ADA PINPOINT TOPIC PACKS

(1)The Equation of a Line (1 Qns)
(2)Equation of a Line from a Graph (0 Qns)
(3)Understanding Lines and Gradients (9 Qns)
(4)Gradient Problems (2 Qns)
(5)Straight Lines and Shape Problems (1 Qns)

52_to_100_Percent_Pinpoint_AI_Pack

Time Allocation = 56mins , Max = 49 Marks

Calculated Grade Boundaries:

Grade	Marks
5	4
5+	7
6-	11
6	14
6+	18
7-	21
7	25
7+	28
8-	32
8	35
8+	39
9-	42
9	46
9+	49

Question 1 (AO3): 43% of students got this right (3 marks)

1. *A* is the point with coordinates (2, 10)
B is the point with coordinates (5, *d*)

The gradient of the line *AB* is 4

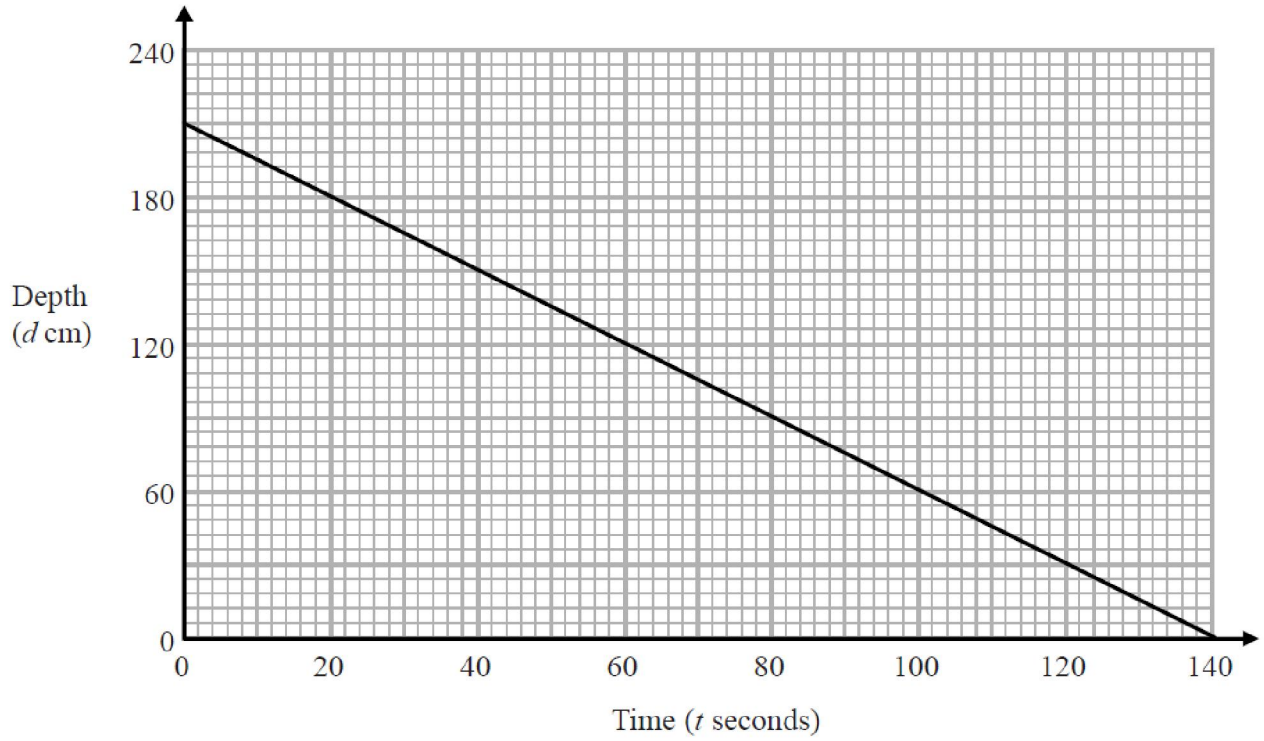
Work out the value of *d*.

d = ...

(Total for Question 1 is 3 marks)

Question 2 (AO2): 39% of students got this right (3 marks)

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



(a) Find the gradient of this graph.

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(2)

(b) Explain what this gradient represents.

.....

.....

(1)

(Total for Question 10 is 3 marks)

Question 3 (AO2): 31% of students got this right (4 marks)

13. The points $A(6, 1)$ and $B(-2, 5)$ are on the line with equation $y = -\frac{1}{2}x + 4$

M is the midpoint of AB.

Find an equation of the line through M that is perpendicular to $y = -\frac{1}{2}x + 4$

.....

(Total 4 marks)

Question 4 (AO2): 29% of students got this right (3 marks)

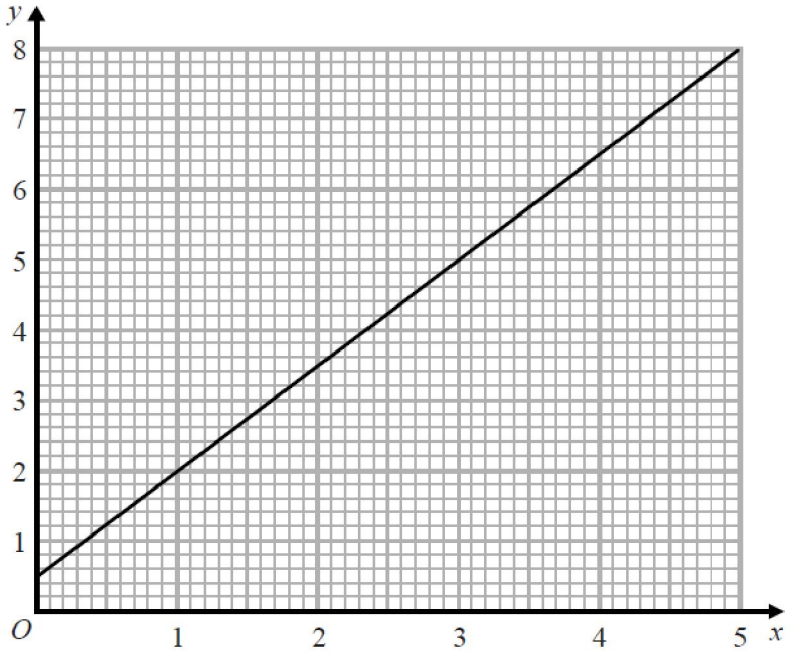
19. **A** and **B** are straight lines.
Line **A** has equation $2y = 3x + 8$.
Line **B** goes through the points $(-1, 2)$ and $(2, 8)$.

Do lines **A** and **B** intersect?
You must show all your working.

(Total 3 marks)

Question 5 (AO1): (No Calc) 29% of students got this right (3 marks)

2 b



Deliveries cost \$ y for x miles.

The graph gives the values of y for values of x from 0 to 5.

(b) Write the equation of the straight line in the form $y = m\,x + c$

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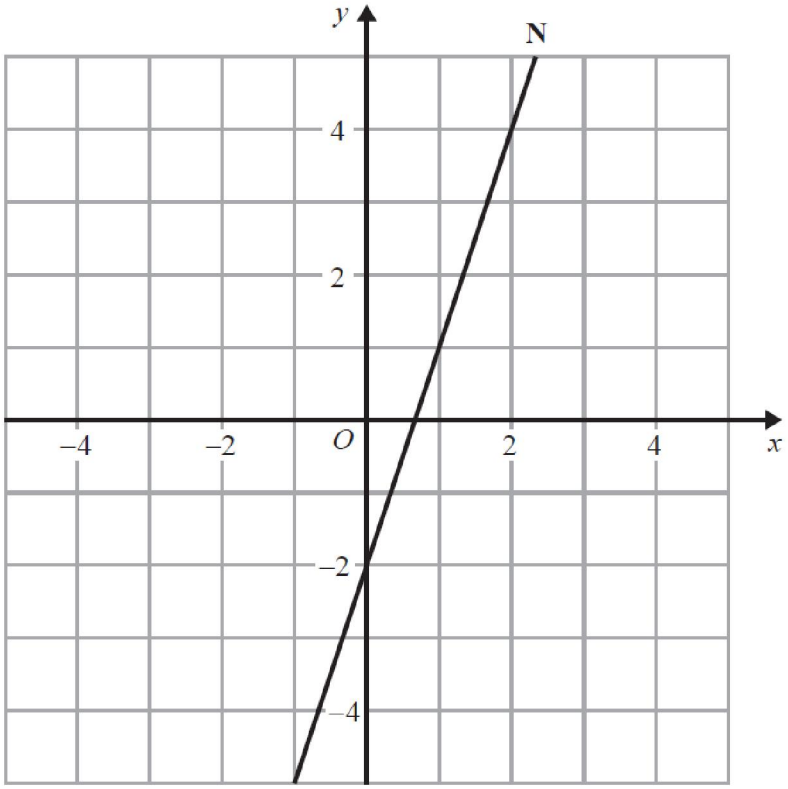
(3)

Question 6 (AO1): 27% of students got this right (3 marks)

20. The line **N** is drawn below.



Find an equation of the line perpendicular to line **N** that passes through the point (0, 1).

.....

(Total 3 marks)

Question 7 (AO2): (No Calc) 21% of students got this right (4 marks)

21. A is the point with coordinates (1, 3).
B is the point with coordinates (4, –1).
The straight line L goes through both A and B.

Is the line with equation $2y = 3x - 4$ perpendicular to line L?
You must show how you got your answer.

(Total 4 marks)

Question 8 (AO1): (No Calc) 18% of students got this right (4 marks)

20.

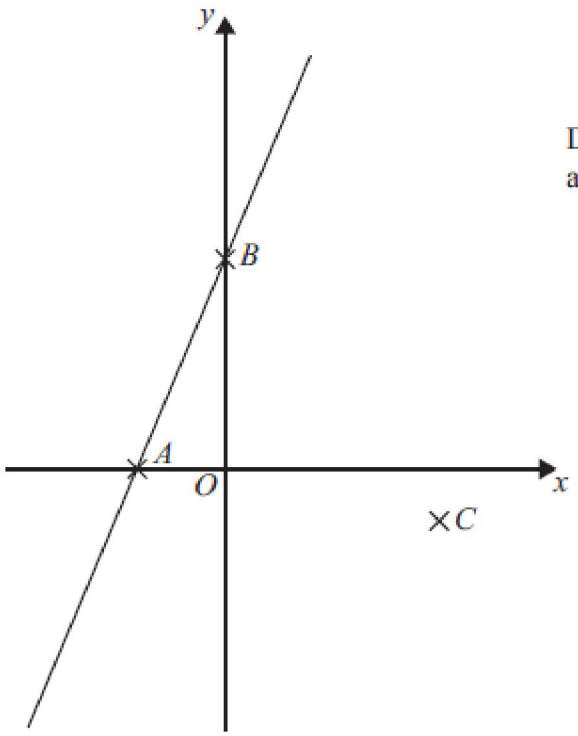


Diagram **NOT** accurately drawn

In the diagram A is the point $(-2, 0)$

B is the point $(0, 4)$

C is the point $(5, -1)$

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

Question 9 (AO2): 18% of students got this right (5 marks)

18.

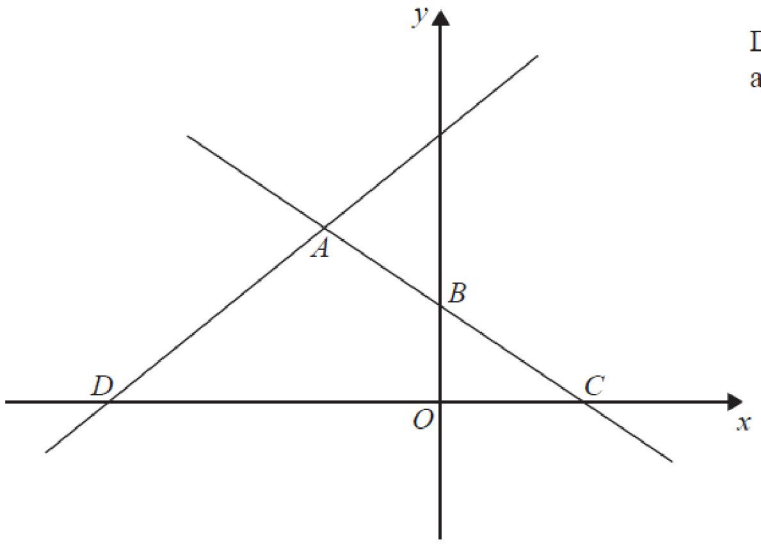


Diagram **NOT** accurately drawn

In the diagram, ABC is the line with equation $y = -\frac{1}{2}x + 5$

$AB = BC$
D is the point with coordinates (–13, 0).

Find an equation of the line through A and D.

(Total 5 marks)

Question 10 (AO3): 16% of students got this right (4 marks)

19 A triangle has vertices P, Q and R.

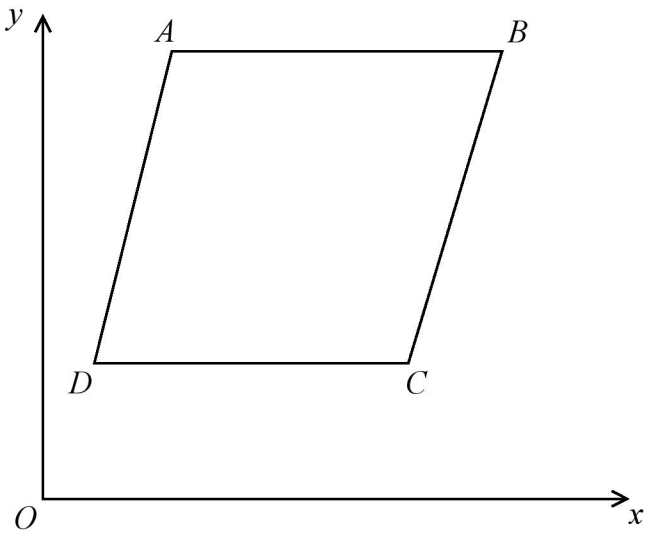
The coordinates of P are $(-3, -6)$
The coordinates of Q are $(1, 4)$
The coordinates of R are $(5, -2)$

M is the midpoint of PQ.
N is the midpoint of QR.

Prove that MN is parallel to PR.
You must show each stage of your working.

Question 11 (AO3): (No Calc) 15% of students got this right (4 marks)

18



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*.

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(Total for Question 18 is 4 marks)

Question 12 (AO3): (No Calc) 14% of students got this right (4 marks)

21. A has coordinates $(-3, 0)$

B has coordinates $(1, 6)$

C has coordinates $(5, 2)$

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

Give your equation in the form $ax + by = c$ where a, b and c are integers.

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(Total 4 marks)

Question 13 (AO3): 9% of students got this right (5 marks)

19 A has coordinates $(-9, 7)$
B has coordinates $(11, 12)$

M is the point on the line segment AB such that $AM : MB = 2 : 3$

Line **L** is perpendicular to the line segment AB.
L passes through M.

Find an equation of **L**.

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(Total for Question 19 is 5 marks)

Answers to Qn 1 (AO3): 43% of students got this right

Question	Working	Answer	Mark	Notes
1		22	P1	Process to use gradient, e.g. $\frac{d-10}{5-2}=4$
			P1	for a complete process to rearrange equation formed to isolate d
			A1	cao

Answers to Qn 2 (AO2): 39% of students got this right

Paper 1MA1: 2H			
Question	**Working**	**Answer**	**Notes**
10 a		–1.5	M1 for method to find A1 gradient, eg. 210 ÷ 140
b			C1 for correct interpretation of the negative gradient for explanation, eg. rate of change of depth of water in tank

Answers to Qn 3 (AO2): 31% of students got this right

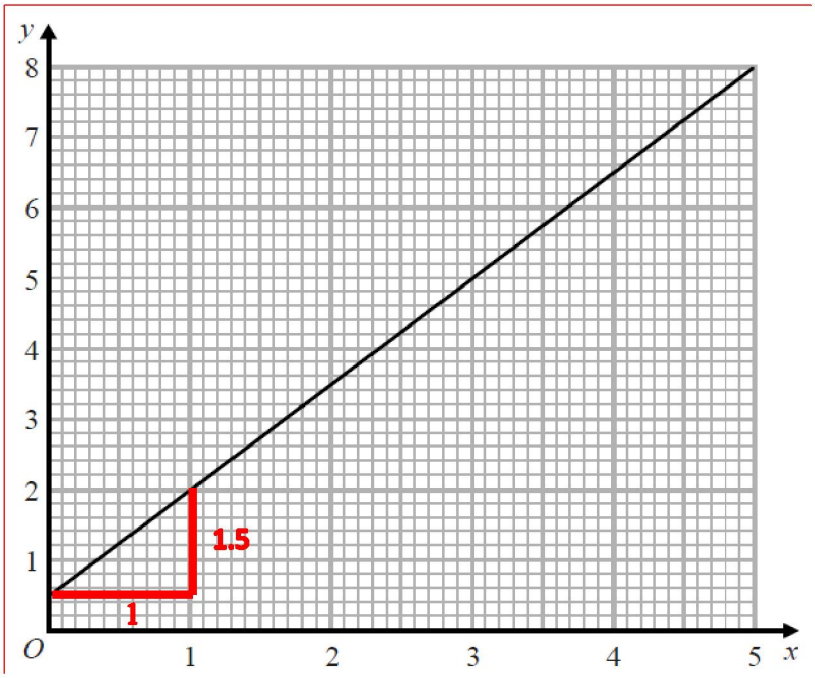
13.			$y = 2x - 1$	4	M1 for $\left(\frac{6+-2}{2}, \frac{1+5}{2}\right)$ oe M1 for $\frac{-1}{0.5}$ oe (= 2) M1(dep on previous M1) for using $y =$ '2'$x + c$ with their coordinates for the midpoint used correctly to find c A1 for $y = 2x - 1$ oe

Answers to Qn 4 (AO2): 29% of students got this right

19.			Yes with explanation	3	M1 For **Line A**: writes equation as $y = 1.5x + 4$ or gives the gradient as 1.5 or constant term of 4 OR for **Line B**: shows a method which could lead to finding the gradient or gives the gradient as 2 or constant term of 4 or calculates a sequence of points including (0,4) or writes equation of line as $y = 2x + 4$ M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made e.g. gradients, equations or points. C1 for gradients 1.5 **and** 2 **and** Yes **with** explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations OR M1 for a diagram that shows both lines drawn and intersecting at (0,4) M1 for a diagram that shows both lines and their intersection point identified as (0,4) C1 for Yes and states the intersection point as (0,4)

Answers to Qn 5 (AO1): (No Calc) 29% of students got this right

2 b



Deliveries cost \$ y for x miles.

The graph gives the values of y for values of x from 0 to 5.

(b) Write the equation of the straight line in the form $y = mx + c$

Gradient: $m = \frac{change\ in\ y}{change\ in\ x} = \frac{1.5}{1} = 1.5$

Equation: $y = 1.5x + 0.5$

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(3)

Answers to Qn 6 (AO1): 27% of students got this right

Question		Working	Answer	Mark	Notes
20		Gradient of N = 3 Gradient of perpendicular to line N $= -\frac{1}{3}$	$y = -\frac{1}{3}x + 1$	3	M1 for complete method to find gradient of line N or for drawing a perpendicular line M1 for method to find the gradient of a perpendicular line A1 $y = -\frac{1}{3}x + 1$ oe

Answers to Qn 7 (AO2): (No Calc) 21% of students got this right

Question		Working	Answer	Mark	Notes
21.		$2y = 3x - 4$ $y = \frac{3}{2}x - 2$; $m = \frac{3}{2}$ $\frac{3--1}{1-4} = -\frac{4}{3}$ $\frac{3}{2} \times -\frac{4}{3} = -2$	No, with reason	4	M1 for $\frac{3}{2}$ oe or $y = \frac{3}{2}x\left(-\frac{4}{2}\right)$ oe M1 for method to find gradient of AB, e.g. $\frac{3--1}{1-4}$ **or** $\frac{-1-3}{4-1}$ **or** $-\frac{4}{3}$ oe A1 for identifying gradients as $\frac{3}{2}$ oe **and** $-\frac{4}{3}$ oe C1 (dep on M1) for a conclusion with a correct reason, e.g. No, as product of $\frac{3}{2}$ and $-\frac{4}{3}$ is not −1, ft (from their two gradients)

Answers to Qn 8 (AO1): (No Calc) 18% of students got this right

Question		Working	Answer	Mark	Notes
20.		Gradient of $AB = 2$ Gradient of perpendicular line $= -\frac{1}{2}$ $y = -\frac{1}{2}x + c$ $-1 = -\frac{1}{2} \times 5 + c$ $c = \frac{3}{2}$	$y = -\frac{1}{2}x + \frac{3}{2}$	4	M1 for attempt to find gradient of AB M1 (dep) for attempt to find gradient of perpendicular line eg use of $-1/m$ M1(dep on M2) for substitution of $x = 5$, $y = -1$ A1 for $y = -\frac{1}{2}x + \frac{3}{2}$ oe

Answers to Qn 9 (AO2): 18% of students got this right

		18.	$y = \frac{10}{3}x + \frac{130}{3}$	5	B1 for stating B as (0, 5) or $OB = 5$ (could be written on the diagram) B1 for C as (10, 0) or $OC = 10$ (could be written on the diagram) or A is (–10, 10) or ft from their BC M1 gradient of $DA = \frac{10}{3}$ or $y = \frac{10}{3}x + c$ M1 for substitution of $x = -13,\ y = 0$ or $x = -10,\ y = 10$ in their equation A1 $y = \frac{10}{3}x + \frac{130}{3}$ oe

Answers to Qn 10 (AO3): 16% of students got this right

Paper: 1MA1/2H				
Question	**Working**	**Answer**	**Mark**	**Notes**
19		Proof (supported)	M1	for a method to find coordinates of $M(-1, -1)$ or $N(3, 1)$
			M1	for method to find gradient of MN or PR or for method to find column vector for MN or PR or for differences of x coordinates and differences of y coordinates for MN or PR
			A1	for gradients of MN and PR , ie ½ oe or for column vectors of MN and PR, $\overrightarrow{MN} = \begin{pmatrix}4\\2\end{pmatrix}$ and $\overrightarrow{PR} = \begin{pmatrix}8\\4\end{pmatrix}$ or for differences of x coordinates and of y coordinates for MN and PR
			C1	for conclusion from reasoning and correct working

Answers to Qn 11 (AO3): (No Calc) 15% of students got this right

Question 18 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Gradient of $DB = \frac{1}{2}$	P1	This mark is given for finding the gradient of the line DB
	Gradient of $AC = -\frac{1}{\frac{1}{2}} = -2$, so equation for AC is $y = -2x + c$	P1	This mark is given for understanding that the line AC is perpendicular to DB and using $-\frac{1}{m}$ to find its gradient
	$11 = -10 + c$ $c = 21$	P1	This mark is given for substituting the values for the coordinates of A ($x = 5$ and $y = 11$) into $y = -2x + c$ to find the value of c
	$y = -2x + 21$	A1	This mark is given for the correct answer only

Answers to Qn 12 (AO3): (No Calc) 14% of students got this right

21.			$3y + 2x = 16$	4	M1 for method to find gradient of AB, e.g. $\frac{6-0}{1--3}\left(=\frac{3}{2}\right)$ M1 for method to find gradient of line, e.g. $-1\div\frac{3}{2}\left(=-\frac{2}{3}\right)$ M1 for method to find y intercept, e.g. $2 = -\frac{2}{3}\times 5 +$ c or $c = \frac{16}{3}$ A1

Answers to Qn 13 (AO3): 9% of students got this right

19 *A* has coordinates (–9, 7)
B has coordinates (11, 12)

M is the point on the line segment *AB* such that *AM* : *MB* = 2 : 3

Line **L** is perpendicular to the line segment *AB*.
L passes through *M*.

Find an equation of **L**.

Gradient of AB: $\frac{12-7}{11-(-9)} = \frac{5}{20} = \frac{1}{4}$

Gradient of L: $m = -4$

M: $\left(-9 + \frac{2}{5} \times 20\ ,\ 7 + \frac{2}{5} \times 5\right) = (-1,9\ )$

Equation of L: $y = -4x + c$

$(-1,9\ ) \rightarrow \quad 9 = -4 \times (-1) + c$

$c = 5$

Equation of L: $\boldsymbol{y = -4x + 5}$

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(Total for Question 19 is 5 marks)
