

Equation of a Straight Line (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

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Total Marks:	

1. The line L1 is shown in the diagram below.

The line L2, which is not shown, is perpendicular to L1.

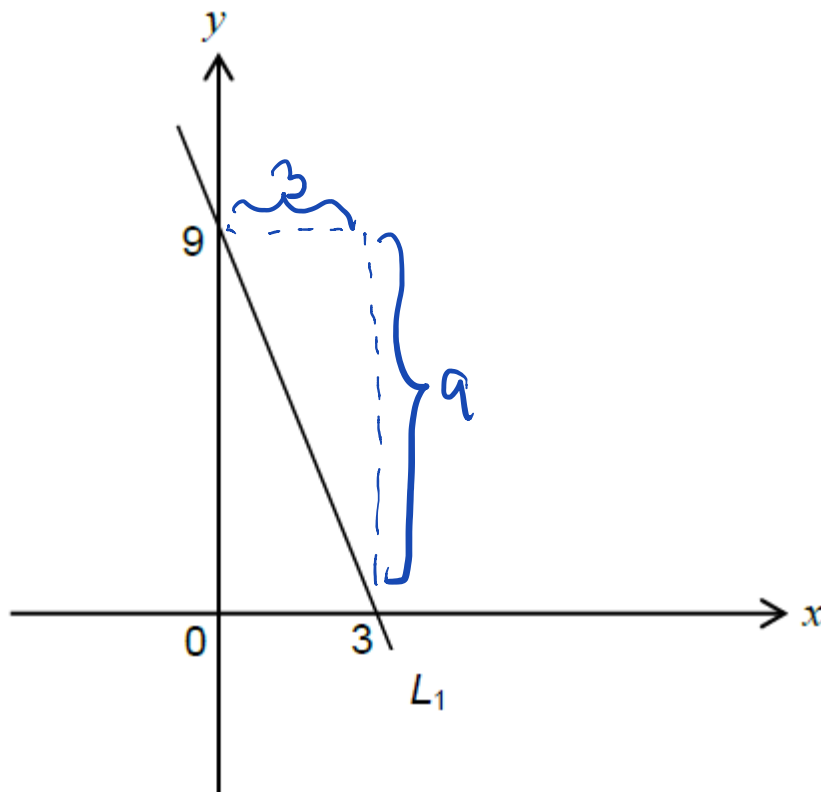


Diagram not drawn to scale

(i) Find the gradient of L1.

$$\frac{\text{change in } y}{\text{change in } x} = \frac{-9}{3} = -3$$

[2]

(ii) Write down the gradient of L2.

L2 is perpendicular to L1

$$m_2 = -\frac{1}{m_1} \quad m_2 = \frac{1}{3}$$

[1]

(b) The two straight lines L1 and L2 intersect at the point (1, 6).

Find the equation of L2 and write it in the form $ax + by + c = 0$.

$L2 \quad y = \frac{1}{3}x + c$
 when $x=1, y=6$
 $6 = \frac{1}{3}(1) + c$

$c = 5\frac{2}{3}$
 $= \frac{17}{3}$

$y = \frac{1}{3}x + \frac{17}{3} \quad (\times 3)$
 $3y = x + 17$
 $3y - x - 17 = 0$

[4]

2. In an experiment, the mass added to the end of a vertical spring is gradually increased.

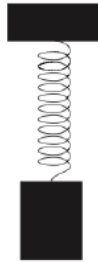
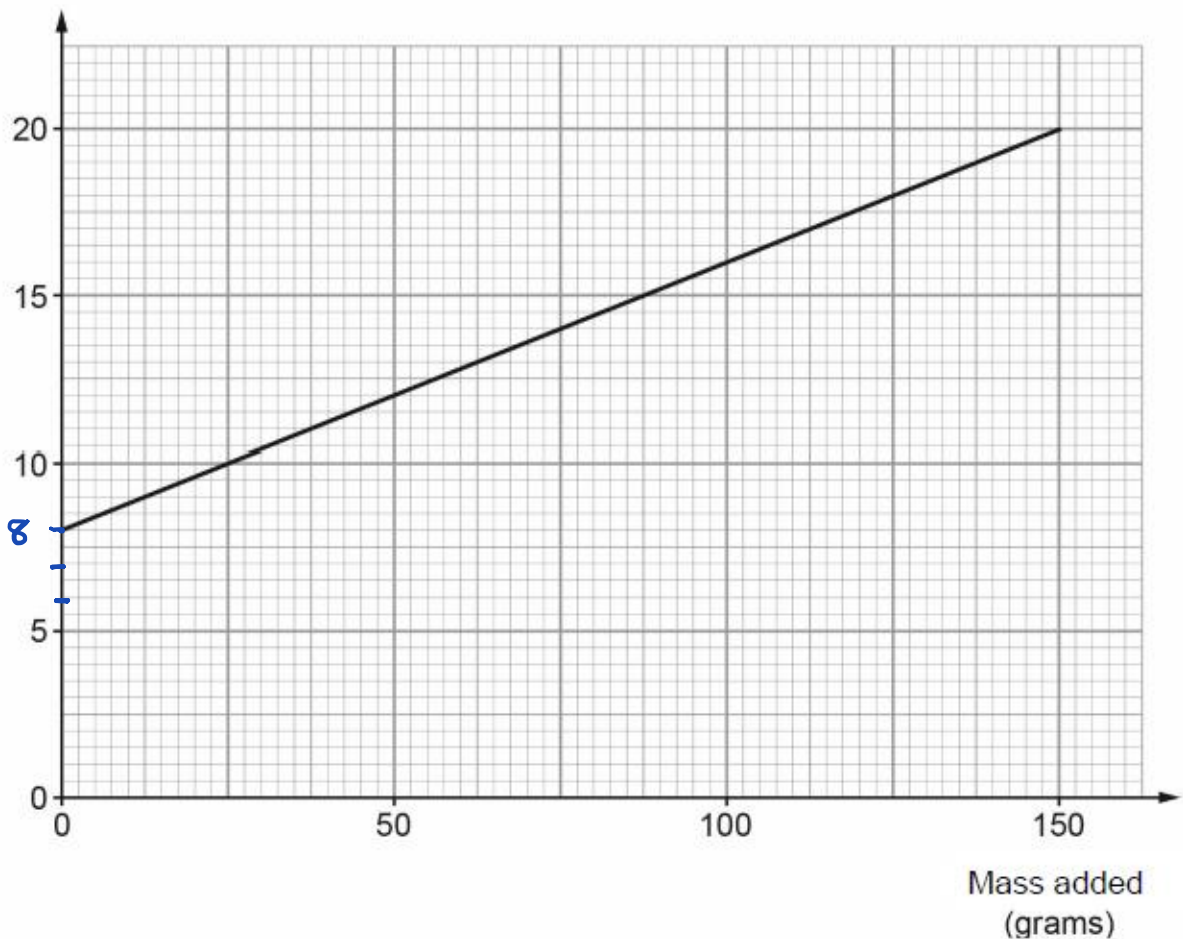


Diagram not drawn to scale

At the end of the experiment, a computer produced the graph shown below.

Length of spring (mm)



(a) Write down the length of the spring without any mass added.

8 mm

[1]

(b) (i) Calculate the gradient of the straight line drawn on the graph.

$$\frac{\text{change in } y}{\text{change in } x} = \frac{12}{150} = \frac{6}{75} = \frac{2}{25}$$

[2]

(ii) Explain what the gradient of this graph tells you in relation to the experiment.

every 25g of mass added, the length of spring expands by 2mm

[1]

(c) The straight line stops before the right-hand edge of the graph paper.

Why do you think this might be?

- * experiment was stopped
- * spring broke
- * spring could not expand beyond 150g

[1]

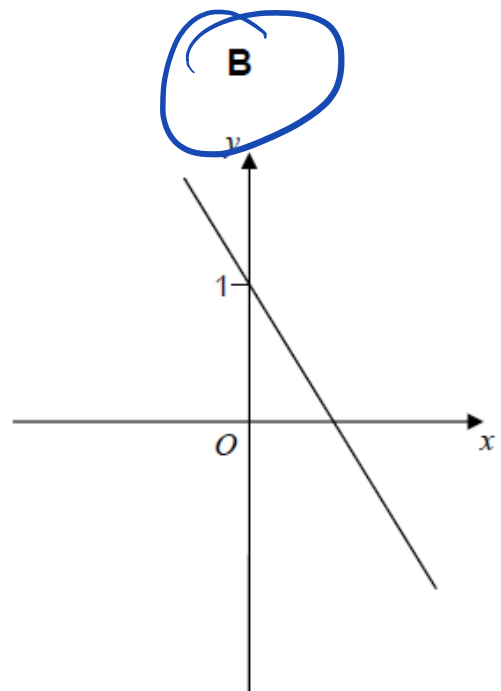
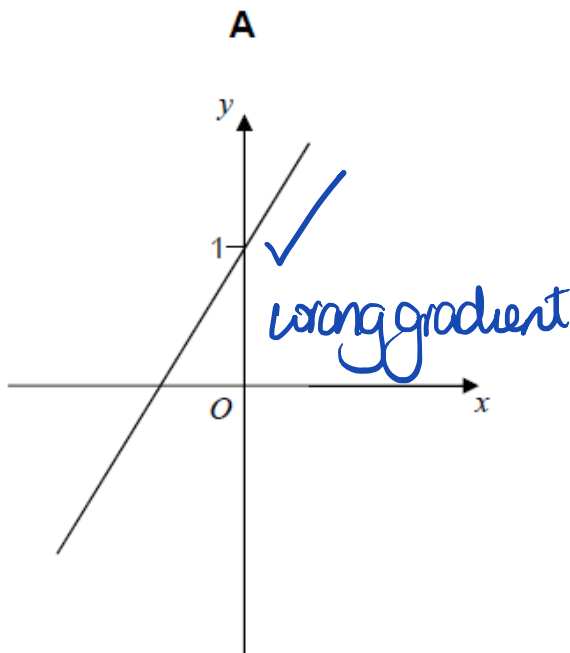
3. One of these graphs is a sketch of $y = 1 - 2x$

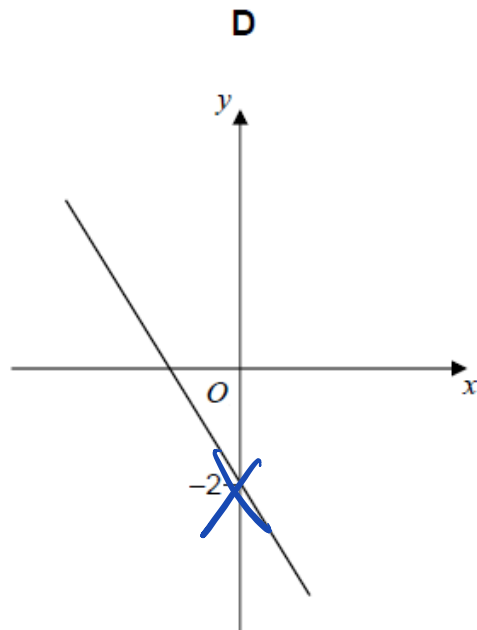
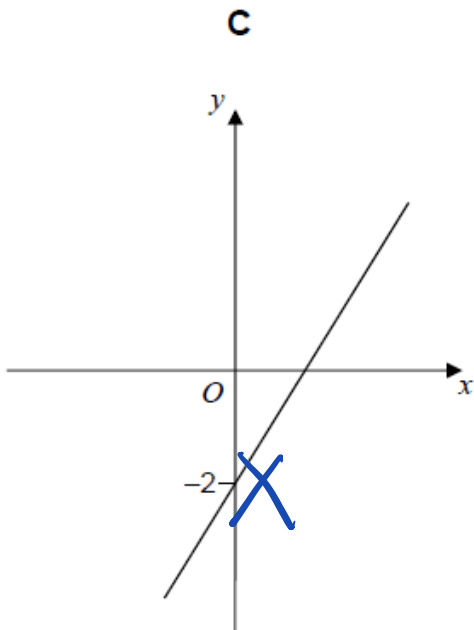
Which one?

Circle the correct letter.

↑ intercept = 1 ↗ negative gradient

[1]

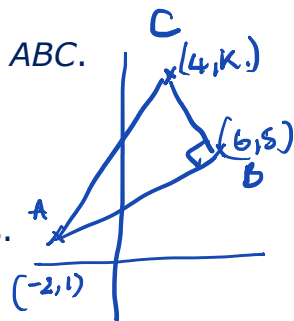




4. $A(-2, 1)$, $B(6, 5)$ and $C(4, k)$ are the vertices of a right-angled triangle ABC . Angle ABC is the right angle.

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.



gradient $AB = \frac{4}{8} = \frac{1}{2}$ (need 'C' $(4, k)$)
 $k = -2 \times 4 + 17 = 9$
 $\therefore C = (4, 9)$
 gradient $BC = -2$
 line BC $y = -2x + c$
 sub $(6, 5)$ $5 = -2 \times 6 + c$
 $c = 17$
 BC $y = -2x + 17$
 gradient $AC = \frac{8}{6} = \frac{4}{3}$
 $y = \frac{4}{3}x + c$

need intercept
 sub $(-2, 1)$ $1 = \frac{4}{3}(-2) + c$
 $c = 1 + \frac{8}{3} = \frac{11}{3}$
 $\therefore y = \frac{4}{3}x + \frac{11}{3}$
 $3y - 4x = 11$ [5]

5. Circle the equation of a line that is parallel to $y = 5x - 2$

$y = 2x - 5$
X

$y = 5x + 2$ (circled)

$y = 3x - 2$
X

$y = -\frac{1}{5}x - 2$
X perpendicular

[1]

6. Show that line $3y = 4x - 14$ is perpendicular to line $4y = -3x + 48$.

$y = \frac{4}{3}x - \frac{14}{3}$

$y = -\frac{3}{4}x + 12$

$\frac{4}{3} \times -\frac{3}{4} = -1 \therefore$ they are perpendicular

$m_1 \times m_2 = -1$

[4]

7. A straight line goes through the points (p, q) and (r, s) , where

• $p + 2 = r$

$q + 4 = s$

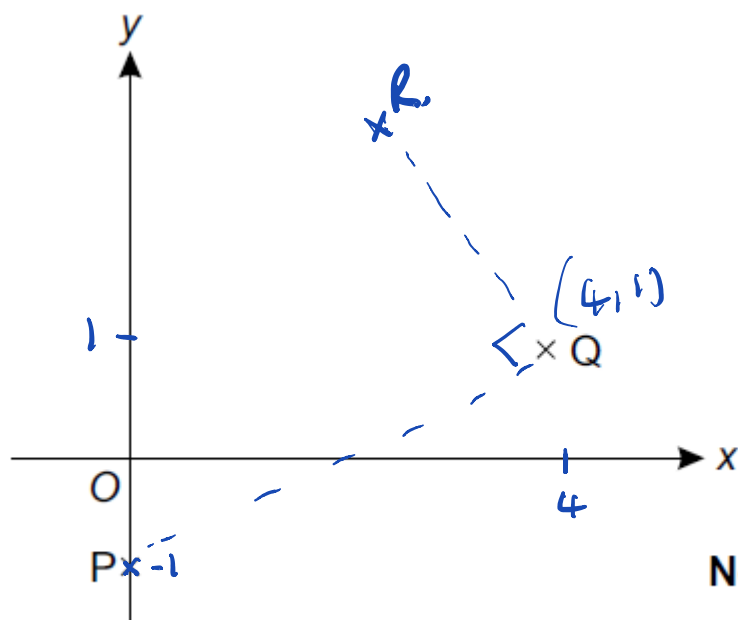
• $q + 4 = s$.

Find the gradient of the line.

$$\text{gradient} = \frac{(q+4) - q}{(p+2) - p} = \frac{4}{2}$$

..... 2 [3]

8. P has coordinates $(0, -1)$ and Q has coordinates $(4, 1)$.



a) Find the equation of line PQ.

$$\text{gradient} = \frac{2}{4} = \frac{1}{2}$$

a) $y = \frac{1}{2}x - 1$ [3]

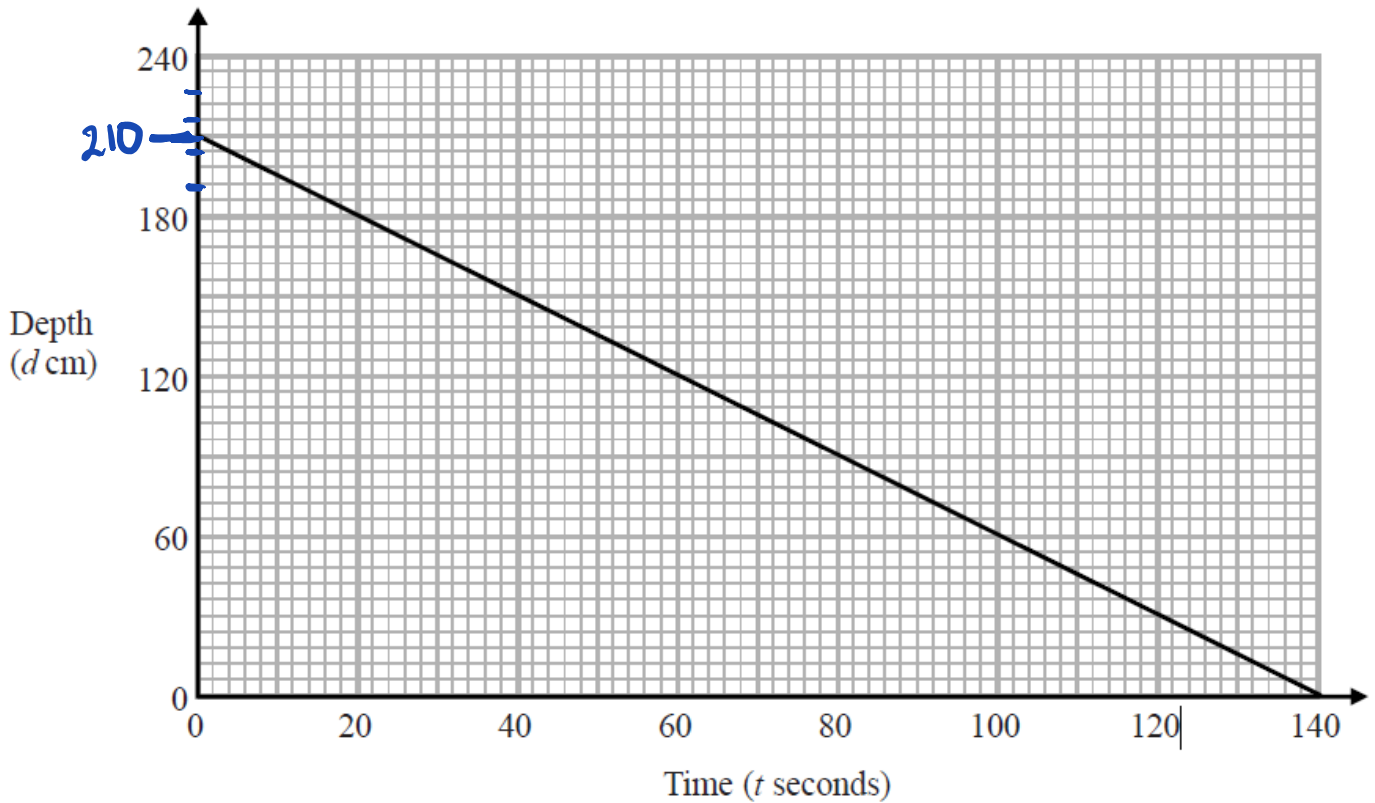
b) P and Q are two vertices of rectangle PQRS.

Find the equation of line QR.

gradient QR = -2 at $(4, 1)$
 \therefore line $y = -2x + c$ $1 = -2(4) + c$
 $c = 9$

b) $y = -2x + 9$ [3]

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



a) Find the gradient of this graph.

$$m = \frac{-210}{140} = \frac{-3}{2}$$

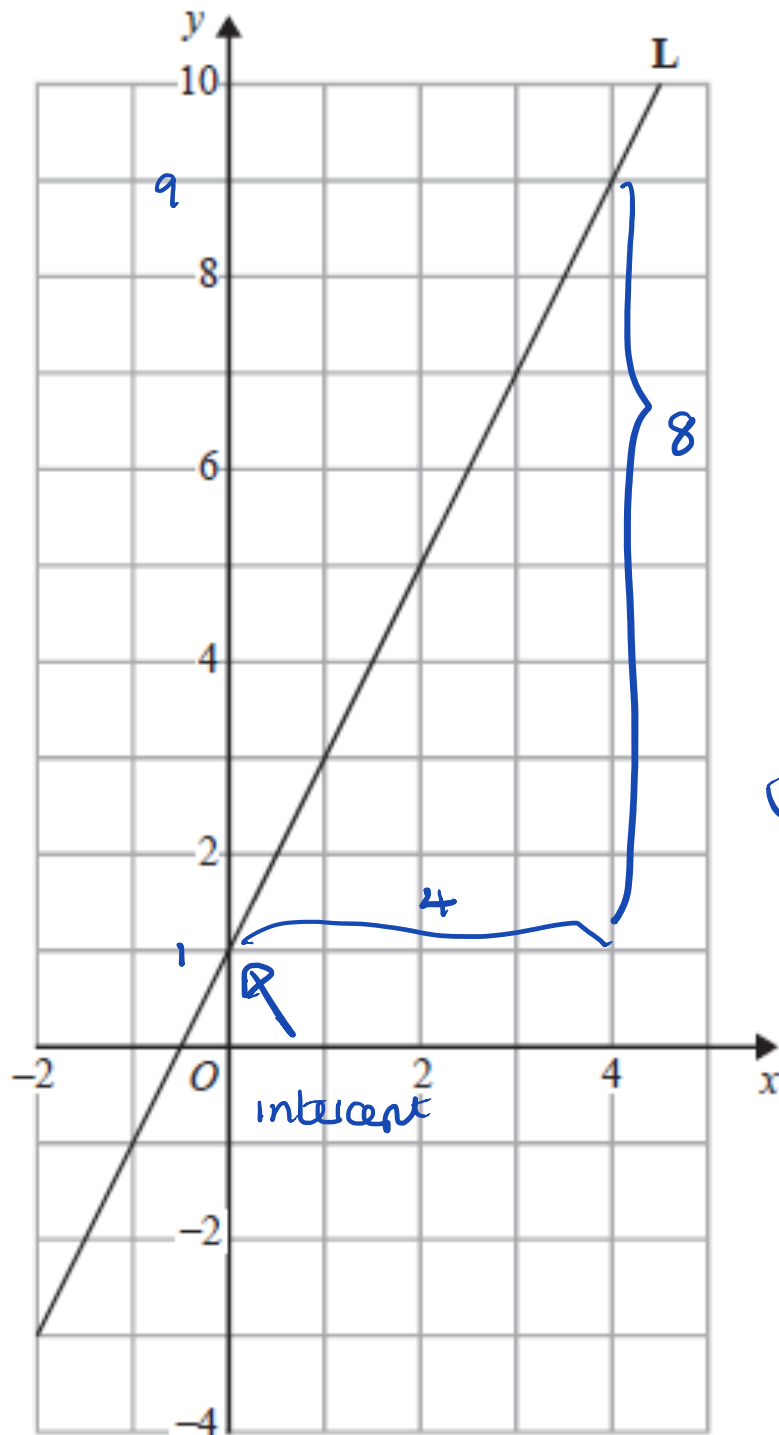
..... $\frac{-3}{2}$ [2]

b) Explain what this gradient represents.

every 2 seconds the depth drops by 3cm

[1]

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



gradient
 $= \frac{8}{4} = 2$

Find an equation for the straight line **L**.

Give your answer in the form $y = mx + c$

$$y = 2x + 1$$

11. Here are the equations of four straight lines.

Line A $y = 2x + 4$

Line B $2y = x + 4$ $y = \frac{1}{2}x + 4$

Line C $2x + 2y = 4$ $2y = 4 - 2x$ $y = 2 - x$ $y = -x + 2$

Line D $2x - y = 4$ $y = 2x - 4$

Two of these lines are parallel.

Write down the two parallel lines.

Line A and line D [1]

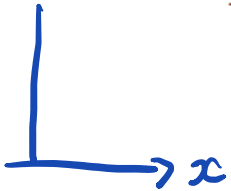
12. Circle the equation of the x-axis.

$x + y = 0$

$x - y = 0$

$x = 0$

$y = 0$



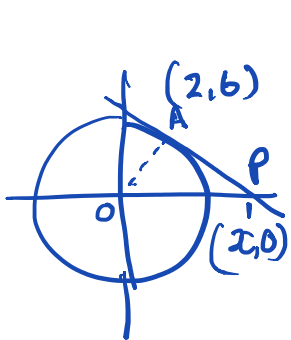
[1]

13. The line l is a tangent to the circle $x^2 + y^2 = 40$ at the point A .

A is the point $(2, 6)$.

The line l crosses the x -axis at the point P .

Work out the area of triangle OAP .



gradient $OA = \frac{6}{2} = 3$

gradient $AP = -\frac{1}{3}$

line AP $y = -\frac{1}{3}x + C$
passes through $(2, 6)$

$6 = -\frac{1}{3}(2) + C$

$\frac{18}{3} + \frac{2}{3} = C$

$C = \frac{20}{3}$

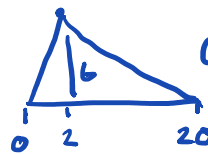
$y = -\frac{1}{3}x + \frac{20}{3}$

when $y = 0$

$\frac{1}{3}x = \frac{20}{3}$

$\therefore x = 20$

so $P = (20, 0)$

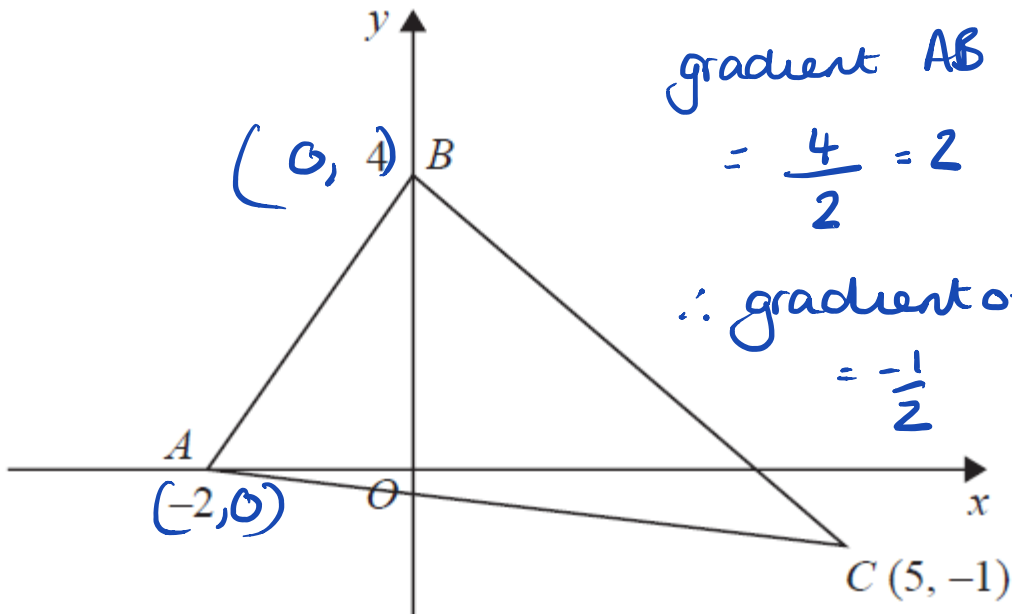


area = $\frac{1}{2} \times 20 \times 6$

= 60 units²

[5]

14. Find an equation of the line that passes through C and is perpendicular to AB.



gradient AB

$$= \frac{4}{2} = 2$$

\therefore gradient of perp. line

$$= -\frac{1}{2}$$

perp. line $y = -\frac{1}{2}x + C$

passes through $(5, -1)$
 $x \quad y$

$$-1 = -\frac{1}{2}(5) + C$$

$$C = -1 + 2.5$$

$$= 1.5$$

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

or $2y = -x + 3$

or $2y + x - 3 = 0$

[4]

15. Work out the equation of the line that

is parallel to the line $y = 5x - 3$

passes through $(-2, -4)$
 $x \quad y$

$$y = 5x + C$$

$$-4 = 5(-2) + C$$

$$-4 + 10 = C$$

$$C = 6$$

$$\therefore y = 5x + 6$$

[3]

16. A straight line has equation

$$y = 6 - 2x$$

Circle the gradient of the line.

$$y = \underline{\underline{-2}}x + 6$$

-2

2

2x

6

[1]

17. ACB is a straight line.

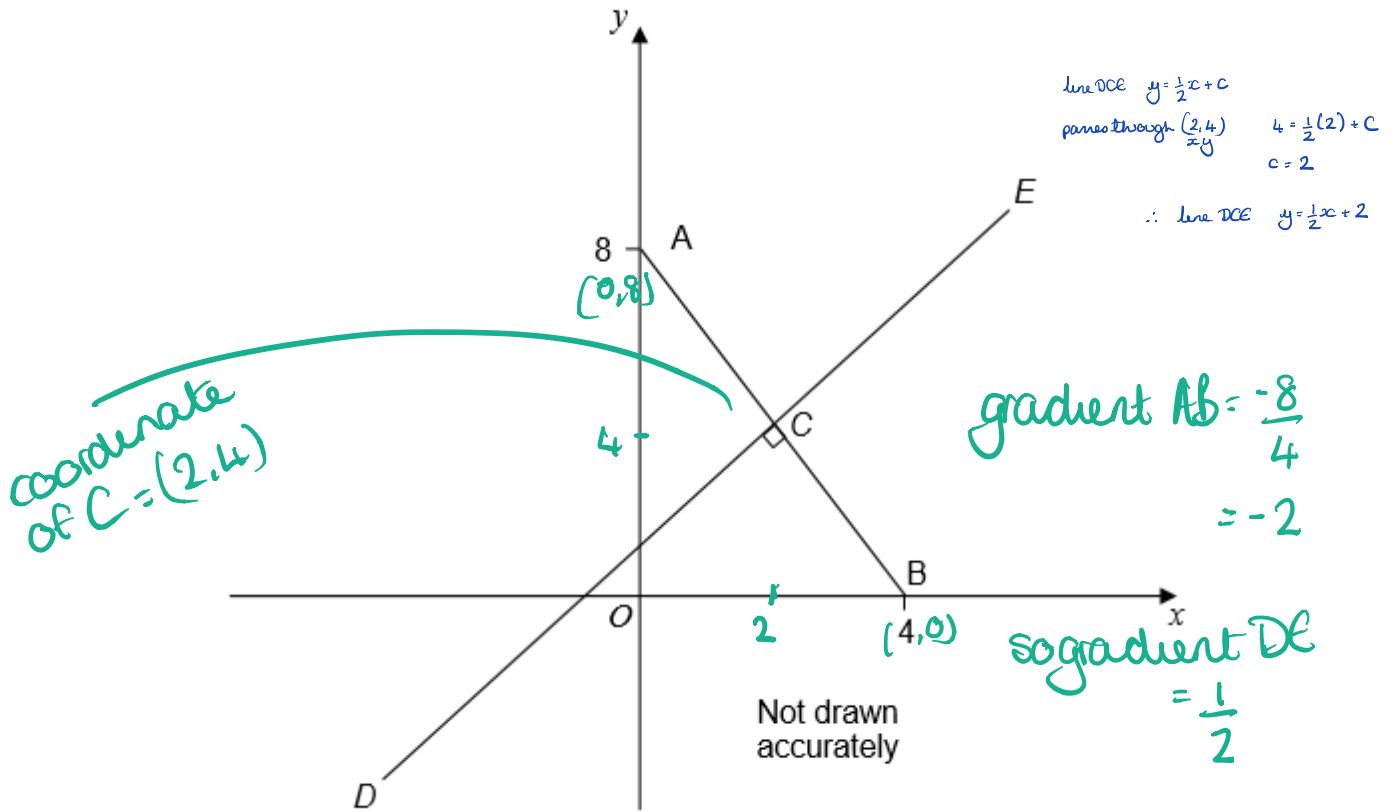
A is the point (0, 8), and B is the point (4, 0)

C is the midpoint of AB.

Line DCE is perpendicular to line ACB.

gradient AB
 $= \frac{-8}{4} = -2$
 gradient DE
 $= \frac{1}{2}$

coordinates of C
 $(2, 4)$ → $(, 0)$



Work out the equation of line DCE.

[5]

line DCE gradient = $\frac{1}{2}$

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

$(2, 4)$
 $x \ y$

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

$$4 - 1 = c$$

\therefore line DCE

$$y = \frac{1}{2}x + 3$$

CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	WJEC Eduqas	9	Pearson Edexcel	17	AQA
2	WJEC Eduqas	10	Pearson Edexcel		
3	AQA	11	Pearson Edexcel		
4	Pearson Edexcel	12	AQA		
5	AQA	13	Pearson Edexcel		
6	OCR	14	Pearson Edexcel		
7	OCR	15	AQA		
8	OCR	16	AQA		

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/qcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

Contents: CREDITS AND NOTES

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material

