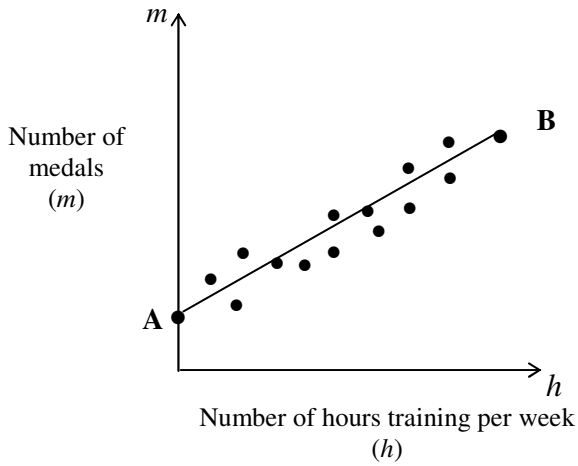
10. Gradients and the Straight Line

Applications, graphs, line of best fit 1

Applications of the Equation of a Straight Line

1. The graph shows the relationship between the number of hours (h) an athlete trains per week and the number of Championship medals (m) they have won.



A best fitting straight line AB has been drawn.

Athlete A does not train but has won 4 medals this year.

Athlete B who trains for 12 hours per week has won 40 medals this year.

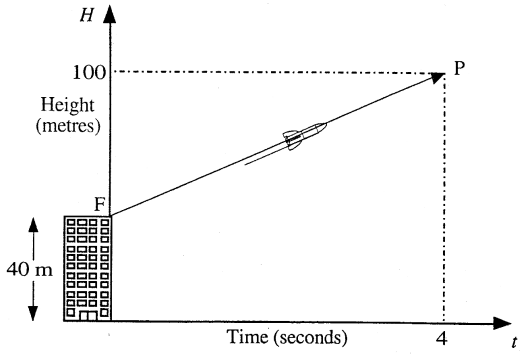
(a) Find the equation of the straight line AB in terms of m and h. 4 RE

(b) How many medals would you expect an athlete who trains 8 hours per week to have won ? 1 KU

2. A boy sets of a rocket from the top of a 40 metre high block of flats.

The diagram shows the path of the rocket over the first 4 seconds.

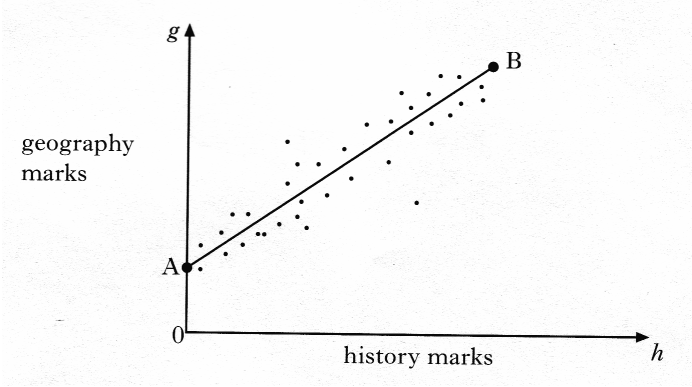
It is represented by the straight line in the graph.



After 4 seconds, the rocket has reached a point 100 metres above the ground.

Find the equation of the straight line FP in terms of H and t. 4 RE

3. The graph below shows the relationship between the history and geography marks of a class of students



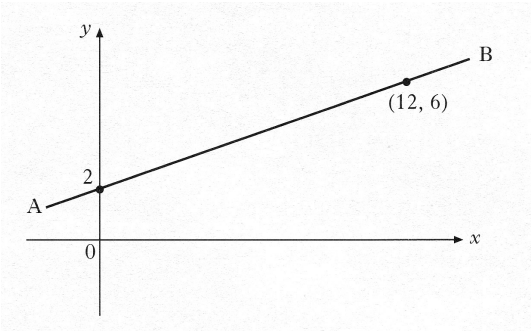
A best fitting straight line, AB has been drawn.

Point A represents 0 marks for history and 12 marks for geography.

Point B represents 90 marks for history and 82 marks for geography.

Find the equation of the straight line AB in terms of h and g. 4 RE

4. A water pipe runs between two buildings.
These are represented by the points A and B in the diagram below.

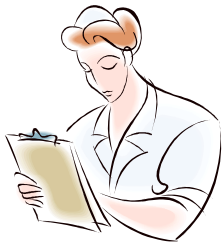


a) Using the information in the diagram, show that the equation of the line AB is $3y - x = 6$. 3 KU

b) An emergency outlet pipe has to be built across the main pipe.
The line representing this outlet pipe has equation $4y + 5x = 46$

Calculate the coordinates of the point on the diagram at which the outlet pipe will cut across the main water pipe. 4 RE

5. When a patient's blood pressue (B.P.), is taken, two measurements are made.



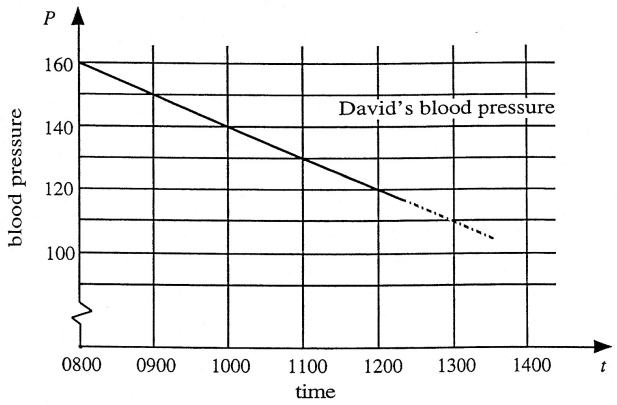
For example, in **"160 over 70"** (or $\frac{160}{70}$),

$\Rightarrow$ the 160 is the reading when the heart is pumping.

$\Rightarrow$ the 70 is the reading when the heart is at rest.

David has a heart problem, and has his blood pressure taken every hour.

The first number of these two measurements is monitored very carefully and the nurse plots a graph, showing the changes from 8 am.



a) Find the gradient of the line shown above. 2 KU

b) Write down the equation of the line in the form

P = …….. 2 KU

c) It is known that if the blood pressure drops below 70, the patient will be in danger of losing consciousness.

If David's blood pressure continues to drop in the way indicated, when might he be expected to become unconscious. 3 RE

6. A tank contains 240 litres of water.

When the tap is opened, water flows from the tank at a steady rate of 20 litres per minute.

a) On the 2mm square-ruled paper provided, draw a graph of the volume V litres, of water in the tank against the time, t minutes. 3 KU

b) Write down an equation connecting V and t. 2 KU

7. The graph below shows the number of grams, s, of a substance that can be dissolved in a fixed quantity of water when the temperature of the water is t°C.

Find the equation of this straight line in terms of s and t. 4 KU