

## GRADIENT OF LINE

### Pearson Edexcel – Thursday 4 June 2020 - Paper 2 (Calculator) Higher Tier

1.

12	(a)	-0.09	M1	for suitable method to find gradient, eg $27 \div 300$	Any readings from the graph must be reasonable. Condone missing negative for M1
			A1	for answer in the range -0.1 to -0.08 oe	
	(b)		C1	for explanation  <b>Acceptable examples</b> volume of petrol used each km litres/km Rate of fuel consumption For every 9 litres you can travel 100 km <b>Not acceptable examples</b> volume $\div$ distance volume of petrol used per distance km/litre as distance increases volume decreases	Can fit explanation linked to incorrect gradient in part (a)

### Pearson Edexcel - Thursday 8 November 2018 - Paper 2 (Calculator) Higher Tier

2.

6	7	P1	process to use gradient eg $y=3x+c$ or $c = -6$ or $\frac{15-9}{d-5}$	Condone use of a letter other than $d$ , for $d$  Must show processes to get as far as $d =$ Award P2 for an answer of (7, 15)
		P1	(dep) full process to rearrange equation formed to isolate $d$ eg rearrangement of $15 = 3d - 6$ or $3 = \frac{15-9}{d-5}$ or for $5 + \frac{15-9}{3}$	
		A1	cao	

### Pearson Edexcel - Tuesday 12 June 2018 - Paper 3 (Calculator) Higher Tier

3.

12	(a)	1.5	M1	for method to find the gradient of the line, eg $\frac{12}{8}$	Must see use of scales.  Ignore any quantities given. Award the mark for an explanation involving rate.
			A1	for 1.5 oe	
	(b)	Explanation	C1	Explanation relating to rate of change of volume with time, eg rate at which the container fills or change in number of litres per second or number of litres added per second	
	(c)	Explanation	C1	Explanation relating to volume (amount) of liquid in the container at the start eg number of litres in the container when $t = 0$ , amount of liquid in the container to start with	

### Pearson Edexcel - Thursday 25 May 2017 - Paper 1 (Non-Calculator) Higher Tier

4.

6		comparison	M1	starts to manipulate expression e.g. $3y = 9x - 6$ or $3y = 9x - 5$
			A1	gives equation(s) which can be used to show that the gradients of the two lines are the same e.g. $y = 3x - 5/3$

**Pearson Edexcel - Thursday 25 May 2017 - Paper 1 (Non-Calculator) Higher Tier**

5.

18		$y = -2x + 21$	P1 P1 P1 A1	shows evidence of understanding that $AC$ is perpendicular to $DB$ , or states the gradient of $DB$ as 0.5 oe shows a process to find the gradient of a perp. line e.g. use of $-\frac{1}{m}$ or states $y = -2x + c$ or states the gradient of $AC$ as $-2$ (dep on P2) for sub. of $x = 5, y = 11$ into $y = mx + c$ where $m$ is their found gradient for $AC$ . oe
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**Pearson Edexcel - Thursday 8 June 2017 - Paper 2 (Calculator) Higher Tier**

6.

23		$y = \frac{-3}{\sqrt{7}}x + \frac{8}{\sqrt{7}}$	M1 M1 A1	for method to find gradient of $OP$ , eg $\frac{\sqrt{7}}{2} \div \frac{3}{2} (= \frac{\sqrt{7}}{3}$ or 0.88 ...) oe (dep) for method to find gradient of tangent, $m$ , eg. $\frac{\sqrt{7}}{2} \times m = -1$ ( $m = \frac{-3}{\sqrt{7}}$ or $-1.13..$ ) for $y - \frac{\sqrt{7}}{2} = \frac{-3}{\sqrt{7}}(x - \frac{3}{2})$ or $y = \frac{-3\sqrt{7}}{7}x + \frac{8\sqrt{7}}{7}$ oe or $y - 1.32.. = -1.13..(x - 1.5)$
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**Pearson Edexcel - Specimen Papers Set 1 - Paper 2 (Calculator) Higher Tier**

7.

10	(a)		-1.5	M1 A1	for method to find gradient, eg. $210 \div 140$ for correct interpretation of the negative gradient
	(b)			C1	for explanation, eg. rate of change of depth of water in tank

**Pearson Edexcel - Specimen Papers Set 1 - Paper 3 (Calculator) Higher Tier**

8.

7			A and D	C1 in any order
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**Pearson Edexcel - Wednesday 5 November 2014 - Paper 1 (Non-Calculator) Higher Tier**

9.

*24		$2y = 3x - 4$ $y = \frac{3}{2}x - 2; m = \frac{3}{2}$ $\frac{3 - -1}{1 - 4} = -\frac{4}{3}$ $\frac{3}{2} \times -\frac{4}{3} = -2$	No with reason	4	M1 for $\frac{3}{2}$ oe or $y = \frac{3}{2}x (-\frac{4}{2})$ oe M1 for method to find gradient of $AB$ , eg $\frac{3 - -1}{1 - 4}$ 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, eg No as product of $\frac{3}{2}$ and $-\frac{4}{3}$ is not $-1$ , ft from their two gradients
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Pearson Edexcel - Friday 8 November 2013 - Paper 2 (Calculator) Higher Tier

10.

*25		Yes with explanation	3	<p>M1 For <b>Line A</b>: writes equation as <math>y = 1.5x + 4</math> or gives the gradient as 1.5 or constant term of 4  OR for <b>Line B</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 <math>y = 2x + 4</math></p> <p>M1 Shows correct aspects relating to an aspect of Line A and an aspect of Line B that enables some comparison to be made eg gradients, equations or points.</p> <p>C1 for gradients 1.5 <b>and</b> 2 <b>and</b> Yes <b>with</b> explanation that the gradients are different or states the lines intersect at (0,4) or explanation that interprets common constant term (4) from equations</p> <p>OR</p> <p>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)</p>
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Pearson Edexcel - Friday 14 June 2013 - Paper 2 (Calculator) Higher Tier

11.

13	(a)		(3, 3.5) oe	2	<p>M1 for a correct method to find the value of either the <math>x</math> coordinate or the <math>y</math> coordinate of the midpoint <b>or</b> <math>x = 3</math> <b>or</b> <math>y = 3.5</math>  A1 cao</p>
	(b)		-1.8 oe	2	<p>M1 for correct method to find the gradient OR (+)1.8  A1 for -1.8 oe</p>

OCR GCSE – Tuesday 3 November 2020 – Paper 4 (Calculator) Higher Tier

12.

7	(a)	<p>Any correct reason e.g.  two points identified e.g (-2,-6) and (2,4) or a triangle drawn on the graph</p> <p>and</p> <p>[gradient = ]  e.g <math>\frac{4 - -6}{2 - -2}</math> (could be marked on graph)  <math>= \frac{10}{4} = (\frac{5}{2}</math> or 2.5) oe</p>	1		<p>reason has to be fully correct</p> <p>condone triangle with base 1 and height 2.5 providing it is clear</p> <p>alternative 1: e.g.  <math>-6 = m(-2) + -1</math>  leading to <math>m = (-6 + 1) \div -2 = \frac{-5}{-2} = (\frac{5}{2}</math> or 2.5)</p> <p>alternative 2 :  <math>-6 = m(-2) + c</math>  <math>4 = m(2) + c</math>  subtract  <math>-10 = m(-4)</math>  <math>\frac{-10}{-4} = (\frac{5}{2}</math> or 2.5) oe</p>
	(b)	$y = 2.5x - 1$	2	<b>B1</b> for $y = 2.5x + c$ ( $c \neq -1$ )	condone $\frac{5}{2}$ for 2.5

OCR GSCE – Sample Papers – Paper 5 (Non - Calculator) Higher Tier

13.

14		Fully correct explanation, finding gradients of both lines and showing that the gradients' product equals -1	<b>4</b> 1 AO1.3a 2 AO2.2 1 AO2.4b	<b>B1</b> for gradient of first line is $\frac{4}{3}$ <b>B1</b> for gradient of second line is $-\frac{3}{4}$ <b>M1</b> for finding the product of <i>their</i> gradients <b>oe</b>	
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OCR GSCE – Sample Papers – Paper 6 (Calculator) Higher Tier

14.

14		2	<b>3</b> 1 AO1.3a 2 AO3.1b	<b>M1</b> for any correct $\frac{\text{change in } y}{\text{change in } x}$ <b>M1</b> for $\frac{s-q}{r-p} = \frac{4}{2}$ If zero scored <b>SC1</b> for $\frac{\text{change in } x}{\text{change in } y} = \frac{1}{2}$	
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AQA GSCE – Thursday 4 June 2020 – Paper 2 (Calculator) Higher Tier

15.

12	$\frac{9-3}{1--2}$ or $\frac{6}{3}$	M1	oe eg $\frac{3-9}{-2-1}$ or $\frac{-6}{-3}$
	or $2x (+ c)$ where $c$ is a constant		
	2	A1	
	<b>Additional Guidance</b>		
	2x may be implied eg $y - 3 = 2(x + 2)$		M1A0

AQA GSCE – Thursday 8 June 2020 – Paper 3 (Calculator) Higher Tier

16.

28	$-\frac{1}{4}$ or $-1 \div 4$	M1	oe
	5 = their $-\frac{1}{4} \times 8 + c$ or $c = 7$ or $y - 5 = -\frac{1}{4}(x - 8)$	M1dep	oe $y = -\frac{1}{4}x + 7$ implies M2
	$-\frac{1}{4}x + 7 = 0$ or $(x =) 28$	M1dep	oe
	(28, 0)	A1	SC2 (-12, 0) or (6.75, 0)
	<b>Additional Guidance</b>		
	Answer (0, 28) is A0 but may score M marks if working seen		
	(-12, 0) from using the gradient of the perpendicular as $\frac{1}{4}$		SC2
	(6.75, 0) from using the gradient of the perpendicular as 4		SC2

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17.

25(a)	(gradient of $OP =$ ) $\frac{8-0}{4-0}$	M1	oe eg (gradient of $OP =$ ) $\frac{8}{4}$
	(gradient of $OP =$ ) 2 or $\frac{2}{1}$ and $-1 \div 2 = -\frac{1}{2}$ or $2 \times -\frac{1}{2} = -1$ with M1 seen	A1	oe accept 'negative reciprocal, so $-\frac{1}{2}$ , or 'product of gradients is $-1$ , so $-\frac{1}{2}$ , oe comment
	<b>Additional Guidance</b>		
	$4 \div 8 = \frac{1}{2}$ but slope is negative, so $-\frac{1}{2}$		M0A0
	Do not accept a gradient including $x$ eg $\frac{8}{4} = 2$ , so gradient of $OP = 2x$ , product of gradients is $-1$ , so $-\frac{1}{2}x$		M1A0

<b>25(b)</b>	<b>Alternative method 1: <math>y = -\frac{1}{2}x + c</math> and substitutes 8 and 4</b>		
	$8 = -\frac{1}{2} \times 4 + c$ or $(c =) 10$	M1	oe implied by $y = -\frac{1}{2}x + 10$
	$0 = -\frac{1}{2}x +$ their 10 or $(x =) 20$	M1dep	oe
	their $20^2 +$ their $10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	<b>Alternative method 2: uses the formula for a line and substitutes <math>x = 0</math> and <math>y = 0</math></b>		
	$y - 8 = -\frac{1}{2}(x - 4)$ and substitutes $x = 0$ or $y = 0$ or $(x =) 20$ or $(y =) 10$	M1	oe equation eg $x + 2y = 20$
	$y - 8 = -\frac{1}{2}(x - 4)$ and substitutes $x = 0$ and substitutes $y = 0$ or $(x =) 20$ and $(y =) 10$	M1	oe equation eg $x + 2y = 20$
	their $20^2 +$ their $10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	<b>The mark scheme for question 25(b) continues on the next page</b>		

<b>25(b) (cont)</b>	<b>Alternative method 3: uses formula for gradient with points A and B</b>		
	$\frac{8-0}{4-x} = -\frac{1}{2}$ or $(x =) 20$	M1	oe correct method to work out the x-coordinate of point A
	$\frac{y-8}{0-4} = -\frac{1}{2}$ or $(y =) 10$	M1	oe correct method to work out the y-coordinate of point B
	their $20^2 +$ their $10^2$ or 500 or $\sqrt{500}$	M1dep	oe eg $2\sqrt{125}$ dep on M2
	$10\sqrt{5}$	A1	accept $a = 10$ with $\sqrt{500}$ seen
	<b>Additional Guidance</b>		
	Check the diagram and 25(a) for possible correct working or values eg 1 20 marked on axis at A eg 2 10 marked on axis at B	M1 M1	
	On alternative method 2, if using $y - 8 = -\frac{1}{2}(x - 4)$ , they must substitute $x = 0$ or $y = 0$ for M1 and both separately for M1M1		
	On alternative method 2, incorrect rearrangement of $y - 8 = -\frac{1}{2}(x - 4)$ can score up to 3 marks eg $y - 8 = -\frac{1}{2}(x - 4)$ , $2y - 8 = -x - 4$ , when $y = 0$ , $x = 4$ , when $x = 0$ , $y = 2$ , $\sqrt{4^2 + 2^2} = \sqrt{20}$		M1M1M1

**AQA GCSE – Monday 12 November 2018 – Paper 3 (Calculator) Higher Tier**

**18.**

<b>28</b>	gradient is negative	B1	
	<b>Additional Guidance</b>		

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**19.**

<b>12(a)</b>	$\frac{1}{2}$ or 0.5	B1	oe eg $\frac{4}{8}$ or $\frac{2}{4}$
	<b>Additional Guidance</b>		
	1 : 2 or 50%		B0
	$\frac{1}{2}x$		B0
	$y = 0.5x + 2$		B0
	$\frac{0.5}{1}$		B0
	Ignore units		

<b>12(b)</b>	<input type="checkbox"/> The answer to part (a) is too big	B1	
	<input checked="" type="checkbox"/> The answer to part (a) stays the same		
	<input type="checkbox"/> The answer to part (a) is too small		
<b>Additional Guidance</b>			

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20.



<b>8(a)</b>	<b>Alternative method 1 – Using gradients</b>	
	Gradient of $y = 3x + 7$ is 3  and $y = 3x + 4$  and gradient of $2y - 6x = 8$ is 3 or $6 \div 2$	<p>B3</p> <p>May come from using points on line eg using (0, 7) and (1, 10) and <math>\frac{10 - 7}{1 - 0} = 3</math>  or correct calculation for gradient from points on line <math>2y - 6x = 8</math>  eg using (0, 4) and (1, 7) and <math>\frac{7 - 4}{1 - 0} = 3</math>  B2 for <math>y = 3x + 4</math> and lines have same gradient  or <math>y = 3x + 4</math> and gradient of <math>2y - 6x = 8</math> is 3 or <math>6 \div 2</math>  or gradient of <math>y = 3x + 7</math> is 3 and <math>y = 3x + 4</math>  B1 for gradient of <math>y = 3x + 7</math> is 3 or <math>y = 3x + 4</math> or gradient of <math>2y - 6x = 8</math> is 3 or <math>6 \div 2</math></p>
	<b>Alternative method 2 – Using coordinates and distances</b>	
	Chooses a value for $x$ and correctly evaluates the $y$ value for both lines	M1 eg (0, 7) and (0, 4)
	Chooses a different value for $x$ and correctly evaluates the $y$ value for both lines	M1dep eg (1, 10) and (1, 7)
States that $y$ values are a constant distance apart so parallel	A1 oe	

Continues on next page

<b>8(a) cont</b>	<b>Alternative method 3 – Using simultaneous equations</b>	
	$y = 3x + 4$ or $y - 3x = 4$ or $2y = 6x + 14$ or $2y - 6x = 14$	M1 oe Equates coefficients in any form
	Any attempt to eliminate both variables from their equations	M1dep
	States simultaneous equations have no (real) solution and concludes parallel	A1
	<b>Additional Guidance</b>	
	To award A mark on Alternative method 2, the working must be seen	
	$y = 3x + 4$ and lines have gradient of 3x	B2
	$y = 3x + 4$ and 3x identified in both equations	B2
	Both lines have gradient 3x	B1
	$y = 3x + 7$ , gradient 3 and $y = 3x + 8$ , gradient 3 (error in rearrangement)	B1
	$y = 3x + 8$ , gradient 3 (error in rearrangement)	B0
	Parallel as both have same gradient	B0
	$2(3x + 7) - 6x = 8$ $6x + 14 - 6x = 8$ $14 = 8$	M1 M1
	$y = 3x + 7$ and $y = \frac{8 + 6x}{2}$ are equated coefficients, Alternative method 3	M1

8(b)	$3 \times -5 + 7$ or $-15 + 7$ or $-8$ or $(-5, -8)$  or $(-6 - 7) \div 3$ or $-4.33\dots$ or $y = 3x + 9$	M1	Use a point on $y = 3x + 7$ with $(-5, -6)$ to compare gradient to 3 eg Gradient from $(-5, -6)$ to $(0, 7)$ is 2.6
	Above and $-8$ or Above and $-4.33$ or Above and $y = 3x + 9$	A1	oe Above and eg Gradient from $(-5, -6)$ to $(0, 7)$ is 2.6
	<b>Additional Guidance</b>		
	Do not ignore incorrect statements eg $-6$ is less than $-8$ so above		M1A0
$(0, 7), (-1, 4), (-2, 1), (-3, -2), (-4, -5), (-5, -8)$ and ticks below		M1A0	

AQA GCSE – Wednesday 25 May 2017 – Paper 1 (Non - Calculator) Higher Tier

21.

Alternative method 1	
<p>17(a)</p> $\frac{-9 - -5}{4 - 2}$ <p>or</p> $\frac{-5 - -9}{2 - 4}$ <p>or</p> $(2, -5) - (4, -9) = (-2, 4)$ <p>or</p> $(4, -9) - (2, -5) = (2, -4)$ <p>or</p> <p><u>change in y</u> change in x</p> <p>or</p> $\frac{\Delta y}{\Delta x}$ <p>or</p> <p>triangle drawn with points <i>A</i> and <i>B</i> and side lengths of 4 and (-)2 identified</p> <p>or</p> <p>correct explanation of pattern of graph</p> <p><b>and</b></p> $\frac{-4}{2} = -2 \text{ or } \frac{4}{-2} = -2$	<p>oe fraction eg <math>\frac{-9 + 5}{4 - 2}</math> or <math>\frac{-5 + 9}{2 - 4}</math></p> <p>B1 for</p> $\frac{-9 - -5}{4 - 2}$ <p>or</p> $\frac{-5 - -9}{2 - 4}$ <p>or</p> $(2, -5) - (4, -9) = (-2, 4)$ <p>or</p> $(4, -9) - (2, -5) = (2, -4)$ <p>or</p> <p><u>change in y</u> change in x</p> <p>or</p> $\frac{\Delta y}{\Delta x}$ <p>or</p> <p>triangle drawn with points <i>A</i> and <i>B</i> and side lengths of 4 and (-)2 identified</p> <p>or</p> <p>correct explanation of pattern of graph</p> <p>or</p> $\frac{-4}{2} = -2 \text{ or } \frac{4}{-2} = -2$ <p>B2</p>

<b>17(a) cont</b>	<b>Alternative method 2</b>		
	Gives $y = -2x + c$ and substitutes $(2, -5)$ or $(4, -9)$ to find $c = -1$ or $y - -5 = -2(x - 2)$ or $y + 5 = -2(x - 2)$ or $y - -9 = -2(x - 4)$ or $y + 9 = -2(x - 4)$ <b>and</b> gives $y = -2x - 1$ <b>and</b> correctly substitutes and evaluates with the other pair of coordinates to check	B2	B1 for $(2, -5)$ or $(4, -9)$ to find $c = -1$ or $y - -5 = -2(x - 2)$ or $y + 5 = -2(x - 2)$ or $y - -9 = -2(x - 4)$ or $y + 9 = -2(x - 4)$ <b>or</b> gives $y = -2x - 1$ and correctly substitutes and evaluates with one or both pair(s) of coordinates
	<b>Alternative method 3</b>		
	$-5 = 2m + c$ and $-9 = 4m + c$ and works out $m = -2$ using a correct algebraic method	B2	oe equations B1 for $-5 = 2m + c$ and $-9 = 4m + c$
	<b>Alternative method 4</b>		
	$-5 = -2(2) + c$ and $-9 = -2(4) + c$ and works out $c = -1$ for both	B2	oe equations B1 for $-5 = -2(2) + c$ and $-9 = -2(4) + c$
	<b>Additional Guidance</b>		
	In alt 1, examples of correct explanation are: 2 left and 4 up 2 right and 4 down		
	In alt 1, points <i>A</i> and <i>B</i> can be identified on a diagram by their coordinates		
	In alt 2, accept rearrangements of $y = -2x - 1$ eg $2x + y = -1$		
$\frac{-5 - 9}{2 - 4}$ or $\frac{-9 - 5}{4 - 2}$ ( $= -2$ or $= 2$ )		B0	

<b>17(b)</b>	<b>Alternative method 1</b> – uses given point with one from (a) to show gradient = -2		
	$\frac{601 - -9}{-301 - 4}$ or $\frac{601 - -5}{-301 - 2}$	M1	oe eg $\frac{610}{-305}$ or $\frac{606}{-303}$
	-2 and Yes	A1	Must see working for M1
	<b>Alternative method 2</b> – correct or no equation shown in (a)		
	Correct method to find $y = -2x - 1$	M1	May be seen in part (a)
	$y = -2x - 1$ and shows that $601 = -2(-301) - 1$ and Yes	A1	
	<b>Alternative method 3</b> – incorrect equation shown in (a)		
	Substitutes -301 and 601 into their equation from (a)	M1	equation must involve $x$ and $y$
	Correct evaluation and No	A1ft	
	<b>Alternative method 4</b> – have gained two marks in (a) by any method		
	uses (2, -5) or (4, -9) to work out $c = -1$	M1	
	$601 = -2(-301) + c$ and $c = -1$ and Yes	A1	
	<b>Alternative method 5</b> – have shown that $c = -1$ for both points in (a)		
	$601 = -2(-301) + c$	M1	
	$601 = -2(-301) + c$ and $c = -1$ and Yes	A1	
	<b>Additional Guidance</b>		
	$y = -2x - 1$ given in (a) but not used in (b)		M0 for equation
Correct method in (a) to show that the gradient is -2, but followed by incorrect equation. Incorrect equation then used correctly in (b)		B2 in (a) M1A0 in (b)	