EXCEL IN MATHSCI
HIGHER MATHEMATICS • TOPIC RESOURCE

2026–27
Portfolio 10

Circle

PUPIL WORKSHEET

Skills covered: Circle equations; completing the square; diameter; point location; equations with no real circle; line–circle intersections; tangent equations; circle geometry.

Instructions: Attempt all questions. Show sufficient working to justify your answers. Give exact values unless a degree of accuracy is stated. Each section is separate for targeted revision.

Prerequisite core skills revise earlier learning; *topic practice* develops individual techniques; *exam-style and challenge* combines skills.

Pupil: _____ **Date:** _____

SECTION A | Prerequisite core skills

Question 1

[2 marks]

Find the equation of the circle with centre $(-2, 3)$ and radius 5.

Question 2

[4 marks]

Find the centre and radius of $x^2 + y^2 - 6x + 4y - 12 = 0$.

Question 3

[4 marks]

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

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Question 4

[3 marks]

For the circle $(x-1)^2+(y-2)^2=9$, state whether $P(4,2)$ and $Q(1,7)$ are inside, on, or outside the circle.

Question 5

[3 marks]

Explain why $x^2+y^2+4x-2y+10=0$ does not represent a real circle.

Question 6

[2 marks]

Find the points at which $x^2+y^2=16$ intersects the x-axis.

SECTION B | Topic practice

Question 7

[3 marks]

Find the points of intersection of $(x-1)^2+(y+2)^2=20$ and the line $y=0$.

Question 8

[4 marks]

A circle has equation $x^2+y^2-4x-6y+9=0$. Find its points of intersection with $y=3$.

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Question 9

[4 marks]

Find the equation of the tangent to $x^2 + y^2 = 25$ at $P(3, 4)$.

Question 10

[4 marks]

The line $y = mx + 5$ is tangent to $x^2 + y^2 = 25$. Find m.

Question 11

[5 marks]

Two identical circles with centres $C_1(1, 2)$ and $C_2(7, 2)$ touch externally. Find their radius, point of contact, and both equations.

Question 12

[5 marks]

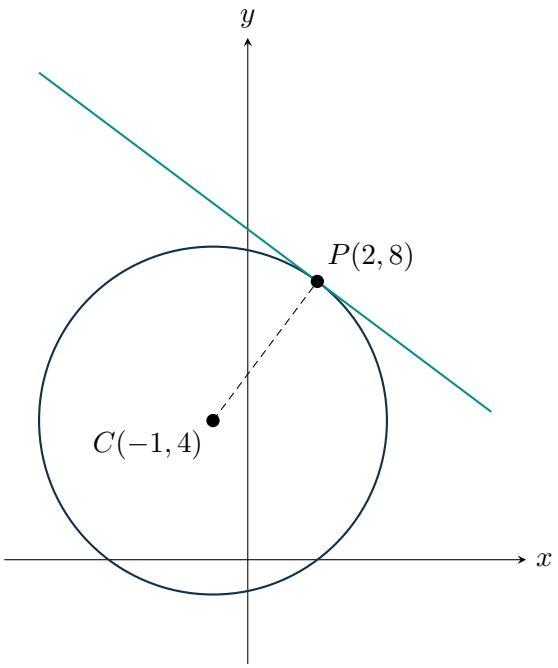
Find the values of k for which $y = x + k$ is tangent to $(x - 1)^2 + (y + 2)^2 = 8$.

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Question 13

[4 marks]

The diagram shows a circle with centre $C(-1, 4)$ and the point $P(2, 8)$ on its circumference. Find the equation of the tangent at P.



Question 14

[5 marks]

Find the exact coordinates of the points where the line $y = 2x + 5$ meets the circle $(x + 2)^2 + (y - 1)^2 = 25$.

SECTION C | Exam-style and challenge

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Question 15 [5 marks]

The circle $x^2 + y^2 - 2x + 4y + k = 0$ is tangent to the line $y = 3$. Find k.

Question 16 [6 marks]

Find the exact points of intersection of $(x-1)^2 + (y-1)^2 = 10$ and $(x-5)^2 + (y-1)^2 = 10$.

Question 17 [5 marks]

A circle passes through $A(0,0)$, $B(4,0)$ and $C(0,6)$. Find its equation.

Question 18 [6 marks]

From $P(8,0)$, two tangents are drawn to $x^2 + y^2 = 16$. Find their points of contact and equations.

— End of pupil worksheet —

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