HIGHER ONLY

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Name ..... Class .....

A16: Equation of a circle

Reason with circles centred at the origin and their tangents

20 marks · 25 minutes · Non-calculator

1) Show that (5, 12) lies on the circle $x^2 + y^2 = 169$

[Question 1: 2 marks]

2) Explain why the circle $x^2 + y^2 = 25$ has radius 5, not 25

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[Question 2: 1 marks]

3) Show that $(3, 4)$ lies on $x^2 + y^2 = 25$ and that the tangent at $(3, 4)$ is $3x + 4y = 25$

[Question 3: 4 marks]

4) Is $(6, 6)$ inside the circle $x^2 + y^2 = 64$? Explain.

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[Question 4: 2 marks]

5) Explain how we know that a tangent is perpendicular to the radius at the point of contact.

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[Question 5: 1 marks]

6) Kim says the tangent to $x^2 + y^2 = 10$ at $(1, 3)$ has gradient 3. Explain her mistake.

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[Question 6: 2 marks]

7) Show that the line $y = 7$ does not meet the circle $x^2 + y^2 = 36$

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[Question 7: 2 marks]

8) Show that the line $y = x + 1$ meets the circle $x^2 + y^2 = 13$ at $(2, 3)$ and $(-3, -2)$

[Question 8: 3 marks]

9) A circle has centre $(0, 0)$ and passes through $(-8, 6)$. Show that its equation is $x^2 + y^2 = 100$

[Question 9: 2 marks]

10) How many points does the line $y = 5$ share with $x^2 + y^2 = 25$? Explain.

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[Question 10: 1 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	Shown	$25 + 144 = 169$ (M1); C1.
2	Explanation	The equation is $x^2 + y^2 = r^2$ (C1).
3	Shown	$9 + 16 = 25$ (B1); radius gradient $\frac{4}{3}$ (M1); tangent gradient $-\frac{3}{4}$ (M1); equation (C1).
4	Outside	$36 + 36 = 72 > 64$ (M1); C1.
5	Explanation	Circle theorem: tangent meets the radius at 90° (C1).
6	$-\frac{1}{3}$	3 is the radius gradient (C1); tangent is the negative reciprocal (B1).
7	Shown	$x^2 = -13$ has no solution, or 7 is more than the radius 6 (M1); C1.
8	Shown	$x^2 + (x + 1)^2 = 13$ (M1); $x^2 + x - 6 = 0$ (M1); C1.
9	Shown	$64 + 36$ (M1); C1.
10	One	It is a tangent at $(0, 5)$ (C1).