3.1 Coordinate Geometry: Straight Lines: 2-hour Pack

AQA 8365 · Calculator allowed · about 120 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A is the point (-7, -1) and B is the point (7, 6). Find the equation of the perpendicular bisector of AB, in the form y = mx + c.

(Total for Question 1 is 5 marks)

2 A is the point (0, -2) and B is the point (-4, -7). Find the length of AB, giving your answer as a simplified surd, and find the midpoint of AB.

(Total for Question 2 is 4 marks)

3 A line has equation 3x + 6y = -10. Find the equation of the line that is perpendicular to it and passes through (8, -6). Give your answer in the form ax + by = c, where a, b and c are integers.

(Total for Question 3 is 3 marks)

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4 A is the point (4, 5) and B is the point (-6, 0). Find the equation of the perpendicular bisector of AB, in the form $y = mx + c$.

(Total for Question 4 is 5 marks)

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5 A straight line passes through A(-7, 1) and B(-6, -7). Find the equation of the line in the form $y = mx + c$.

(Total for Question 5 is 4 marks)

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6 The points A(4, 2), B(-8, k) and C(8, 4) lie on a straight line. Find the value of k.

(Total for Question 6 is 3 marks)

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7 A is the point (-2, -7) and B is the point (-1, -6). Find the length of AB, giving your answer as a simplified surd, and find the midpoint of AB.

(Total for Question 7 is 4 marks)

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8 The line $2x + 5y = 30$ crosses the x-axis at A and the y-axis at B, and O is the origin. Find the area of triangle OAB.

(Total for Question 8 is 4 marks)

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9 A straight line passes through A(5, -4) and B(3, -8). Find the equation of the line in the form $y = mx + c$.

(Total for Question 9 is 4 marks)

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10 A line has equation $4x - 5y = -19$. Find the equation of the line that is parallel to it and passes through (-4, 4). Give your answer in the form $ax + by = c$, where a, b and c are integers.

(Total for Question 10 is 3 marks)

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11 Find the coordinates of the point of intersection of the lines $y = 2x - 3$ and $y = -x + 9$.

(a) Find the point of intersection. **(3)**

.....

(Total for Question 11 is 3 marks)

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12 A(1, 6) and B(7, -2) are two points. Find the equation of the perpendicular bisector of AB, giving your answer in the form y = mx + c.

(Total for Question 12 is 5 marks)

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13 Two points are given: E(-1, 4) and F(3, 4).

(a) Find the midpoint of EF. **(1)**

.....

(b) Find the length of EF. **(1)**

.....

(Total for Question 13 is 2 marks)

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14 Find the distance between the points C(0, 0) and D(6, 8).

(Total for Question 14 is 1 mark)

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15 Find the equation of the line with gradient 3 that passes through the point (2, 7). Give your answer in the form y = mx + c.

(Total for Question 15 is 2 marks)

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16 Find the equation of the line passing through the points (0, 2) and (4, 14). Give your answer in the form y = mx + c.

(Total for Question 16 is 2 marks)

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17 A circle has centre C(2, -1) and passes through the point Q(5, 3).

(a) Find the radius of the circle. **(2)**

.....

(b) Find the equation of the tangent to the circle at Q, giving your answer in the form $ax + by = c$, where a, b and c are integers. **(4)**

.....

(Total for Question 17 is 6 marks)

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18 Triangle ABC has vertices A(1, 1), B(5, 2) and C(3, 6). Find the area of triangle ABC.

(Total for Question 18 is 4 marks)

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19 Points A(2, 3) and B(14, 15) are given. The point Q lies on the line segment AB such that AQ : QB = 1 : 3.

(a) Find the coordinates of Q. **(3)**

(Total for Question 19 is 3 marks)

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20 The line l has equation $4x + 3y = 25$. The point P has coordinates (12, 9).

(a) Find the gradient of l. **(1)**

(b) Find the equation of the line through P perpendicular to l. **(3)**

(c) Find the coordinates of the point where the perpendicular line from part (b) meets l. **(3)**

(d) Hence find the shortest distance from P to the line l. **(2)**

(Total for Question 20 is 9 marks)

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21 The lines l1: y = 2x + 1, l2: y = -x + 10 and l3: x = 0 (the y-axis) enclose a triangle.

(a) Find the coordinates of the point of intersection of l1 and l2. **(3)**

.....

(b) State the coordinates of the points where l1 and l2 cross l3. **(2)**

(c) Hence find the area of the triangle enclosed by l1, l2 and l3. **(3)**

.....

(Total for Question 21 is 8 marks)

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22 A(0, 0) and B(8, 6) are two points. The perpendicular bisector of AB meets the x-axis at the point C. Find the coordinates of C.

(Total for Question 22 is 5 marks)

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23 A(-3, 1) and B(5, 7) are the endpoints of a diameter of a circle C.

(a) Find the coordinates of the centre of C. **(2)**

.....

(b) Find the radius of C. **(2)**

.....

(c) Determine, with justification, whether the point (6, 2) lies inside, on, or outside circle C. **(3)**

(Total for Question 23 is 7 marks)

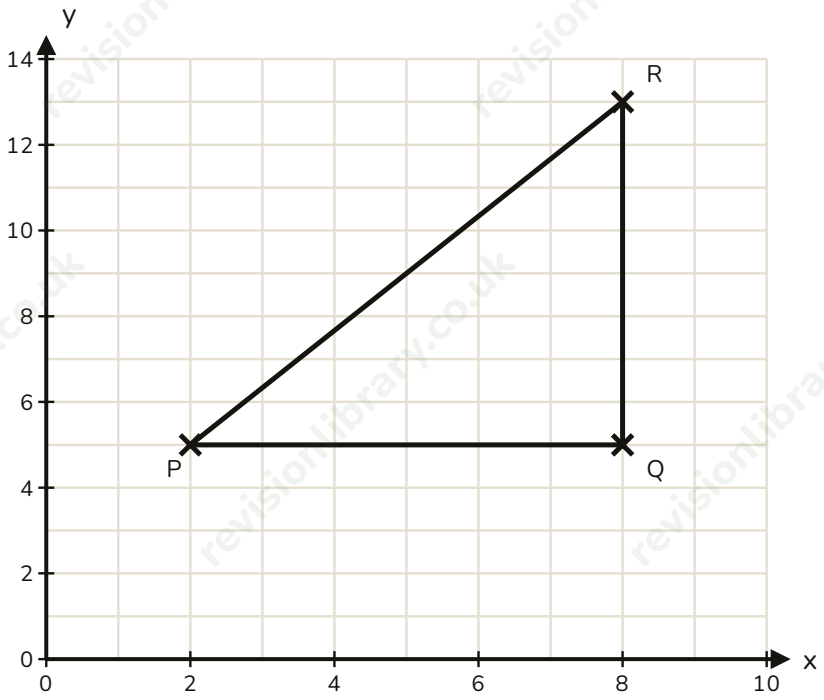
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24 Line L has equation $4x + 2y = 10$. A second line M is perpendicular to L and passes through the point (3, -1). Find the equation of M in the form $y = mx + c$.

(Total for Question 24 is 3 marks)

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25 Points P(2, 5), Q(8, 5) and R(8, 13) form a right-angled triangle, right-angled at Q. Find the length of the hypotenuse PR.



(Total for Question 25 is 3 marks)

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26 The line $y = 2x - 3$ crosses the line $x + y = 12$ at the point T. Find the coordinates of T.

(Total for Question 26 is 3 marks)

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Mark scheme · 3.1 Coordinate Geometry: Straight Lines: 2-hour Pack

Question 1

midpoint (0, 5/2)	**M1**
gradient of AB = 1/2	**M1**
perpendicular gradient -2	**M1**
substitutes the midpoint to find c	**M1**
y = -2x + 5/2 cao	**A1**

Answer: y = -2x + 5/2

Question 2

$(-4)^2 + (-5)^2$	**M1**
AB = $\sqrt{41}$	**A1**
midpoint method	**M1**
(-2, -9/2)	**A1**

Answer: AB = $\sqrt{41}$, midpoint (-2, -9/2)

Question 3

rearranges or finds the gradient of the given line	**M1**
perpendicular direction: coefficients swapped with one sign changed	**M1**
2x - y = 22 oe cao	**A1**

Answer: 2x - y = 22

Question 4

midpoint (-1, 5/2)	**M1**
gradient of AB = 1/2	**M1**
perpendicular gradient -2	**M1**
substitutes the midpoint to find c	**M1**
y = -2x + 1/2 cao	**A1**

Answer: y = -2x + 1/2

Question 5

gradient = (-7 - 1)/(-6 + 7)	**M1**
m = -8	**A1**
substitutes a point to find c	**M1**
y = -8x - 55 cao	**A1**

Answer: y = -8x - 55

Question 6

gradient AC = 1/2	**M1**
gradient AB = gradient AC, or equation of AC found	**M1**
k = -4 cao	**A1**

Answer: k = -4

Question 7

$(1)^2 + (1)^2$	**M1**
AB = $\sqrt{2}$	**A1**
midpoint method	**M1**
(-3/2, -13/2)	**A1**

Answer: AB = $\sqrt{2}$, midpoint (-3/2, -13/2)

Question 8

A(15, 0)	**M1**
B(0, 6)	**M1**
1/2 x base x height	**M1**
45 square units cao	**A1**

Answer: 45

Question 9

gradient = (-8 + 4)/(3 - 5)	**M1**
m = 2	**A1**
substitutes a point to find c	**M1**
y = 2x - 14 cao	**A1**

Answer: y = 2x - 14

Question 10

rearranges or finds the gradient of the given line	**M1**
same coefficients of x and y	**M1**
4x - 5y = -36 oe cao	**A1**

Answer: 4x - 5y = -36

Question 11

(a) 2x - 3 = -x + 9 oe	**M1**
(a) 3x = 12, x = 4	**M1**
(a) (4, 5) cao (both coordinates required)	**A1**

(a) Answer: (4, 5)

Question 12

midpoint of AB = (4, 2) oe	**M1**
gradient AB = (-2-6)/(7-1) = -4/3 oe	**M1**
perpendicular gradient = 3/4	**M1**
y - 2 = 3/4(x - 4) oe	**M1**
y = 0.75x - 1 oe cao	**A1**

Answer: y = 0.75x - 1

Question 13

(a) (1, 4) cao	**B1**

(a) Answer: (1, 4)

(b) 4 cao	**B1**

(b) Answer: 4

Question 14

10 cao	**B1**

Answer: 10

Question 15

uses y - 7 = 3(x - 2) or substitutes into y = 3x + c	**M1**
y = 3x + 1 cao	**A1**

Answer: y = 3x + 1

Question 16

finds the gradient = (14-2)/(4-0) = 3	**M1**
y = 3x + 2 cao	**A1**

Answer: y = 3x + 2

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Question 17

(a) $\sqrt{(5-2)^2 + (3-(-1))^2}$ oe **M1**

(a) 5 cao **A1**

(a) Answer: 5

(b) gradient CQ = 4/3 oe **M1**

(b) perpendicular gradient = -3/4 **M1**

(b) y - 3 = -3/4(x - 5) oe **M1**

(b) 3x + 4y = 27 oe cao **A1**

(b) Answer: 3x + 4y = 27

Question 18

correct use of Area = 1/2 $|x_A(y_B-y_C) + x_B(y_C-y_A) + x_C(y_A-y_B)|$ **M1**

correct substitution: 1/2 |1(2-6) + 5(6-1) + 3(1-2)| **M1**

simplifies to 1/2 |18| **A1**

Area = 9 (units^2) cao **A1**

Answer: 9 square units

Question 19

(a) vector AB = (12, 12) oe **M1**

(a) Q = A + 1/4(vector AB) oe **M1**

(a) (5, 6) cao **A1**

(a) Answer: (5, 6)

Question 20

(a) -4/3 oe **B1**

(a) Answer: -4/3

(b) perpendicular gradient = 3/4, ft from part (a) **M1**

(b) y - 9 = 3/4(x - 12) oe **M1**

(b) y = 0.75x oe cao **A1**

(b) Answer: y = 0.75x

(c) substitute y = 0.75x into 4x + 3y = 25, ft from part (b) **M1**

(c) solve to give x = 4 **M1**

(c) (4, 3) cao **A1**

(c) Answer: (4, 3)

(d) $\sqrt{(12-4)^2 + (9-3)^2}$, dependent on part (c) **dM1**

(d) 10 cao **A1**

(d) Answer: 10

Question 21

(a) 2x + 1 = -x + 10 oe **M1**

(a) 3x = 9, x = 3 **M1**

(a) (3, 7) cao **A1**

(a) Answer: (3, 7)

(b) (0, 1) **B1**

(b) (0, 10) **B1**

(b) Answer: (0, 1) and (0, 10)

(c) base along y-axis = 10 - 1 = 9, ft from part (b) **M1**

(c) Area = 1/2 x 9 x 3 oe, using horizontal distance from y-axis to their part (a) point **M1**

(c) 13.5 (units^2) cao **A1**

(c) Answer: 13.5 square units

Question 22

midpoint AB = (4, 3) oe **M1**

gradient AB = 3/4 oe **M1**

perpendicular gradient = -4/3 **M1**

y - 3 = -4/3(x - 4) oe, set y = 0 and solve **M1**

C = (6.25, 0) oe cao **A1**

Answer: C = (6.25, 0)

Question 23

(a) midpoint formula applied to A and B **M1**

(a) (1, 4) cao **A1**

(a) Answer: (1, 4)

(b) AB = $\sqrt{8^2 + 6^2}$ = 10 oe **M1**

(b) radius = 5 cao **A1**

(b) Answer: 5

(c) distance from centre (1, 4) to (6, 2): $\sqrt{5^2 + (-2)^2}$ oe, ft from part (a) **M1**

(c) $\sqrt{29}$, awrt 5.39 **A1**

(c) since $\sqrt{29}$ > 5 (the radius), the point lies outside C cso **A1**

(c) Answer: Outside C (distance = $\sqrt{29}$, approx 5.39 > radius 5)

Question 24

rearranges L to y = 5 - 2x and identifies its gradient as -2 **M1**

finds the perpendicular gradient 1/2 and uses it with the point (3, -1) **M1**

y = x/2 - 5/2 oe (e.g. y = 0.5x - 2.5) cao **A1**

Answer: y = x/2 - 5/2

Question 25

finds PQ = 6 and QR = 8 (or sets up the distance formula for PR directly) **M1**

applies Pythagoras' theorem or the distance formula: $\sqrt{6^2 + 8^2}$ **M1**

PR = 10 cao **A1**

Answer: PR = 10

Question 26

substitutes y = 2x - 3 into x + y = 12 **M1**

solves the resulting equation to find x = 5, dependent on previous M1 (dM1) **M1**

T = (5, 7) cao **A1**

Answer: T = (5, 7)

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