Lower 6 Chapter 5

Linear Graphs

Chapter Overview

1.

2. Parallel and perpendicular lines

3. Lengths and Areas

4. Modelling



1. Linear Graphs

Examples:

1. The point lies on the line with equation . Determine the value of .

2. Find the coordinate of the point where the line cuts the -axis.

Test Your Understanding:

Determine where the line crosses both the axes

Gradient

Examples:

Find the gradient of the line between the following sets of points:

1.

2.

3.

4. Show that the points all lie on a straight line.

5. The line joining to has gradient -1. Work out the value of .

Example:

Determine the gradient and -intercept of the line with equation

Example

Express in the form , where are integers.

Test Your Understanding

Express in the form , where are integers.

Exercise 5A/B Page 90-93

Equations using one point and the gradient

Example

Find the equation of the line that goes through and has gradient 2.

Quickfire Questions

|  |  |  |
| --- | --- | --- |
| **Gradient** | **Point** | **(Unsimplified) Equation** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Finding a line using 2 Points:

Example

1. Find the equation of the line that goes through and , giving your equation in the form .

**Test Your Understanding:**

1. Find the equation of the line that goes through and , giving your equation in the form .

Exercise 5C Page 94-95

Intersection of Lines:

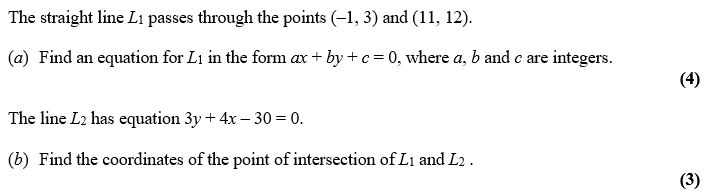
Example

The diagram shows two lines with equations and , which intersect at the point .

a. Determine the coordinates of .

b. The line intersects the -axis at the point . Determine the coordinate of .

Test Your Understanding



Exercise 5D Page 95

Perpendicular Lines

Quickfire Questions

|  |  |
| --- | --- |
| Gradient | Gradient of Perpendicular Line |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Problems

1. A line is goes through the point (9,10) and is perpendicular to another line with equation . What is the equation of the line?

2. A line goes through the points and . A second line is perpendicular to and passes through point B. Where does cross the x-axis?

3. Are the following lines parallel, perpendicular, or neither?

Test Your Understanding

1. A line goes through the point (4,7) and is perpendicular to another line with equation . What is the equation of the line? Put your answer in the form , where are integers.

2. Determine the point .

Extension

1. *[MAT 2004 1D]*

What is the reflection of the point in the line ?

2. *[MAT 2014 1D]* The reflection of the point in the line has coordinates: (in terms of )

3. *[STEP I 2004 Q6]* The three points have coordinates and , respectively. Find the point of intersection of the line joining to the midpoint of , and the line joining to the midpoint of . Verify that this point lies on the line joining to the midpoint of .

The point has coordinates . Show that if the line intersects the line at right angles, then , and write down a similar result if the line intersects the line at right angles.

Deduce that if is perpendicular to and also is perpendicular to , then is perpendicular to .

Exercise 5E/F Page 96

Distances between points

Examples

**Find the distance between**

and

and

and

Test Your Understanding

**Find the distance between:**

and

and

and

**Area of Shapes**

Example 1

The diagram shows two lines with equations

and , which intersect at the point .

a)Determine the coordinates of .

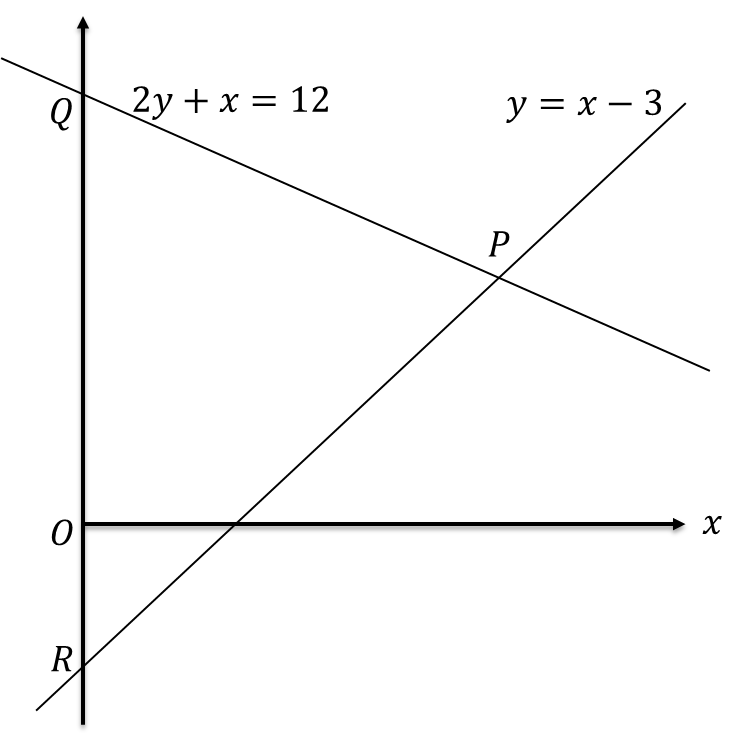
b) The line intersects the -axis at the point . Determine the area of the triangle .

When

Example 2

a)Determine the length of

b) Determine the area .

**Test Your Understanding:**

a) Determine the coordinate of .

b) Determine the area of .

c) Determine the length **.**

*Extension*

*[MAT 2001 1C]*

The shortest distance from the origin to the line is what?

Exercise 5G Page 102/103

**Modelling with Linear Graphs**

Many real life variables have a ‘linear’ relationship, i.e. there is a fixed increase/decrease in one variable each time the other variable goes up by 1 unit.

**Example**

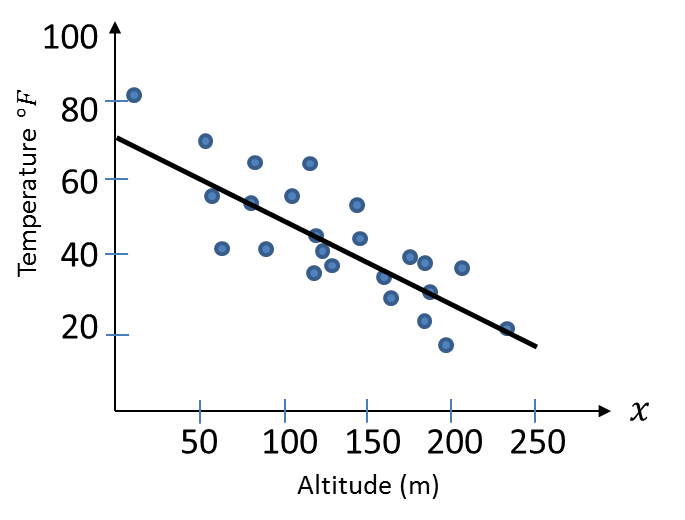
The temperature at different points on a mountain is recorded at different altitudes .

Suppose we were to use a linear model .

a) Determine and (you can assume the line goes through and .

b) Interpret the meaning of m and c in this context

c) Predict at what altitude the temperature reaches

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**Evaluating a Model**

Example:

The current population of Bickerstonia is 26000. This year (2017) the population increased by 150. Matt decides to model the population based on the years after 2017 by the linear model:

Why might this not be a suitable model?

Exercise 5H Page 106/108