

Straight-line graphs

Foundation and Higher tiers | Total marks: 84

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Coordinates in four quadrants	A8	Foundation	2	No	2
2	Drawing a straight-line graph	A9	Foundation	3	No	5
3	Matching lines to equations	A9 A10	Foundation	3	No	3
4	Midpoints	A8 G11	Foundation	4	No	4
5	Gradient, intercept and parallel lines	A10 A9	Common	4	No	3
6	Coordinates and a parallelogram	G11 A8	Foundation	4	No	2
7	Gradient of a line from a graph	A10 A9	Foundation	4	No	3
8	Equation of a line through two points	A9	Common	5	No	3
9	Parallel lines	A9	Common	6	No	3
10	Perpendicular gradients	A9	Higher	7	No	3
11	Equation of a circle	A16	Higher	7	No	3
12	Perpendicular bisector	A9	Higher	8	No	4
13	Tangent to a circle	A16 A9	Higher	8	No	5
14	Plotting a line with decimal coefficients	A9	Foundation	3	Yes	5
15	Gradient and intercept in context	A10 R14	Common	5	Yes	4
16	Testing whether points are on a line	A9	Common	6	Yes	3

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	A linear model from two readings	A14 A10	Common	6	Yes	6
18	Equation of a line through two points, with decimals	A9	Common	6	Yes	5
19	Intercepts and an angle	A9 G20	Common	6	Yes	4
20	Where two lines meet	A9 A19	Common	6	Yes	4
21	Perpendicular lines and distance	A9 A19 G20	Higher	7	Yes	6
22	Testing for a rectangle with gradients	A9	Higher	7	Yes	4
	Total					84

Question 1 A8 · Foundation · Grade 2 · 2 marks

Q	Answer	Mark	Comments
1(a)	$(-3, 4)$	B1	
1(b)	D plotted at $(-4, -2)$	B1	within half a square

Question 2 A9 · Foundation · Grade 3 · 5 marks

Q	Answer	Mark	Comments
2(a)	$-3, -1, 3$	B2	in the right places. B1 for two correct
2(b)	a correct straight line from $(-1, -5)$ to $(3, 3)$	B2	B1 for at least 3 points from their table plotted correctly, or a line of gradient 2, or a line through $(0, -3)$
2(c)	2.5	B1ft	accept $[2.4, 2.6]$, ft their straight line

Question 3 A9 A10 · Foundation · Grade 3 · 3 marks

Q	Answer	Mark	Comments
3	$y = -2x + 4$: C; $x = -2$: D; $y = x + 1$: A; $y = 3$: B	B3	B2 for two correct. B1 for one correct

Question 4 A8 G11 · Foundation · Grade 4 · 4 marks

Q	Answer	Mark	Comments
4(a)	$\frac{-3+7}{2}$ or $\frac{5+1}{2}$	M1	oe, one coordinate correct
	$(2, 2)$	A1	
4(b)	a step of +3 or -5 from M	M1	oe, or one coordinate correct
	$(7, -6)$	A1	

Question 5 A10 A9 · Common · Grade 4 · 3 marks

Q	Answer	Mark	Comments
5(a)	3	B1	
5(b)	$(0, -2.5)$	B1	oe
5(c)	$y = 3x + 2$	B1	

Question 6 G11 A8 · Foundation · Grade 4 · 2 marks

Q	Answer	Mark	Comments
6	a step of $(+2, +4)$ from A, or $(-4, +2)$ from C	M1	oe, or D marked correctly on the grid
	$(-1, 5)$	A1	

Question 7 A10 A9 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
7(a)	$\frac{\text{change in } y}{\text{change in } x}$, e.g. $\frac{8}{4}$	M1	oe, any two points on the line
	2	A1	
7(b)	$y = 2x + 1$	B1ft	ft their gradient with intercept 1

Question 8 A9 · Common · Grade 5 · 3 marks

Q	Answer	Mark	Comments
8	$\frac{7-1}{-1-3}$ or $\frac{-8}{4}$ or -2	M1	oe, the gradient
	$7 = -2 \times -1 + c$ or $-1 = -2 \times 3 + c$	M1	oe, ft their gradient
	$y = -2x + 5$	A1	oe

Question 9 A9 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
9	$y = 6 - \frac{3}{2}x$ or gradient $-\frac{3}{2}$	M1	oe
	$1 = -\frac{3}{2} \times 4 + c$	M1	oe, ft their gradient
	(0, 7)	A1	$c = 7$ or $y = -\frac{3}{2}x + 7$ on its own scores M1 M1 A0

Question 10 A9 · Higher · Grade 7 · 3 marks

Q	Answer	Mark	Comments
10	gradient PQ = $\frac{3}{6}$ or $\frac{1}{2}$	M1	oe
	gradient QR = $\frac{6}{-3}$ or -2	M1	oe
	$\frac{1}{2} \times -2 = -1$, so PQ is perpendicular to QR	A1	oe, a conclusion is needed

Question 11 A16 · Higher · Grade 7 · 3 marks

Q	Answer	Mark	Comments
11(a)	$x^2 + y^2 = 25$	B1	oe
11(b)	$k^2 + (-2)^2 = 25$	M1	oe, ft their equation
	$\sqrt{21}$	A1	

Question 12 A9 · Higher · Grade 8 · 4 marks

Q	Answer	Mark	Comments
12	midpoint (2, 4)	B1	
	gradient $AB = \frac{4}{6}$ or $\frac{2}{3}$	M1	oe
	gradient of $L = -\frac{3}{2}$ and $4 = -\frac{3}{2} \times 2 + c$	M1	oe, ft their midpoint and gradient
	$y = -\frac{3}{2}x + 7$	A1	

Question 13 A16 A9 · Higher · Grade 8 · 5 marks

Q	Answer	Mark	Comments
13	gradient of the radius = $\frac{4}{2}$ or 2	M1	
	gradient of the tangent = $-\frac{1}{2}$	M1	ft their radius gradient
	$y - 4 = -\frac{1}{2}(x - 2)$	M1	oe, or $y = -\frac{1}{2}x + 5$
	A = (10, 0) and B = (0, 5)	M1	ft their tangent
	25	A1	

Question 14 A9 · Foundation · Grade 3 · 5 marks

Q	Answer	Mark	Comments
14(a)	-5.5, -2.5, -1, 2	B2	in the right places. B1 for two correct
14(b)	a correct straight line from (-2, -5.5) to (3, 2)	B2	B1 for at least 4 points from their table plotted correctly
14(c)	Yes with $1.5 \times 13.6 - 2.5 = 17.9$	B1	oe, or with $20.4 - 2.5$

Question 15 A10 R14 · Common · Grade 5 · 4 marks

Q	Answer	Mark	Comments
15(a)	the charge when Kai starts using the tablet	B1	oe, the starting charge
15(b)	the charge falls by 12 percentage points every hour	B1	oe, must mention a decrease and per hour. Accept 12% each hour
15(c)	$96 - 12t = 30$ or $\frac{96 - 30}{12}$	M1	oe
	5.5	A1	oe, accept 5 hours 30 minutes

Question 16 A9 · Common · Grade 6 · 3 marks

Q	Answer	Mark	Comments
16	gradient AB = $\frac{6}{3}$ or 2	M1	oe, or the equation of AB: $y = 2x - 3$
	gradient BC = $\frac{9}{4}$ or gradient AC = $\frac{15}{7}$	M1	oe, or substitutes $x = 5$ into their line to get 7
	No, with two different gradients	A1	or No as $7 \neq 8$

Question 17 A14 A10 · Common · Grade 6 · 6 marks

Q	Answer	Mark	Comments
17(a)	$\frac{836.4 - 715.3}{6 - 2.5}$ or $\frac{121.1}{3.5}$	M1	oe
	34.6	A1	
17(b)	$836.4 + 2.5 \times 34.6$	M1	oe, ft their rate
	922.9	A1ft	ft their rate
17(c)	$\frac{922.9 - 250}{34.6}$ or 19.45...	M1	oe, ft their values
	19 hours 27 minutes	A1	

Question 18 A9 · Common · Grade 6 · 5 marks

Q	Answer	Mark	Comments
18(a)	$\frac{1.3 - 7.3}{6.5 - 2.5}$ or -1.5	M1	oe, the gradient
	$7.3 = -1.5 \times 2.5 + c$ or $1.3 = -1.5 \times 6.5 + c$	M1	oe, ft their gradient
	$y = -1.5x + 11.05$	A1	oe
18(b)	$-1.5 \times -4.2 + 11.05$	M1	oe, ft their line, or the gradient from (2.5, 7.3) to (-4.2, 17.4) is -1.507...
	No and 17.35	A1	or No with the two gradients compared

Question 19 A9 G20 · Common · Grade 6 · 4 marks

Q	Answer	Mark	Comments
19	P = (7.2, 0) or OP = 7.2	B1	
	Q = (0, 4.5) or OQ = 4.5	B1	
	$\tan OPQ = \frac{4.5}{7.2}$	M1	oe, ft their lengths, or a full method with Pythagoras and sin or cos
	32.0	A1	accept 32.0 or [32.00, 32.01]

Question 20 A9 A19 · Common · Grade 6 · 4 marks

Q	Answer	Mark	Comments
20	$2 = -0.8 \times 3.5 + c$	M1	oe
	$y = -0.8x + 4.8$	A1	oe
	$-0.8x + 4.8 = 1.2x - 4$	M1	oe, ft their line L
	(4.4, 1.28)	A1	

Question 21 A9 A19 G20 · Higher · Grade 7 · 6 marks

Q	Answer	Mark	Comments
21	gradient of L = $-\frac{2}{5}$	M1	oe
	$y - 9 = \frac{5}{2}(x - 6)$ or $y = \frac{5}{2}x - 6$	M1	oe, ft their gradient of L
	$2x + 5(\frac{5}{2}x - 6) = 20$ or $\frac{29}{2}x = 50$	M1	oe, a correct method to solve their equations
	P = (3.45, 2.62)	A1	accept [3.44, 3.45] and [2.62, 2.63]
	$\sqrt{((6 - 3.45)^2 + (9 - 2.62)^2)}$	M1	ft their P
	6.87	A1	accept [6.86, 6.88]

Question 22 A9 · Higher · Grade 7 · 4 marks

Q	Answer	Mark	Comments
22	gradient AB = $\frac{1.8}{4.5} = 0.4$ or gradient DC = 0.4	M1	oe
	gradient BC = $\frac{2}{-0.9} = -2.22\ldots$ or gradient AD = $-2.22\ldots$	M1	oe
	$0.4 \times -2.22\ldots = -0.889\ldots$, or the gradient perpendicular to AB is -2.5	M1	oe
	No, as $-0.889\ldots \neq -1$ so the corners are not right angles	A1	Alternative: $AC = \sqrt{27.4} = 5.23\ldots$ and $BD = \sqrt{29.2} = 5.40\ldots$, so the diagonals are not equal and it is not a rectangle, M3 A1