3.15 Drawing Linear Graphs: 2-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 120 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A straight line has equation $5y = 10x + 20$.
Work out the gradient of the line and the y-intercept.

(Total for Question 1 is 3 marks)

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2 Here is a table of values for $y = 4x + 6$
Work out the values of y when $x = -2, -1, 0, 1, 2$.
Give your answers as a list in order.

(Total for Question 2 is 2 marks)

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3 The line $y = 3x - 1$ passes through the point (a, 5).
Work out the value of a.

(Total for Question 3 is 3 marks)

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4 A line has equation $y = -x + 6$.
Work out the coordinates of the points where the line crosses (a) the y-axis, (b) the x-axis.

(Total for Question 4 is 2 marks)

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5 A line has equation $y = -2x + 4$.
Work out the coordinates of the points where the line crosses (a) the y-axis, (b) the x-axis.

(Total for Question 5 is 3 marks)

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6 Here is a table of values for $y = 4x + 3$
Work out the values of y when $x = -4, -3, -2, -1, 0$.
Give your answers as a list in order.

(Total for Question 6 is 2 marks)

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7 A straight line has equation $3y = 3x - 6$.
Work out the gradient of the line and the y-intercept.

(Total for Question 7 is 3 marks)

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8 A line has equation $y = -x - 4$.
Work out the coordinates of the points where the line crosses (a) the y-axis, (b) the x-axis.

(Total for Question 8 is 3 marks)

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9 The line $y = 4x + 4$ passes through the point (a, 4).
Work out the value of a.

(Total for Question 9 is 3 marks)

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10 A straight line has equation $3y = 6x - 27$.
Work out the gradient of the line and the y-intercept.

(Total for Question 10 is 3 marks)

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11 A line has equation $y = 2x - 10$.
Work out the coordinates of the points where the line crosses (a) the y-axis, (b) the x-axis.

(Total for Question 11 is 3 marks)

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12 Here is a table of values for $y = 4x - 3$
Work out the values of y when $x = -4, -3, -2, -1, 0$.
Give your answers as a list in order.

(Total for Question 12 is 2 marks)

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13 The line $y = 5x - 5$ passes through the point $(a, -15)$.
Work out the value of a.

(Total for Question 13 is 3 marks)

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14 Does the point $(3, 2)$ lie on the line $y = -x + 3$?
You must show your working.

(Total for Question 14 is 2 marks)

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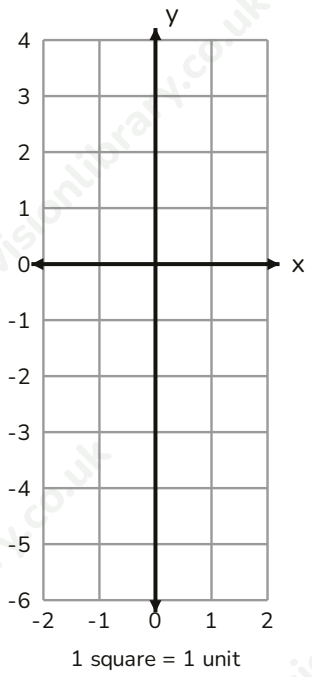
15 A line has equation $y = -2x - 6$.
Work out the coordinates of the points where the line crosses (a) the y-axis, (b) the x-axis.

(Total for Question 15 is 3 marks)

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16 Complete the table of values for $y = 2x - 1$ and use it to draw the graph of $y = 2x - 1$ for values of x from -2 to 2.

x	-2	-1	0	1	2
y					



(Total for Question 16 is 3 marks)

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17 A straight line has equation $y = 5x - 3$.

(a) Write down the gradient of the line. **(1)**

.....

(b) Write down the coordinates of the point where the line crosses the y-axis. **(1)**

.....

(Total for Question 17 is 2 marks)

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18 Plot the three points from the table on graph paper and draw the straight line joining them.

x: -3, 0, 6

y: 4, 3, 1

(Total for Question 18 is 2 marks)

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19 Plot the three points from the table on graph paper and draw the straight line joining them.

x: 0, 2, 4

y: -1, 2, 5

(Total for Question 19 is 2 marks)

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20 A straight line passes through the points (0, -2) and (6, 4). Work out the x-intercept of the line (the value of x when y = 0).

(Total for Question 20 is 3 marks)

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21 Find the equation of the line passing through the points (0, 2) and (4, 0). Give your answer in the form $y = mx + c$.

(Total for Question 21 is 3 marks)

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22 Write down the equation of the straight line passing through the points (0, 5) and (2, 1).

(Total for Question 22 is 2 marks)

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23 A line has equation $y = 3x - 4$.
Work out the coordinates of the point where this line crosses the y-axis and the x-axis.

(a) Work out the y-intercept. **(1)**

.....

(b) Work out the x-intercept. **(2)**

.....

(Total for Question 23 is 3 marks)

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24 The graph of a line through (1, 2) has gradient -1/2.
Find the equation of this line in the form $y = mx + c$.

(Total for Question 24 is 3 marks)

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25 Two lines L1 and L2 are given by L1: $y = 2x + 1$ and L2: $y = -x + 7$.
Find the coordinates of their point of intersection.

(Total for Question 25 is 4 marks)

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26 A company charges a fixed booking fee and a constant hourly rate for hiring equipment. A graph of cost C (pounds) against hours h is a straight line. The graph passes through (0, 18) and (5, 58).

(a) Find the booking fee and the hourly rate. **(3)**

(b) Write down the equation connecting C and h. **(3)**

(Total for Question 26 is 6 marks)

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27 A cyclist travels at a steady speed along a straight path. Her distance d (metres) from the start after t minutes is modelled by $d = 350t + 120$.

(a) Interpret the numbers 350 and 120 in context. **(2)**

(b) Another cyclist starts at the same start but 6 minutes later. For $t \geq 6$, her distance is modelled by $d = 450(t - 6)$, where t is minutes since the original start. Find the time (in minutes since the original start) when the second cyclist catches the first. **(8)**

(Total for Question 27 is 10 marks)

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Mark scheme · 3.15 Drawing Linear Graphs: 2-hour Pack

Question 1

divides all terms by 5	**M1**
gradient 2	**A1**
y-intercept 4	**A1**

Answer: gradient 2, y-intercept 4

Question 2

substitutes at least two values of x correctly	**M1**
all y values correct	**A1**

Answer: y = -2, 2, 6, 10, 14

Question 3

5 = 3a - 1	**M1**
correct rearrangement	**M1**
a = 2	**A1**

Answer: a = 2

Question 4

(a) (0, 6)	**B1**
(b) (6, 0), from setting y = 0	**B1**

Answer: (0, 6) and (6, 0)

Question 5

(0, 4)	**B1**
sets y = 0	**M1**
(2, 0)	**A1**

Answer: (0, 4) and (2, 0)

Question 6

substitutes at least two values of x correctly	**M1**
all y values correct	**A1**

Answer: y = -13, -9, -5, -1, 3

Question 7

divides all terms by 3	**M1**
gradient 1	**A1**
y-intercept -2	**A1**

Answer: gradient 1, y-intercept -2

Question 8

(0, -4)	**B1**
sets y = 0	**M1**
(-4, 0)	**A1**

Answer: (0, -4) and (-4, 0)

Question 9

4 = 4a + 4	**M1**
correct rearrangement	**M1**
a = 0	**A1**

Answer: a = 0

Question 10

divides all terms by 3	**M1**
gradient 2	**A1**
y-intercept -9	**A1**

Answer: gradient 2, y-intercept -9

Question 11

(0, -10)	**B1**
sets y = 0	**M1**
(5, 0)	**A1**

Answer: (0, -10) and (5, 0)

Question 12

substitutes at least two values of x correctly	**M1**
all y values correct	**A1**

Answer: y = -19, -15, -11, -7, -3

Question 13

-15 = 5a - 5	**M1**
correct rearrangement	**M1**
a = -2	**A1**

Answer: a = -2

Question 14

substitutes x = 3 to get y = 0	**M1**
correct conclusion with a comparison	**A1**

Answer: No

Question 15

(0, -6)	**B1**
sets y = 0	**M1**
(-3, 0)	**A1**

Answer: (0, -6) and (-3, 0)

Question 16

all five table values correct: -5, -3, -1, 1, 3	**B1**
correct straight line drawn through the plotted points (B1 for at least 4 points correctly plotted if the line is not fully correct)	**B2**

Answer: Table: -5, -3, -1, 1, 3. Line through (-2,-5), (-1,-3), (0,-1), (1,1), (2,3).

Question 17

(a) 5 cao	**B1**

(a) Answer: 5

(b) (0, -3) oe -3 cao	**B1**

(b) Answer: (0, -3)

Question 18

at least two points plotted correctly and a straight line drawn through them (oe)	**M1**
all three points plotted accurately and correct straight line (cao)	**A1**

Answer: Line with equation y = -1/3 x + 3, passing through (-3,4), (0,3), (6,1).

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Question 19

at least two points plotted correctly and a straight line drawn through them (oe) **M1**

all three points plotted accurately and correct straight line (cao) **A1**

Answer: Line with equation y = 3/2 x - 1, passing through (0,-1), (2,2), (4,5).

Question 20

find gradient: (4 - (-2)) / (6 - 0) = 6/6 = 1 **M1**

use y = mx + c with known point to find equation: y = x - 2 **M1**

x-intercept = 2 cao **A1**

Answer: 2

Question 21

calculate gradient: (0 - 2) / (4 - 0) = -1/2 **M1**

substitute to find c: 2 = -1/2 * 0 + c so c = 2 **M1**

y = -1/2 x + 2 cao **A1**

Answer: y = -1/2 x + 2

Question 22

find gradient m = (1 - 5) / (2 - 0) = -4/2 = -2 or equivalent method **M1**

y = -2x + 5 cao **A1**

Answer: y = -2x + 5

Question 23

(a) y-intercept (0, -4) cao **B1**

(a) Answer: (0, -4)

(b) set y = 0 and solve 0 = 3x - 4, showing method **M1**

(b) x = 4/3, so x-intercept (4/3, 0) cao **A1**

(b) Answer: (4/3, 0)

Question 24

substitute point into y = (-1/2)x + c and solve for c: 2 = (-1/2)(1) + c **M1**

c = 5/2 or 2.5 **A1**

y = -1/2 x + 5/2 cao **A1**

Answer: y = -1/2 x + 5/2

Question 25

set 2x + 1 = -x + 7 and form equation 3x = 6 or equivalent **M1**

x = 2 cao **A1**

substitute x = 2 into one equation to find y **M1**

y = 5, intersection (2, 5) cao **A1**

Answer: (2, 5)

Question 26

(a) booking fee identified as C when h = 0 is £18 **B1**

(a) find gradient (58 - 18) / (5 - 0) = 40 / 5 = 8 **M1**

(a) hourly rate £8 per hour cao **A1**

(a) Answer: Booking fee = £18; hourly rate = £8/hour

(b) use C = mh + c with m = 8 and c = 18 **M1**

(b) C = 8h + 18 cao **A1**

(b) units consistent: C in pounds and h in hours (communication) oe **A1**

(b) Answer: C = 8h + 18

Question 27

(a) 350 is speed in metres per minute oe **B1**

(a) 120 is initial distance from the start in metres at t = 0 (a head start) oe **B1**

(a) Answer: 350 metres per minute; 120 metres initial head start

(b) set 350t + 120 = 450(t - 6), correctly using the second cyclist's delayed start **M1**

(b) expand and rearrange to 2820 = 100t **M1**

(b) t = 28.2 minutes cao **A1**

(b) check second cyclist has actually started: confirm t = 28.2 is greater than 6, so the model d = 450(t - 6) applies **M1**

(b) state that catching occurs at t = 28.2 minutes since original start cao **A1**

(b) units stated: minutes oe **B1**

(b) sanity check: distances equal: 350*28.2 + 120 = 9990 and 450*(28.2 - 6) = 9990 **M1**

(b) final value 28.2 minutes cao **A1**

(b) Answer: 28.2 minutes

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