarithms to base 10 of two variables, x and y, are plotted against each other below.

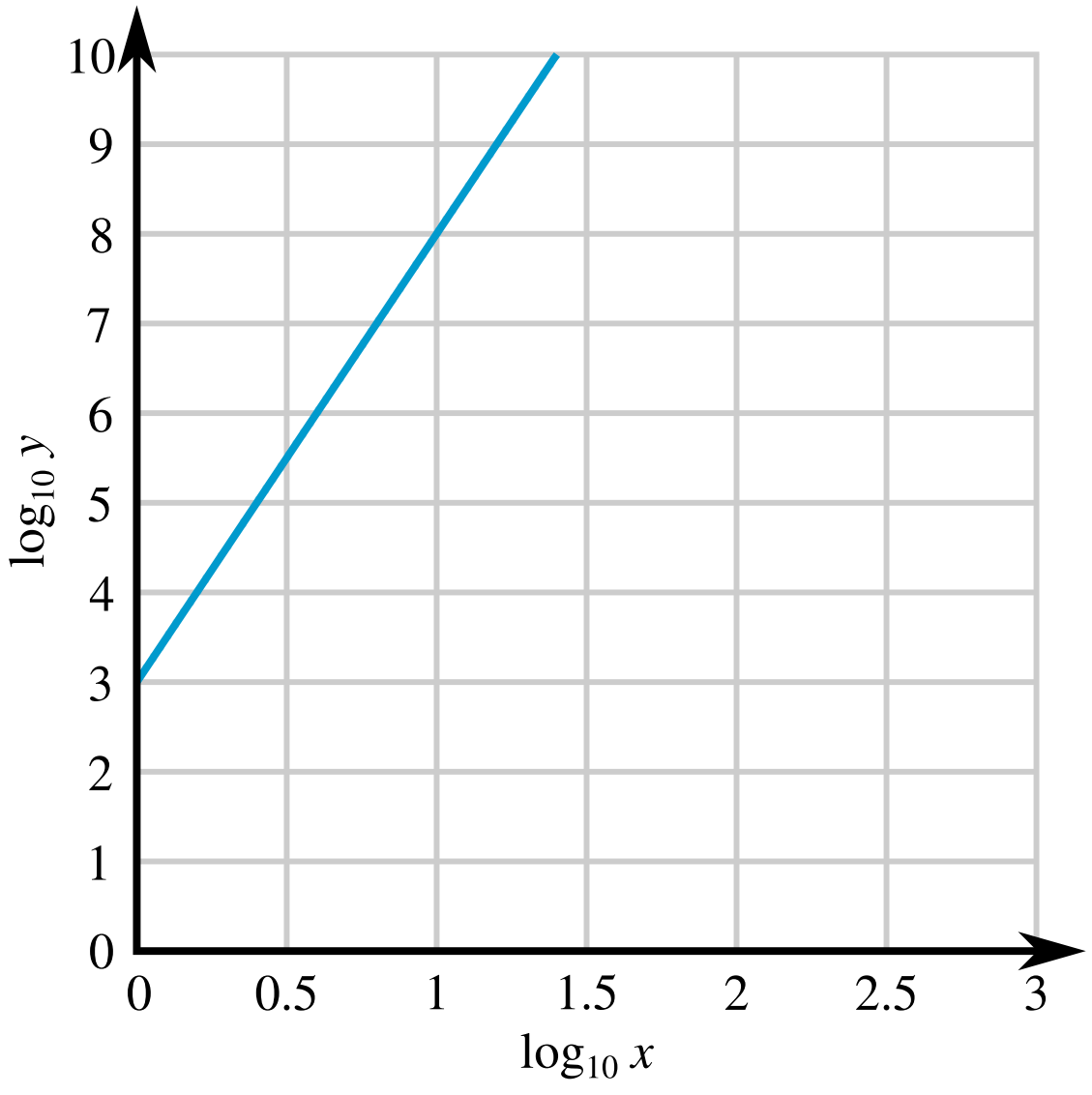

Figure 1: A plot of $\log_{10} y$ against $\log_{10} x$.

Use this plot to determine the relationship between x and y. Give your answer in the form $y = ax^b$, where a and b are constants.

The following symbols may be useful: `x, y`

Adapted for Isaac Physics from NST IA Biology preparation work

Gameboard:
STEM SMART Single Maths 9 - Linear Plots

Logarithmic Plots 2

A Level

The equation representing the radioactive decay of the number of atoms in a sample, N, with time, t, is $N = N_0 e^{-\lambda t}$ where λ is the decay constant.

Below is a graph of $\ln N$ against t for a particular radioactive substance.

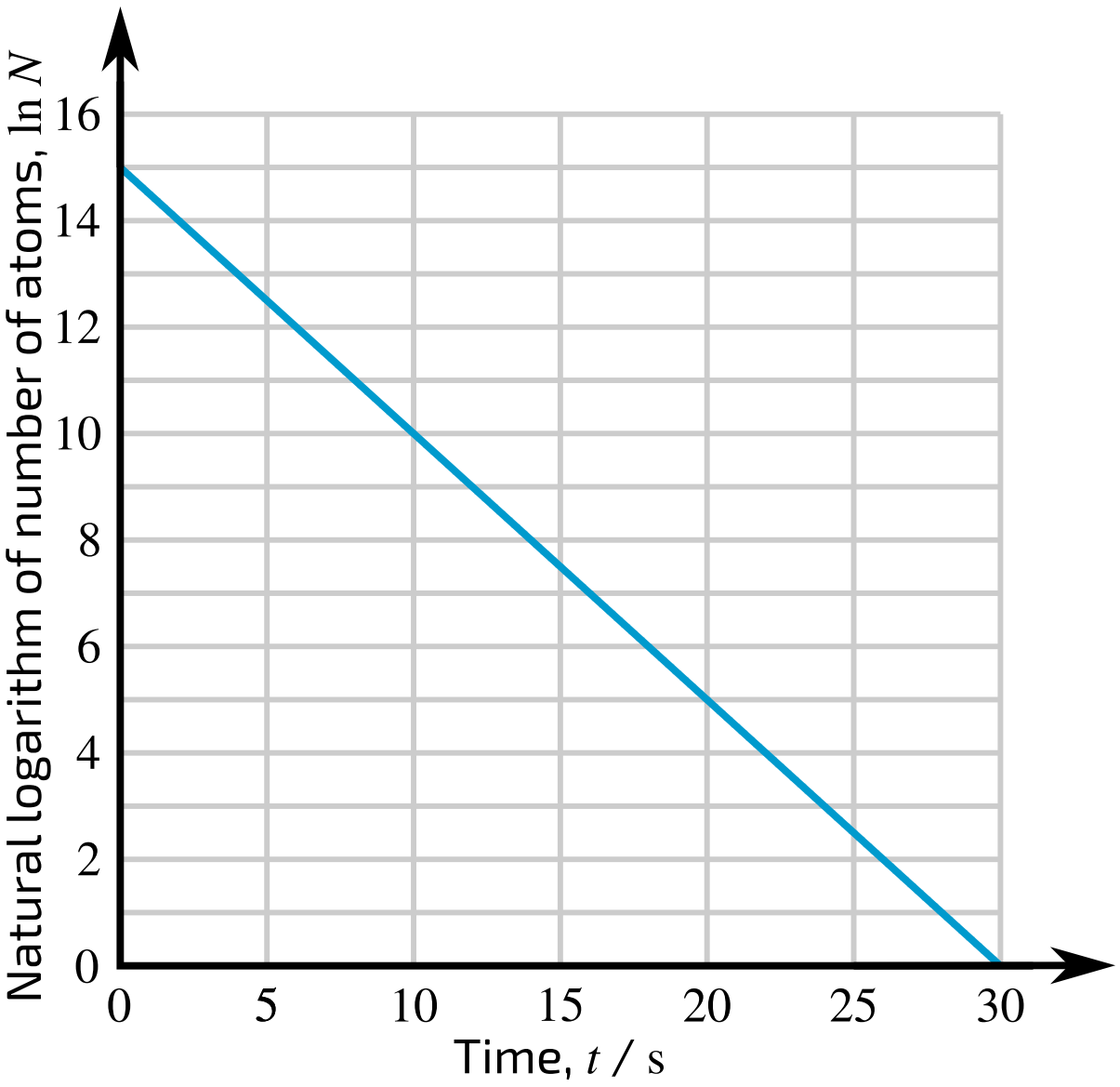

Figure 1: A plot of the natural logarithm of the number of atoms, $\ln N$, against time, t.

Part A Find λ

Use this plot to determine λ for this sample.

Part B Find N_0

Use this plot to determine N_0 for this sample. Give your value for N_0 to 2 significant figures.

Adapted for Isaac Physics from NST IA Biology preparation work

Gameboard:

STEM SMART Single Maths 9 - Linear Plots

Logarithmic Plots 3

A Level

By plotting a graph of $\ln F$ against $\ln r$, a student finds that the relationship between the gravitational force, F, on a pair of objects with fixed masses is given by

$$F = \frac{10^8}{r^2}$$

where r is the separation between them.

Part A Find the gradient

What was the gradient of the graph?

Part B Find the intercept

What was the intercept of the graph? Give your answer to 2 significant figures.

Adapted for Isaac Physics from NST IA Biology preparation work