Name ANSWERS	Class

MATHS TEACHER HUB

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Linear graphs

(9 – 1) Topic booklet

Higher

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

Information

- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

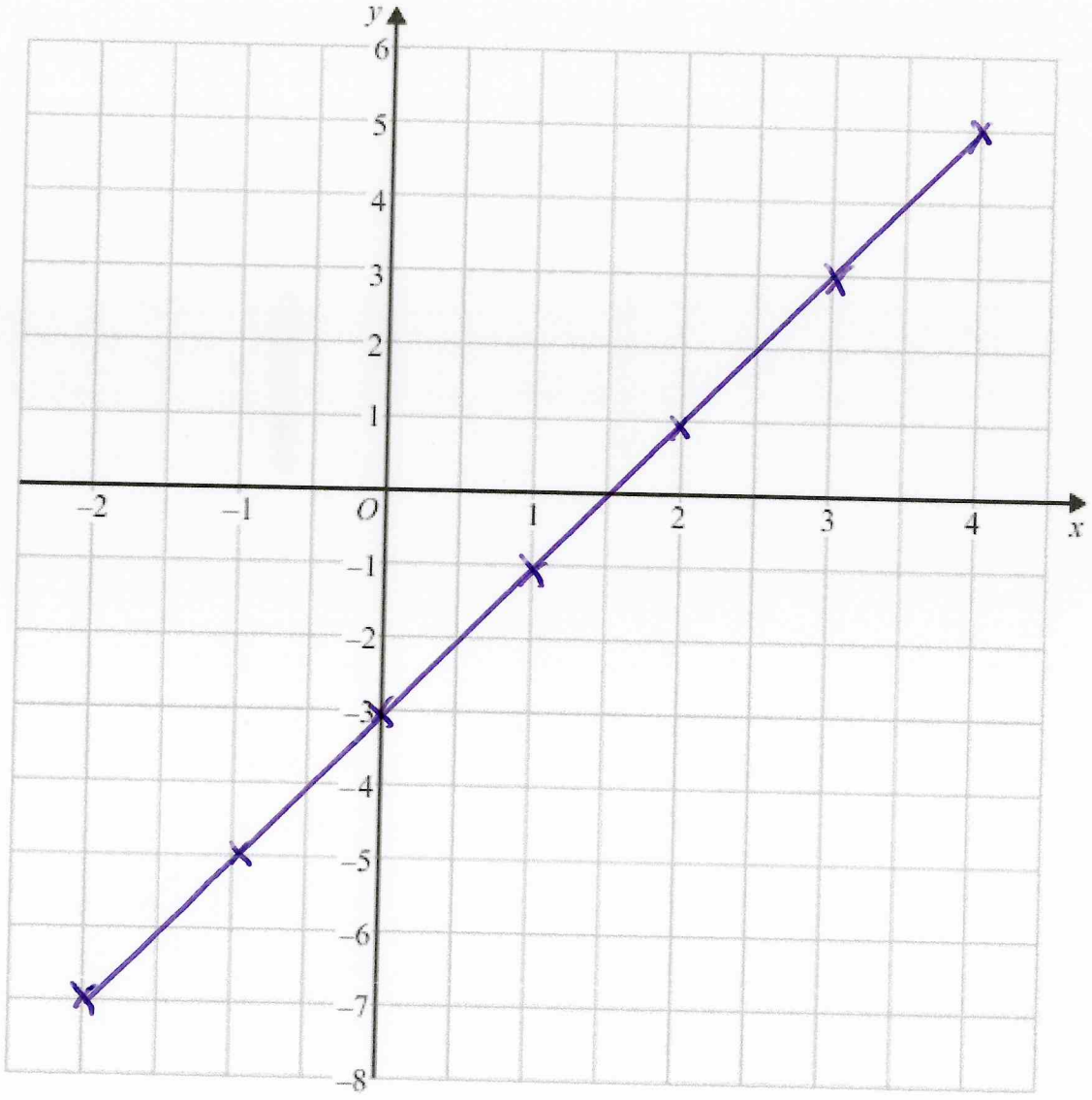
Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

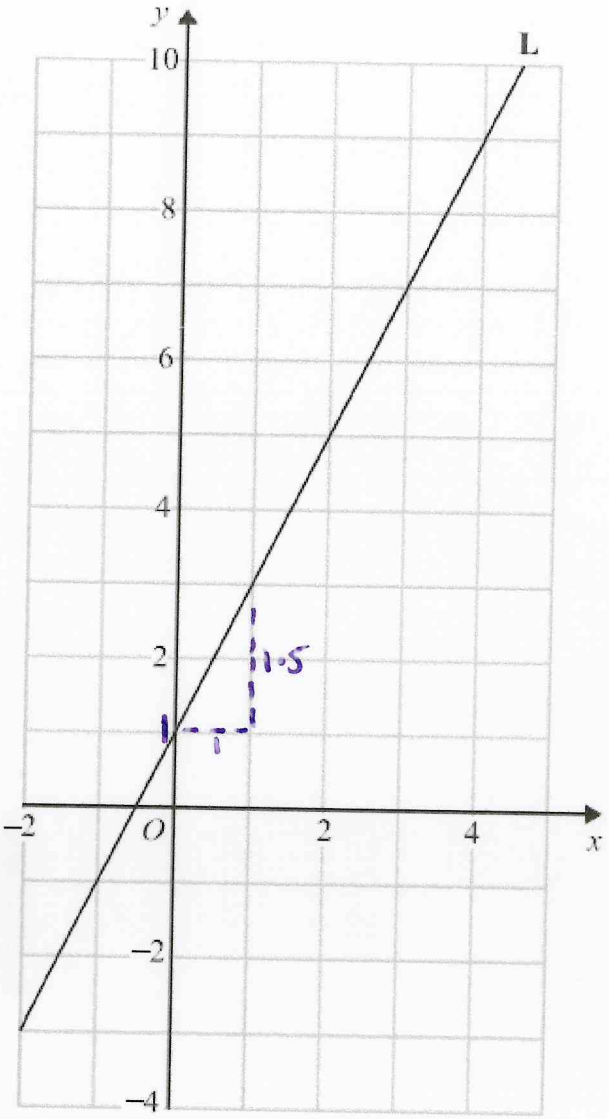
2 On the grid below, draw the graph of $y = 2x - 3$ for values of x from -2 to 4

x	-2	-1	0	1	2	3	4
y	-7	-5	-3	-1	1	3	5



(Total for Question 2 is 3 marks)

3 Line **L** is drawn on the grid below.

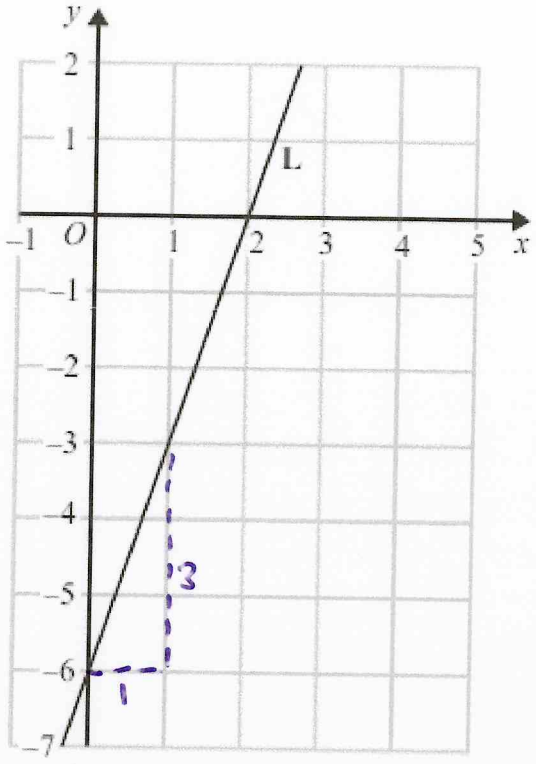


Find the equation for the straight line **L**.
Give your answer in the form $y = mx + c$

$y = 1.5x + 1$

(Total for Question 3 is 3 marks)

3 The line **L** is shown on the grid.



Find an equation for **L**.

$y = 3x - 6$

(Total for Question 3 is 3 marks)

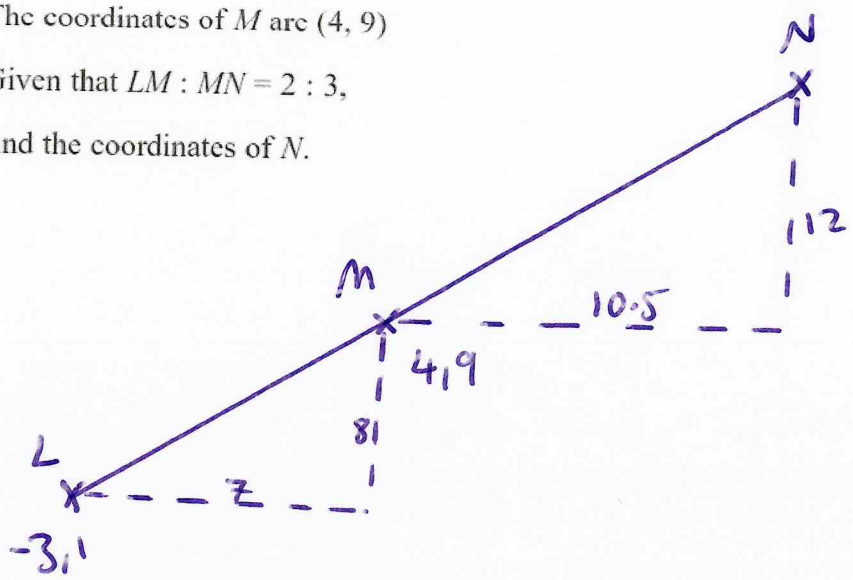
5 The points L, M and N are such that LMN is a straight line.

The coordinates of L are $(-3, 1)$

The coordinates of M are $(4, 9)$

Given that $LM : MN = 2 : 3$,

find the coordinates of N.



2 parts = $\begin{pmatrix} 7 \\ 8 \end{pmatrix}$

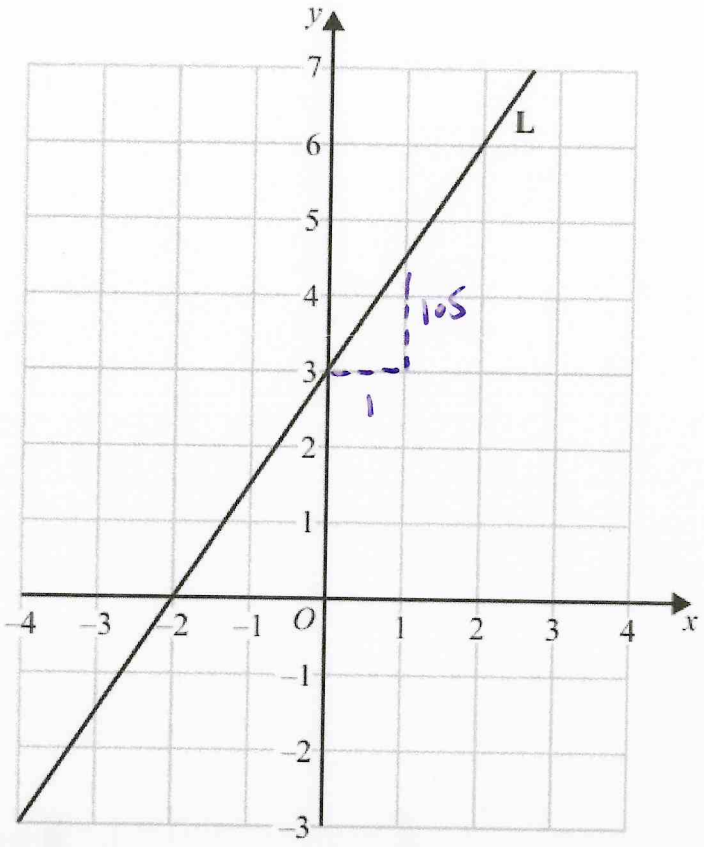
1 part = $\begin{pmatrix} 3.5 \\ 4 \end{pmatrix}$

(14.5 21)

(Total for Question 5 is 4 marks)

3 parts = $\begin{pmatrix} 10.5 \\ 12 \end{pmatrix}$

6 Here is a straight line **L** drawn on a grid.



(a) Find an equation for **L**.

$y = 1.5x + 3$

(3)

M is a different straight line with equation $y = 5x$

(b) Write down the equation of a straight line parallel to **M**.

$y = 5x + 3$

(1)

(Total for Question 6 is 4 marks)

6 A is the point with coordinates (5, 9)
B is the point with coordinates (d, 15)

The gradient of the line AB is 3

Work out the value of d.

$$m = \frac{\Delta y}{\Delta x}$$

$$3 = \frac{15-9}{d-5}$$

$$3(d-5) = 6$$

$$3d - 15 = 6$$

$$3d = 21$$

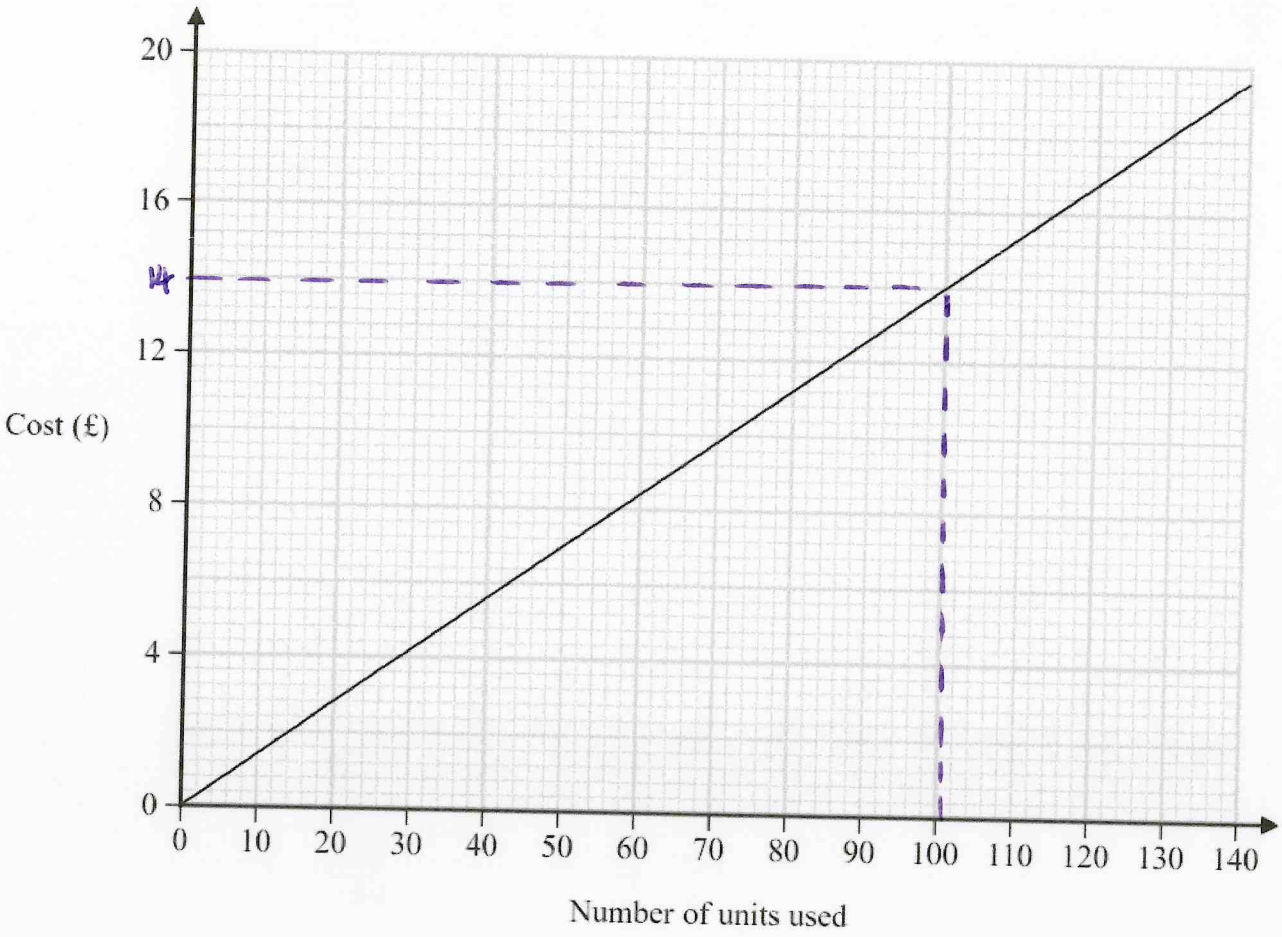
$$d = 7$$

$d = 7$

(Total for Question 6 is 3 marks)

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(a) Work out the gradient of the straight line.

$$m = \frac{\Delta y}{\Delta x} = \frac{14}{100} = 0.14$$

0.14

(2)

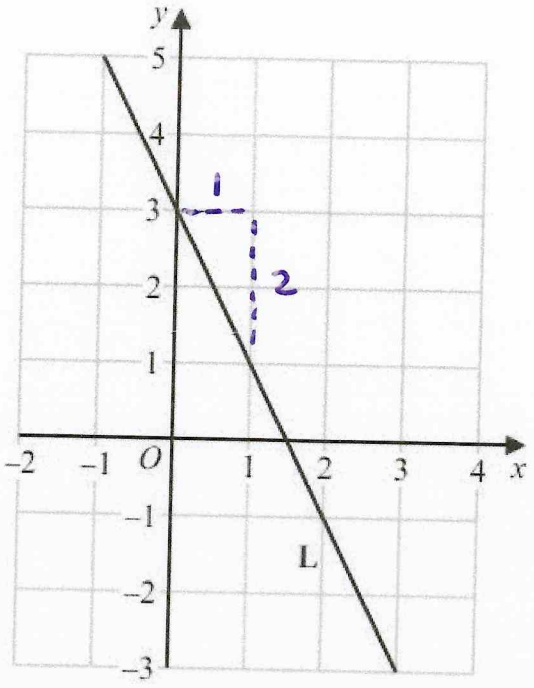
(b) What does the gradient of this line represent?

The cost per unit of electricity in pound sterling

(1)

(Total for Question 8 is 3 marks)

9 The line **L** is shown on the grid.



Find an equation for **L**.

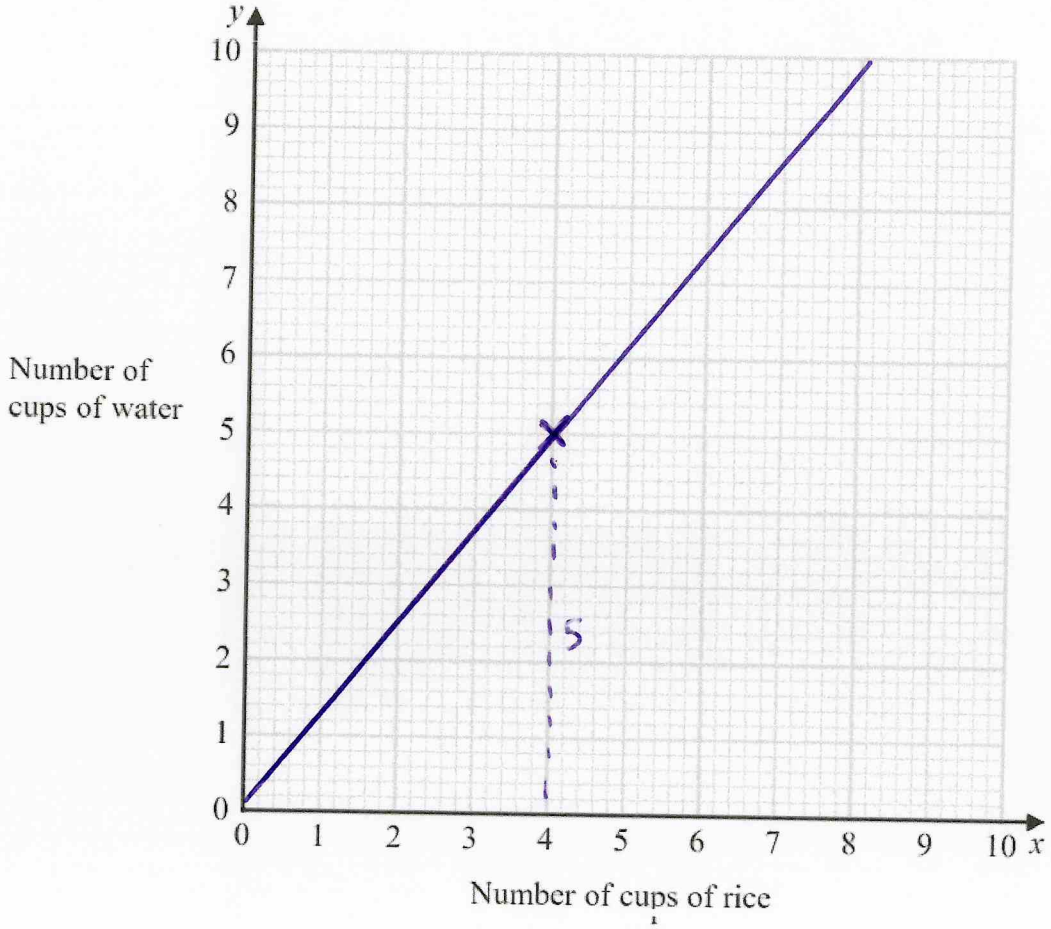
$y = -2x + 3$

(Total for Question 9 is 3 marks)

9 To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.



(2)

(b) (i) Find the gradient of the line drawn in part (a).

$m = \frac{\Delta y}{\Delta x} = \frac{5}{4}$ $1\frac{1}{4}$

(1)

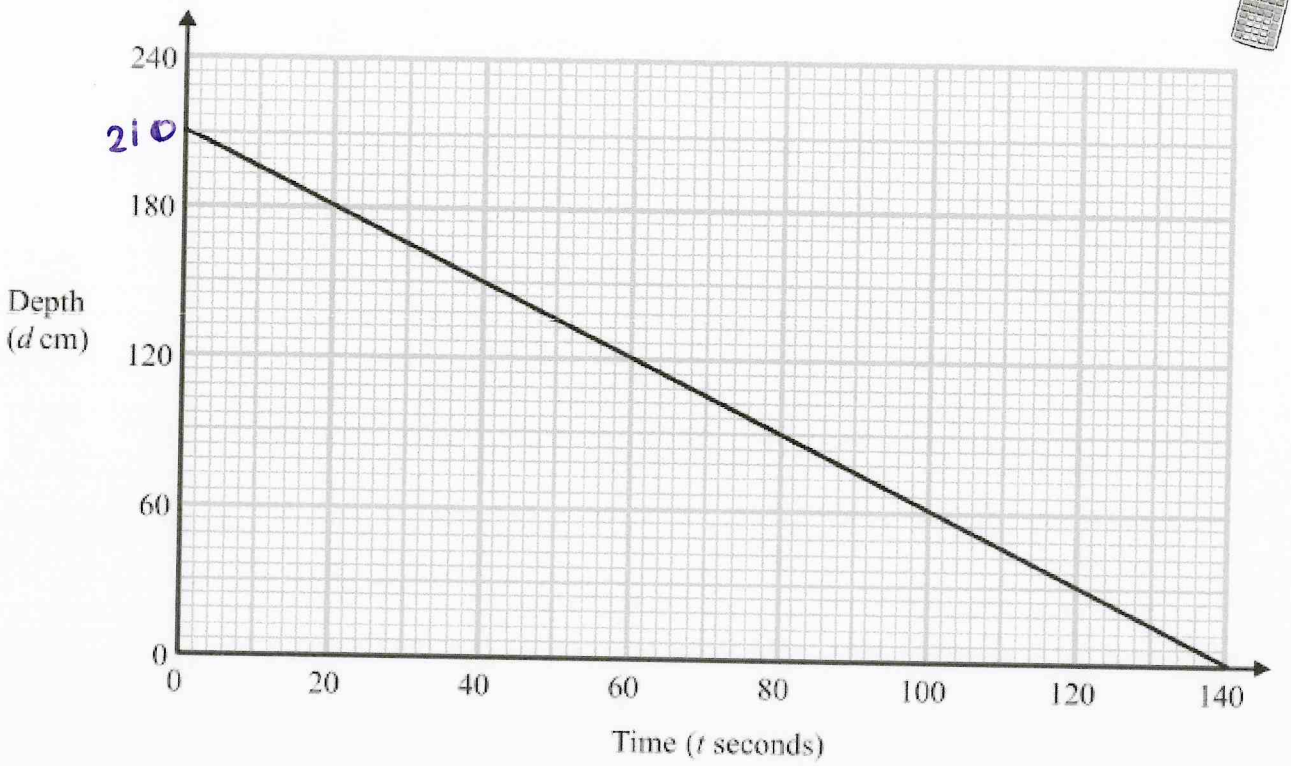
(ii) Explain what this gradient represents.

How many cups of water for each cup of rice,

(1)

(Total for Question 9 is 4 marks)

10 The graph shows the depth, d cm, of water in a tank after t seconds.



(a) Find the gradient of this graph.

$$m = \frac{\Delta y}{\Delta x} = \frac{210}{140} = \frac{3}{2}$$

-1.5

(2)

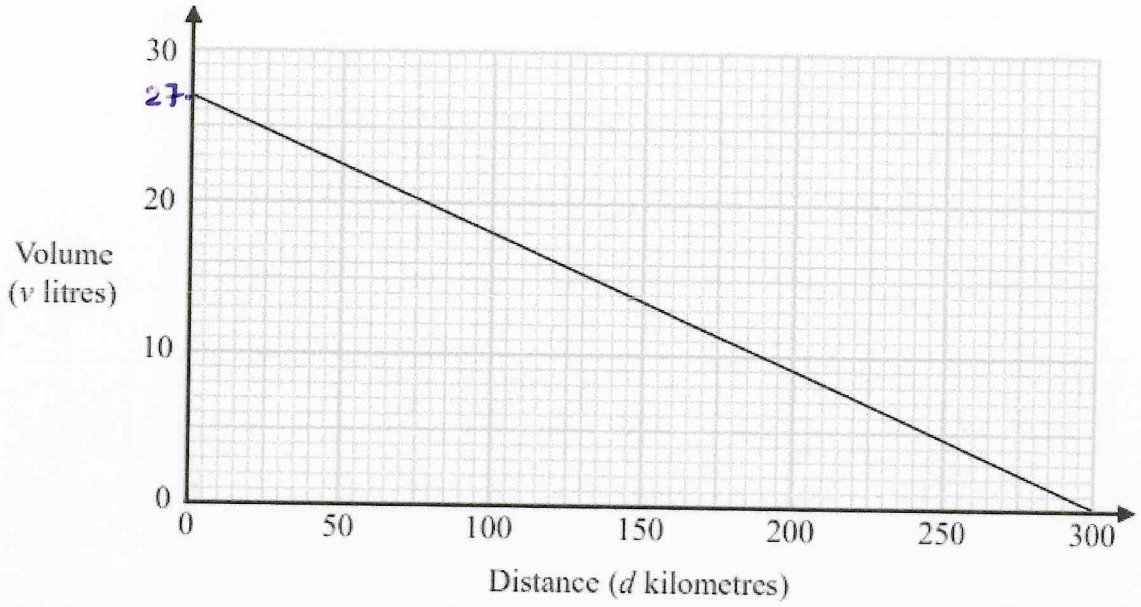
(b) Explain what this gradient represents.

The fall in the water depth per second.

(1)

(Total for Question 10 is 3 marks)

12 The graph gives information about the volume, v litres, of petrol in the tank of Jim's car after it has travelled a distance of d kilometres.



(a) Find the gradient of the graph.

$$m = \frac{\Delta y}{\Delta x} = \frac{27}{300} = 0.09$$

-0.09

(2)

(b) Interpret what the gradient of the graph represents.

The fuel consumption of Jims car in litres per km.

(1)

(Total for Question 12 is 3 marks)

18 The straight line L_1 passes through the points with coordinates (4, 6) and (12, 2)
The straight line L_2 passes through the origin and has gradient -3

The lines L_1 and L_2 intersect at point P.

Find the coordinates of P.

L_1 $\quad m = \frac{\Delta y}{\Delta x} = \frac{2-6}{12-4} = -\frac{1}{2}$

$y = -\frac{1}{2}x + c \qquad (4,6)$

$6 = -\frac{1}{2}(4) + c$

$6 = -2 + c$

$8 = c$

L_1 $\boxed{y = -\frac{1}{2}x + 8}$

$L_2 = \boxed{y = -3x + 0}$

$-3x = -\frac{1}{2}x + 8$

$-2.5x = 8$

$x = \frac{8}{-2.5}$

$x = \frac{-16}{5}$

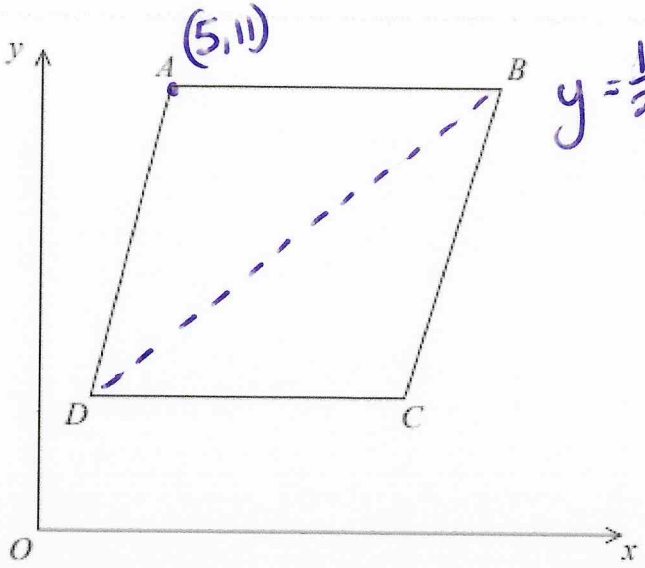
$y = -3\left(\frac{-16}{5}\right)$

$= \frac{48}{5}$

($-\frac{16}{5}$, $\frac{48}{5}$)

(Total for Question 18 is 4 marks)

18



$y = \frac{1}{2}x + 6$

ABCD is a rhombus.
The coordinates of *A* are (5, 11)
The equation of the diagonal *DB* is $y = \frac{1}{2}x + 6$

Find an equation of the diagonal *AC*.

AC $\Rightarrow$ $y = -2x + c$ (5, 11)

$11 = -2(5) + c$

$11 = -10 + c$

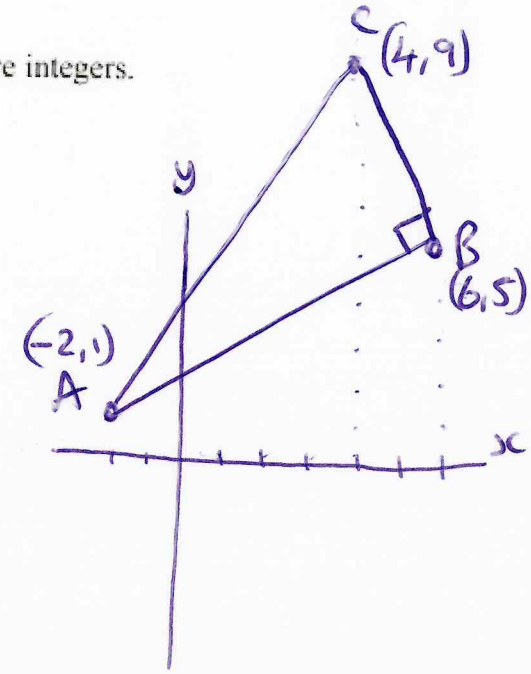
$21 = c$

$y = -2x + 21$

(Total for Question 18 is 4 marks)

25 $A(-2, 1)$, $B(6, 5)$ and $C(4, k)$ are the vertices of a right-angled triangle ABC.
Angle ABC is the right angle.

Find an equation of the line that passes through A and C.
Give your answer in the form $ay + bx = c$ where a, b and c are integers.



AB

$$m = \frac{\Delta y}{\Delta x} = \frac{5-1}{6--2} = \frac{4}{8} = \frac{1}{2}$$

BC

$$m = -2$$

$$-2 = \frac{5-k}{6-4} = \frac{5-k}{2}$$

$$-4 = 5-k$$

$$k = 9$$

AC

$$m = \frac{9-1}{4--2} = \frac{8}{6} = \frac{4}{3}$$

$$y = \frac{4}{3}x + c$$

$$1 = \frac{4}{3}(-2) + c$$

$$1 = \frac{-8}{3} + c$$

$$\frac{11}{3} = c$$

$$y = \frac{4}{3}x + \frac{11}{3}$$

$$3y - 4x = 11$$

(Total for Question 25 is 5 marks)