1.3 Pure: Coordinate Geometry (Lines and Circles): 1-hour Pack

Total Marks

EDEXCEL 9MA0 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A circle has centre (0, 0) and passes through the point (5, 12). Write down the radius of the circle.

(Total for Question 1 is 1 mark)

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2 The points A(1, 5) and B(9, -1) are the endpoints of a diameter of a circle. Find the centre of the circle.

(Total for Question 2 is 2 marks)

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3 A circle has equation $x^2 + y^2 = 36$. Write down the radius of the circle.

(Total for Question 3 is 1 mark)

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4 Find the gradient of the line joining P(-1, 4) and Q(3, -8).

(Total for Question 4 is 1 mark)

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5 A circle has equation $x^2 + y^2 - 6x + 4y - 37 = 0$.

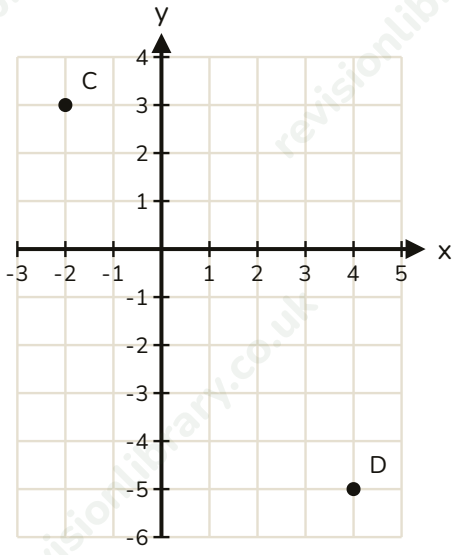
(a) Find the centre and the exact radius of the circle. **(4)**

(b) The line l has equation $y = x + k$, where k is a constant. Given that l is a tangent to the circle, find the two possible values of k. **(6)**

(Total for Question 5 is 10 marks)

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6 The points C(-2, 3) and D(4, -5) are shown on a coordinate grid.



(a) Find the midpoint M of CD. **(2)**

(b) Find the gradient of CD. **(2)**

(c) Find an equation of the perpendicular bisector of CD, giving your answer in the form ax + by + c = 0 where a, b and c are integers. **(3)**

(Total for Question 6 is 7 marks)

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7 A(-1, 6) and B(7, -2) are the endpoints of a diameter of circle C.

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

(b) Find the exact radius of C. **(3)**

(c) Write down an equation of circle C. **(2)**

(Total for Question 7 is 7 marks)

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8 Find an equation of the line through the point (2, -3) with gradient 4, giving your answer in the form y = mx + c.

(Total for Question 8 is 2 marks)

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9 The points C(-3, 4) and D(5, -2) are joined by a straight line. Find an equation of the line CD, giving your answer in the form ax + by + c = 0 where a, b and c are integers.

(Total for Question 9 is 3 marks)

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10 A circle has centre (-1, 3) and passes through the point (4, 15). Find an equation of the circle.

(Total for Question 10 is 3 marks)

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11 The points A(4, -2) and B(-4, 2) are the end points of a diameter of a circle.

(a) Find the coordinates of the centre of the circle and an equation of the circle. **(4)**

(b) Show that the point C(2, 4) lies on the circle. **(2)**

(c) Use gradients to show that angle ACB is a right angle, and state the circle theorem used. **(3)**

(Total for Question 11 is 9 marks)

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12 A circle C has equation $(x-1)^2 + (y-1)^2 = 50$. The line l has equation $y = x + 6$.

(a) State the coordinates of the centre and the exact radius of C. **(2)**

(b) Find the perpendicular distance from the centre of C to the line l. **(3)**

(c) Hence find the length of the chord cut from C by the line l, giving your answer in the form $k\sqrt{2}$ where k is an integer. **(3)**

(Total for Question 12 is 8 marks)

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Mark scheme · 1.3 Pure: Coordinate Geometry (Lines and Circles): 1-hour Pack

Question 1

13 cao **B1**

Answer: 13

Question 2

uses the midpoint formula on A and B **M1**

centre = (5, 2) cao **A1**

Answer: centre = (5, 2)

Question 3

6 cao **B1**

Answer: 6

Question 4

-3 cao **B1**

Answer: -3

Question 5

(a) completes the square on the x terms: $x^2 - 6x = (x-3)^2 - 9$ **M1**

(a) completes the square on the y terms: $y^2 + 4y = (y+2)^2 - 4$ **M1**

(a) centre = (3, -2) **A1**

(a) radius = $\sqrt{50} = 5\sqrt{2}$, exact **A1**

(a) Answer: Centre (3, -2), radius $5\sqrt{2}$

(b) substitutes $y = x + k$ into $(x-3)^2 + (y+2)^2 = 50$ **M1**

(b) forms the correct quadratic in x: $2x^2 + (2k-2)x + (k^2+4k-37) = 0$ **A1**

(b) uses the tangency condition $b^2 - 4ac = 0$ **M1**

(b) simplifies to $k^2 + 10k - 75 = 0$ oe **A1**

(b) k = 5 **A1**

(b) k = -15 **A1**

(b) Answer: k = 5 or k = -15

Question 6

(a) uses ((x1+x2)/2, (y1+y2)/2) **M1**

(a) M = (1, -1) cao **A1**

(a) Answer: M = (1, -1)

(b) uses (-5 - 3)/(4 - (-2)) **M1**

(b) gradient = -4/3 cao **A1**

(b) Answer: Gradient = -4/3

(c) uses perpendicular gradient = 3/4 (negative reciprocal of -4/3) **M1**

(c) forms y - (-1) = (3/4)(x - 1) using M = (1, -1) **M1**

(c) 3x - 4y - 7 = 0 oe with integer coefficients, cao **A1**

(c) Answer: 3x - 4y - 7 = 0

Question 7

(a) uses the midpoint formula on A and B **M1**

(a) centre = (3, 2) cao **A1**

(a) Answer: Centre = (3, 2)

(b) finds length AB = $\sqrt{(7-(-1))^2 + (-2-6)^2}$ **M1**

(b) halves AB to obtain the radius **M1**

(b) radius = $4\sqrt{2}$ exact, oe $\sqrt{32}$ **A1**

(b) Answer: radius = $4\sqrt{2}$

(c) uses centre (3,2) and $r^2 = (4\sqrt{2})^2 = 32$ **M1**

(c) $(x-3)^2 + (y-2)^2 = 32$ cao **A1**

(c) Answer: $(x-3)^2 + (y-2)^2 = 32$

Question 8

uses y - (-3) = 4(x - 2) or substitutes (2,-3) into y = 4x + c **M1**

y = 4x - 11 cao **A1**

Answer: y = 4x - 11

Question 9

finds gradient CD = (-2-4)/(5-(-3)) = -3/4 **M1**

forms y - 4 = -3/4(x + 3) using point C (or point D) **M1**

3x + 4y - 7 = 0 oe with integer coefficients, cao **A1**

Answer: 3x + 4y - 7 = 0

Question 10

uses $r^2 = (4-(-1))^2 + (15-3)^2$ **M1**

$r^2 = 169$ (r = 13) **A1**

$(x+1)^2 + (y-3)^2 = 169$ cao **A1**

Answer: $(x + 1)^2 + (y - 3)^2 = 169$

Question 11

(a) midpoint of AB **M1**

(a) centre (0, 0) **A1**

(a) radius squared = $(4)^2 + (-2)^2$ using the distance from the centre to A **M1**

(a) $x^2 + y^2 = 20$ **A1**

(a) Answer: $x^2 + y^2 = 20$

(b) substitutes C into the equation: $(2)^2 + (4)^2$ **M1**

(b) 4 + 16 = 20 (cso) **A1**

(b) Answer: C lies on the circle

(c) gradient AC = -3 and gradient BC = 1/3 **M1**

(c) product of gradients = -3 x 1/3 = -1, so AC is perpendicular to BC **A1**

(c) the angle in a semicircle is a right angle **B1**

(c) Answer: angle ACB = 90 degrees

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Question 12

(a) centre = (1, 1) **B1**

(a) radius = $\sqrt{50} = 5\sqrt{2}$, exact **B1**

(a) Answer: Centre (1, 1), radius $5\sqrt{2}$

(b) rearranges l into the form x - y + 6 = 0, or finds the perpendicular to l through the centre, y = -x + 2 **M1**

(b) applies distance = $|1 - 1 + 6| / \sqrt{1^2 + (-1)^2}$, or solves y = -x + 2 with y = x + 6 for the foot (-2, 4) and finds its distance from (1, 1) **M1**

(b) distance = $3\sqrt{2}$ exact, oe awrt 4.24 **A1**

(b) Answer: Distance = $3\sqrt{2}$ (awrt 4.24)

(c) uses $r^2 - d^2 = 50 - 18 = 32$ **M1**

(c) takes the square root and doubles: $2\sqrt{32}$ **M1**

(c) chord length = $8\sqrt{2}$ cao **A1**

(c) Answer: Chord length = $8\sqrt{2}$

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