3.2 Coordinate Geometry of the Circle: 1-hour Pack

AQA 8365 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A circle has equation $x^2 + y^2 - 6x - 12y - 55 = 0$. Find the coordinates of the centre and the radius of the circle.

(Total for Question 1 is 4 marks)

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2 The point P(6, 4) lies on the circle $(x + 2)^2 + (y + 2)^2 = 100$. Find the equation of the tangent to the circle at P. Give your answer in the form $ax + by = c$, where a, b and c are integers.

(Total for Question 2 is 4 marks)

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3 A(3, 5) and B(-3, 3) are the end points of a diameter of a circle. Find the equation of the circle.

(Total for Question 3 is 4 marks)

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4 A circle has equation $(x - 6)^2 + (y + 2)^2 = 20$. Is the point P(3, -2) inside the circle, on the circle or outside the circle? You must show your working.

(Total for Question 4 is 3 marks)

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5 A circle has equation $(x - 5)^2 + (y + 3)^2 = 100$. The line $x = -1$ cuts the circle at two points, P and Q. Find the length of PQ.

(Total for Question 5 is 4 marks)

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6 A circle has equation $x^2 + y^2 - 8x - 6y + 16 = 0$. Find the coordinates of the centre and the radius of the circle.

(Total for Question 6 is 4 marks)

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7 Write down the equation of the circle with centre (1, 2) and radius $\sqrt{5}$.

(Total for Question 7 is 2 marks)

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8 A circle has centre (2, 4) and passes through the point (-4, 2). Find the equation of the circle.

(Total for Question 8 is 3 marks)

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9 The point P(1, 7) lies on the circle $(x + 1)^2 + (y + 4)^2 = 125$. Find the equation of the tangent to the circle at P. Give your answer in the form $ax + by = c$, where a, b and c are integers.

(Total for Question 9 is 4 marks)

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10 A circle has equation $x^2 + y^2 = 25$. The line with equation $y = x - 1$ intersects the circle at two points.

(a) Find the coordinates of the two points of intersection. **(5)**

(b) Calculate the distance between the two points of intersection, giving your answer as a surd in its simplest form. **(3)**

(Total for Question 10 is 8 marks)

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11 A circle has equation $x^2 + y^2 = 10$. A line has equation $y = 3x - 10$.

(a) Show that the line is a tangent to the circle. **(4)**

(b) Find the coordinates of the point of contact. **(2)**

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(Total for Question 11 is 6 marks)

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12 A circle has equation $(x - 5)^2 + (y + 2)^2 = 49$. Exactly one of the following points lies outside the circle. Determine which one, showing your working.

(a) Which point lies outside the circle? **(2)**

- ☐ A) (10, 2)
- ☐ B) (1, -6)
- ☐ C) (5, 4)
- ☐ D) (-3, -2)

(Total for Question 12 is 2 marks)

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13 A circle has equation $x^2 + y^2 = 289$. Find the equation of the tangent to the circle at the point (8, 15), giving your answer in the form $ax + by = c$.

(Total for Question 13 is 4 marks)

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Mark scheme · 3.2 Coordinate Geometry of the Circle: 1-hour Pack

Question 1

completes the square for x	**M1**
completes the square for y	**M1**
centre (3, 6)	**A1**
radius 10	**A1**

Answer: centre (3, 6), radius 10

Question 2

gradient of radius = 3/4	**M1**
tangent gradient is the negative reciprocal	**M1**
substitutes P into the equation of a line	**M1**
4x + 3y = 36 oe cao	**A1**

Answer: 4x + 3y = 36

Question 3

centre = midpoint = (0, 4)	**M1**
radius^2 from a distance calculation	**M1**
radius^2 = 10	**A1**
$x^2 + (y - 4)^2 = 10$ oe cao	**A1**

Answer: $x^2 + (y - 4)^2 = 10$

Question 4

substitutes: $(3 - 6)^2 + (-2 + 2)^2$	**M1**
9 found	**A1**
compares 9 with 20: P is inside the circle	**B1**

Answer: inside

Question 5

substitutes x = -1 into the circle equation	**M1**
solves to find the two y values or uses a right-angled triangle	**M1**
half chord = 8	**A1**
16 cao	**A1**

Answer: 16

Question 6

completes the square for x	**M1**
completes the square for y	**M1**
centre (4, 3)	**A1**
radius 3	**A1**

Answer: centre (4, 3), radius 3

Question 7

$(x - a)^2 + (y - b)^2 = r^2$ with the centre correct	**M1**
$(x - 1)^2 + (y - 2)^2 = 5$ oe cao	**A1**

Answer: $(x - 1)^2 + (y - 2)^2 = 5$

Question 8

$r^2 = (-4 - 2)^2 + (2 - 4)^2$ or equivalent	**M1**
$r^2 = 40$	**A1**
$(x - 2)^2 + (y - 4)^2 = 40$ oe cao	**A1**

Answer: $(x - 2)^2 + (y - 4)^2 = 40$

Question 9

gradient of radius = 11/2	**M1**
tangent gradient is the negative reciprocal	**M1**
substitutes P into the equation of a line	**M1**
2x + 11y = 79 oe cao	**A1**

Answer: 2x + 11y = 79

Question 10

(a) substitutes to get $x^2 + (x-1)^2 = 25$	**M1**
(a) rearranges to $2x^2 - 2x - 24 = 0$, i.e. $x^2 - x - 12 = 0$	**M1**
(a) factorises (x-4)(x+3) = 0 or uses quadratic formula	**M1**
(a) x = 4 or x = -3	**A1**
(a) (4, 3) and (-3, -4) cao	**A1**

(a) Answer: (4, 3) and (-3, -4)

(b) uses distance = $\sqrt{(4-(-3))^2 + (3-(-4))^2}$ ft their coordinates	**M1**
(b) = $\sqrt{49 + 49}$ = $\sqrt{98}$	**M1**
(b) $7\sqrt{2}$ cao	**A1**

(b) Answer: $7\sqrt{2}$

Question 11

(a) substitutes to get $x^2 + (3x-10)^2 = 10$	**M1**
(a) rearranges to $10x^2 - 60x + 90 = 0$, i.e. $x^2 - 6x + 9 = 0$	**M1**
(a) recognises $(x-3)^2 = 0$ or shows discriminant $b^2-4ac = 36 - 36 = 0$	**M1**
(a) discriminant = 0 (or repeated root x = 3), so the line meets the circle at exactly one point and is a tangent, cso	**A1**

(a) Answer: Discriminant = 0, so the line is a tangent to the circle

(b) uses x = 3 (repeated root) to find y = 3(3) - 10, ft their x	**M1**
(b) (3, -1) cao	**A1**

(b) Answer: (3, -1)

Question 12

(a) calculates $(x-5)^2 + (y+2)^2$ for at least two of the given points	**M1**
(a) D, since $(-3-5)^2 + (-2+2)^2 = 64 > 49$, cao	**A1**

(a) Answer: D

Question 13

finds the gradient of the radius to (8, 15) as 15/8	**M1**
finds the perpendicular (tangent) gradient as -8/15	**M1**
forms the tangent equation using y - 15 = -(8/15)(x - 8), dependent on both previous marks (dM1)	**M1**
8x + 15y = 289 oe cao	**A1**

Answer: 8x + 15y = 289

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