Pure Year 1 exam questions Edexcel

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Ch. 5: Straight Line Graphs

June 2023 Question 10

10.

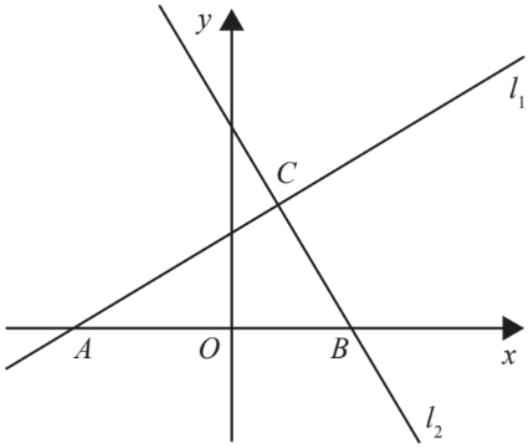

Figure 4

The line l_1 has equation $y = \frac{3}{5}x + 6$

The line l_2 is perpendicular to l_1 and passes through the point $B(8, 0)$, as shown in the sketch in Figure 4.

(a) Show that an equation for line l_2 is

$$5x + 3y = 40$$

(3)

Given that

- lines l_1 and l_2 intersect at the point C
- line l_1 crosses the x-axis at the point A

(b) find the exact area of triangle ABC, giving your answer as a fully simplified fraction in the form $\frac{p}{q}$

(5)

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ANSWER

Question	Scheme	Marks	AOs
10 (a)	Deduces that the gradient of line l_2 is $-\frac{5}{3}$	B1	1.1b
	Complete attempt to find the equation of line l_2 e.g., $y-0=-\frac{1}{"m_1"}(x-8)$	M1	1.1b
	$5x+3y=40$ *	A1*	2.1
		(3)	
(b)	Deduces $A(-10,0)$	B1	2.2a
	Attempts to solve $y=\frac{3}{5}x+6$ and $5x+3y=40$ simultaneously to find the y coordinate of their point of intersection	M1	1.1b
	y coordinate of C is $\frac{135}{17}$ o.e.	A1	1.1b
	Complete attempt at area $ABC=\frac{1}{2}\times\left(8+"10"\right)\times"\frac{135}{17}"$	dM1	2.1
	$=\frac{1215}{17}$	A1	1.1b
		(5)	
(8 marks)			

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June 2023 Question 7

7. The distance a particular car can travel in a journey starting with a full tank of fuel was investigated.

- From a full tank of fuel, 40 litres remained in the car's fuel tank after the car had travelled 80 km
- From a full tank of fuel, 25 litres remained in the car's fuel tank after the car had travelled 200 km

Using a **linear model**, with V litres being the volume of fuel remaining in the car's fuel tank and d km being the distance the car had travelled,

(a) find an equation linking V with d.

(4)

Given that, on a particular journey

- the fuel tank of the car was initially full
- the car continued until it ran out of fuel

find, according to the model,

(b) (i) the initial volume of fuel that was in the fuel tank of the car,

(ii) the distance that the car travelled on this journey.

(3)

In fact the car travelled 320 km on this journey.

(c) Evaluate the model in light of this information.

(1)

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ANSWER

Question	Scheme	Marks	AOs
7 (a)	Uses or implies that $V = ad + b$	B1	3.3
	Uses both $40 = 80a + b$ and $25 = 200a + b$ to get either a or b	M1	3.1b
	Uses both $40 = 80a + b$ and $25 = 200a + b$ to get both a and b	dM1	1.1b
	$\Rightarrow V = -\frac{1}{8}d + 50$ o.e.	A1	1.1b
		(4)	
(b)(i)(ii)	States **either** that the initial volume was 50 {litres} **or** that the distance travelled was 400 {km}	B1 ft	3.4
	Attempts to find **both** answers by solving $0 = -\frac{1}{8}d + 50$ **and** $0 = 400 - 8V$	M1	3.4
	States **both** that the initial volume was 50 litres **and** that the distance travelled was 400 km	A1	3.2b
		(3)	
(c)	States, e.g., “Poor model” as 320km is significantly less than 400 km.	B1ft	3.5a
		(1)	
			(8 marks)

November 2020 Question 4

4. In 1997 the average CO_2 emissions of new cars in the UK was 190 g/km.

In 2005 the average CO_2 emissions of new cars in the UK had fallen to 169 g/km.

Given A g/km is the average CO_2 emissions of new cars in the UK n years after 1997 and using a linear model,

(a) form an equation linking A with n.

(3)

In 2016 the average CO_2 emissions of new cars in the UK was 120 g/km.

(b) Comment on the suitability of your model in light of this information.

(3)

ANSWER

Question	Scheme	Marks	AOs
4 (a)	Attempts $A = mn + c$ with either $(0,190)$ or $(8,169)$ Or attempts gradient eg $m = \pm\frac{190-169}{8}(=-2.625)$	M1	3.3
	Full method to find a linear equation linking A with n E.g. Solves $190 = 0n + c$ and $169 = 8n + c$ simultaneously	dM1	3.1b
	$A = -2.625n + 190$	A1	1.1b
		(3)	
(b)	Attempts $A = -2.625 \times 19 + 190 = ...$	M1	3.4
	$A = 140.125$ g km^{-1}	A1	1.1b
	It is predicting a much higher value and so is not suitable	B1ft	3.5a
		(3)	
			(6 marks)

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June 2019 Question 1

1. The line l_1 has equation $2x + 4y - 3 = 0$

The line l_2 has equation $y = mx + 7$, where m is a constant.

Given that l_1 and l_2 are perpendicular,

(a) find the value of m.

(2)

The lines l_1 and l_2 meet at the point P.

(b) Find the x coordinate of P.

(2)

ANSWER

Question	Scheme	Marks	AOs
1(a)	$2x+4y-3=0 \Rightarrow y = \mp\frac{2}{4}x + \ldots$ Gradient of perpendicular $= \pm\frac{4}{2}$	M1	1.1b
	Either $m=2$ or $y=2x+7$	A1	1.1b
		(2)	
(b)	Combines 'their' $y=2x+7$ with $2x+4y-3=0 \Rightarrow 2x+4(2x+7)-3=0 \Rightarrow x=\ldots$	M1	1.1b
	$x=-2.5$ oe	A1	1.1b
		(2)	
			(4 marks)

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June 2019 Question 4

4. A tree was planted in the ground.
Its height, H metres, was measured t years after planting.

Exactly 3 years after planting, the height of the tree was 2.35 metres.
Exactly 6 years after planting, the height of the tree was 3.28 metres.

Using a linear model,

(a) find an equation linking H with t.

(3)

The height of the tree was approximately 140 cm when it was planted.

(b) Explain whether or not this fact supports the use of the linear model in part (a).

(2)

ANSWER

Question	Scheme	Marks	AOs
4 (a)	Attempts $H = mt + c$ with both $(3, 2.35)$ and $(6, 3.28)$	M1	3.3
	Method to find both m and c	dM1	3.1a
	$H = 0.31t + 1.42$ oe	A1	1.1b
		(3)	
(b)	Uses the model and states that the initial height is their 'b'	B1ft	3.4
	Compares 140 cm with their 1.42 (m) and makes a valid comment. In the case where $H = 0.31t + 1.42$ it should be this fact supports the use of the linear model as the values are close.	B1ft	3.5a
		(2)	
			(5 marks)

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June 2019 Question 7

7. A small factory makes bars of soap.

On any day, the total cost to the factory, £y, of making x bars of soap is modelled to be the sum of two separate elements:

- a fixed cost
- a cost that is proportional to the number of bars of soap that are made that day

(a) Write down a general equation linking y with x, for this model.

(1)

The bars of soap are sold for £2 each.

On a day when 800 bars of soap are made and sold, the factory makes a profit of £500

On a day when 300 bars of soap are made and sold, the factory makes a loss of £80

Using the above information,

(b) show that $y = 0.84x + 428$

(3)

(c) With reference to the model, interpret the significance of the value 0.84 in the equation.

(1)

Assuming that each bar of soap is sold on the day it is made,

(d) find the least number of bars of soap that must be made on any given day for the factory to make a profit that day.

(2)

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ANSWER

Question	Scheme	Marks	AOs
7	£y is the total cost of making x bars of soap Bars of soap are sold for £2 each		
(a)	$y = kx + c$ {where k and c are constants}	B1	3.3
	Note: Work for (a) cannot be recovered in (b) or (c)	**(1)**	
(b) **Way 1**	Either • $x = 800 \Rightarrow y = 2(800) - 500$ $\{= 1100 \Rightarrow (x, y) = (800, 1100)\}$ • $x = 300 \Rightarrow y = 2(300) + 80$ $\{= 680 \Rightarrow (x, y) = (300, 680)\}$	M1	3.1b
	Applies (800, their 1100) and (300, their 680) to give two equations $1100 = 800k + c$ and $680 = 300k + c \Rightarrow k, c = ...$	dM1	1.1b
	Solves correctly to find $k = 0.84$, $c = 428$ and states $y = 0.84x + 428$ *	A1*	2.1
	Note: the answer $y = 0.84x + 428$ must be stated in (b)	**(3)**	
(b) **Way 2**	Either • $x = 800 \Rightarrow y = 2(800) - 500$ $\{= 1100 \Rightarrow (x, y) = (800, 1100)\}$ • $x = 300 \Rightarrow y = 2(300) + 80$ $\{= 680 \Rightarrow (x, y) = (300, 680)\}$	M1	3.1b
	Complete method for finding both $k = ...$ and $c = ...$ e.g. $k = \dfrac{1100 - 680}{800 - 300}$ $\{= 0.84\}$ $(800, 1100) \Rightarrow 1100 = 800(0.84) + c \Rightarrow c = ...$	dM1	1.1b
	Solves to find $k = 0.84$, $c = 428$ and states $y = 0.84x + 428$ *	A1*	2.1
	Note: the answer $y = 0.84x + 428$ must be stated in (b)	**(3)**	
(c)	Allow any of {0.84, in £s} represents • the ***cost*** of {making} each extra bar {of soap} • the direct ***cost*** of {making} a bar {of soap} • the marginal ***cost*** of {making} a bar {of soap} • the ***cost*** of {making} a bar {of soap} (Condone this answer) **Note: Do not allow** • {0.84, in £s} is the profit per bar {of soap} • {0.84, in £s} is the (selling) price per bar {of soap}	B1	3.4
		(1)	
(d) **Way 1**	{Let n be the least number of bars required to make a profit}		
	$2n = 0.84n + 428 \Rightarrow n = ...$ (Condone $2x = 0.84x + 428 \Rightarrow x = ...$)	M1	3.4
	Answer of 369 {bars}	A1	3.2a
		(2)	
(d) **Way 2**	• Trial 1: $n = 368 \Rightarrow y = (0.84)(368) + 428 \Rightarrow y = 737.12$ {revenue $= 2(368) = 736$ or loss $= 1.12$}	M1	3.4
	• Trial 2: $n = 369 \Rightarrow y = (0.84)(369) + 428 \Rightarrow y = 737.96$ {revenue $= 2(369) = 738$ or profit $= 0.04$} leading to an answer of 369 {bars}	A1	3.2a
		(2)	
		(7 marks)	

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June 2018 Question 4

4. The line l_1 has equation $4y - 3x = 10$

The line l_2 passes through the points $(5, -1)$ and $(-1, 8)$.

Determine, giving full reasons for your answer, whether lines l_1 and l_2 are parallel, perpendicular or neither.

(4)

ANSWER

Question	Scheme	Marks	AOs
4	States gradient of $4y-3x=10$ is $\frac{3}{4}$ oe or rewrites as $y=\frac{3}{4}x+\ldots$	B1	1.1b
	Attempts to find gradient of line joining $(5,-1)$ and $(-1,8)$	M1	1.1b
	$=\frac{-1-8}{5-(-1)}=-\frac{3}{2}$	A1	1.1b
	States neither with suitable reasons	A1	2.4
		(4)	
			(4 marks)

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