AS Level Maths: Straight Line Graphs

1 The line l passes through the coordinates (2, 1) and (4, –5).

Find an equation for l.

(Total for question 1 is 3 marks)

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2 The line l_1 has the equation $2x + 3y + 5 = 0$
The line l_2 passes through the coordinates (1, 7) and (5, 1).

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

(Total for question 2 is 4 marks)

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3 (a) Find an equation of the straight line passing through the points (–2, 5) and (5, –1).
Give your answer in the form $ax + by + c = 0$, where a, b and c are integers. **(3)**

The line crosses the x axis at point A, the y axis at point B and O is the origin.

(b) Find the area of triangle AOB. **(3)**

(Total for question 3 is 6 marks)

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4 The points A and B have coordinates $(-1, k + 2)$ and $(2k - 3, 8)$ where k is a constant.

Given the gradient of AB is $\frac{1}{3}$

(a) Show that $k = 4$ **(2)**

(b) Find the equation of the line the passes through A and B. **(3)**

(c) Find the equation of the perpendicular bisector of A and B.
Give your answer in the form $ax + by + c = 0$ **(4)**

(Total for question 4 is 9 marks)

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5 The straight line l has equation $2x - 3y + 24 = 0$ and meets the coordinate axis at the points A and B.

Find the distance of the midpoint of AB from the origin.

Give your answer in the form $k\sqrt{13}$

(Total for question 5 is 4 marks)

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6 The line l_1 has gradient 2 and passes through (5, 7).

(a) Find an equation for l_1 in the form $y = mx + c$

l_2 is perpendicular to l_1 and passes through (0, 1) **(2)**

(b) Find an equation for l_2. **(2)**

(Total for question 6 is 4 marks)

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7 The line l_1 has the equation $5x + 2y - 4 = 0$
The line l_2 has the equation $x - 4y + 1 = 0$

Find the coordinates of the point where l_1 and l_2 intersect.

(Total for question 7 is 3 marks)

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8 The line l_1 has the equation $2x - 3y - 4 = 0$
The line l_2 is perpendicular to l_1 and passes through the point $(4, -1)$

Find an equation for l_2 in the form $ax + by + c = 0$

(Total for question 8 is 5 marks)

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9 The line l passes through the points $A(1, 4)$ and $B(-2, 13)$.

(a) Find an equation for l.

(3)

(b) Find the exact length of AB

(2)

(Total for question 9 is 5 marks)

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10 The line l_1 has gradient 3 and passes through (-2, 5).

(a) Find an equation for l_1 in the form $y = mx + c$

(2)

l_2 is perpendicular to l_1 and passes through (0, 4)

(b) Find an equation for l_2.

(2)

(c) Find the coordinates of the point where l_1 and l_2 intersect.

(3)

(Total for question 10 is 7 marks)

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11 The line l_1 has the equation $5y - 10 = 2x$
The point P with x coordinate 4 lies on l_1.
The line l_2 is perpendicular to l_1 and passes through the point P.

(a) Find an equation for l_2 in the form $ax + by + c = 0$

(4)

The lines l_1 and l_2 cross the x axis at the points Q and R respectively.

(b) Calculate the area of the triangle QPR.

(4)

(Total for question 11 is 8 marks)

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12 Three of the following points lie on the same straight line.

Which point does **not** lie on this line?

Tick **one** box.

(2, -1) ☐

(-2, 11) ☐

(-1, 7) ☐

(1, 2) ☐

(Total for question 12 is 1 mark)

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13 $ABCD$ is a trapezium with point $A(-2, 5)$, point $B(4, 2)$ and point $C(6, -4)$.

AB is parallel to DC
AB is perpendicular to AD

(a) Find the equation of CD **(2)**

(b) Find the coordinates of D. **(3)**

(Total for question 13 is 5 marks)

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14 The point A has the coordinates (-3, -4), point B has the coordinates (7, 2).

Find the equation the perpendicular bisector of AB

(Total for question 14 is 3 marks)

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15 The line l_1 has equation $4y - 3x = 11$

The line l_2 passes through the points (3, 5) and $(-5, -1)$.

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

(Total for question 15 is 4 marks)

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16 The point A has the coordinates (-2, 3), point B has the coordinates (4, -7).

The perpendicular bisector of AB intersects the line $y = 2x + 1$ at the point P.

Find the coordinates of P.

(Total for question 16 is 6 marks)

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17 Points $A(-1, 5)$, $B(1, 1)$, $C(5, 8)$ and $D(7, 4)$ are the vertices of a quadrilateral $ABCD$.

(a) Prove that $ABCD$ is a rectangle. **(4)**

(b) Find the area of $ABCD$. **(2)**

(Total for question 17 is 6 marks)

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18 The line l_1 has equation $2y + 4x + 7 = 0$

The line l_2 has equation $y = mx + 4$, where m is a constant.

Given that l_1 and l_2 are perpendicular.

(a) Find the value of m. **(2)**

(b) Find the coordinates of the point where l_1 and l_2 meet. **(3)**

(Total for question 18 is 5 marks)

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19 In 1960 the life expectancy in the UK was 71 years

In 1975 the life expectancy in the UK was 73 years

Given that x years is the life expectancy n years after 1960.

(a) Using a linear model, form an equation linking x with n. **(3)**

In 2020 the life expectancy in the UK was 81.8 years.

(b) Comment on the suitability of your model in light of this information **(3)**

(Total for question 19 is 6 marks)

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20 In 1960 the life expectancy in the UK was 71 years
In 1975 the life expectancy in the UK was 73 years

Given that x years is the life expectancy n years after 1960.

(a) Using a linear model, form an equation linking x with n. **(3)**

In 2020 the life expectancy in the UK was 81.8 years.

(b) Comment on the suitability of your model in light of this information **(3)**

(Total for question 20 is 6 marks)

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21 Worldwide CO2 emissions in 1990 were 22.5 billion tonnes.
Worldwide CO2 emissions in 2010 were 33.6 billion tonnes.

Given that A billion tonnes is the CO2 emissions n years after 1990.

(a) Using a linear model, form an equation linking A with n. **(3)**

In 2016 worldwide CO2 emissions were 35.7 billion tonnes.

(b) Comment on the suitability of your model in light of this information **(3)**

(Total for question 21 is 6 marks)

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22 Point C has coordinates $(2, c)$ and point D has coordinates $(d, 8)$

The perpendicular bisector of CD has equation $3y + x = 10$

Find c and d.

(Total for question 22 is 5 marks)
