

GCSE Maths: The equation of a circle and tangents (Higher): answers

GCSE Maths - Functions and Advanced Graphs - Higher - Lesson 25.7

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch25-functions-advanced-graphs/higher/the-equation-of-a-circle-and-tangents/

Exercise 25G Circles and tangents Non-calculator

1 Write down the equation of the circle with centre (0, 0) and radius

(a) 3

Answer: $x^2 + y^2 = 9$

(b) 6

Answer: $x^2 + y^2 = 36$

(c) 10

Answer: $x^2 + y^2 = 100$

(d) 2.5

Answer: $x^2 + y^2 = 6.25$

2 Write down the radius of each circle. Give surds in their simplest form.

(a) $x^2 + y^2 = 49$

Answer: 7

(b) $x^2 + y^2 = 100$

Answer: 10

(c) $x^2 + y^2 = 2.25$

Answer: $\frac{3}{2}$

(d) $x^2 + y^2 = 20$

Answer: $2\sqrt{5}$

3 State whether each point is inside, outside or on the circle $x^2 + y^2 = 25$.

(a) (3, 4)

Answer: on

(b) (-5, 0)

Answer: on

(c) (2, 3)

Answer: inside

(d) (4, 4)

Answer: outside

4 Each point is on the given circle. Work out the missing coordinate. (There may be two answers.)

(a) $x^2 + y^2 = 25$, the point ($x = 3$, $y = ?$)

Answer: $y = 4$ or $y = -4$

(b) $x^2 + y^2 = 25$, the point ($x = -4$, $y = ?$)

Answer: $y = 3$ or $y = -3$

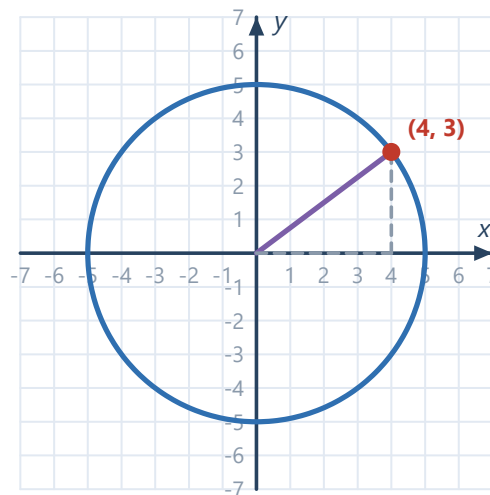
(c) $x^2 + y^2 = 13$, the point ($x = 2$, $y = ?$)

Answer: $y = 3$ or $y = -3$

(d) $x^2 + y^2 = 20$, the point ($x = 2$, $y = ?$)

Answer: $y = 4$ or $y = -4$

5 The diagram shows a circle with centre (0, 0) passing through (4, 3). Write down the equation of the circle.



Answer: $x^2 + y^2 = 25$

6 Find the equation of the tangent to the circle at the given point. Write your answer in the form $y = mx + c$.

(a) $x^2 + y^2 = 25$ at (3, 4)

Answer: $y = -\frac{3x}{4} + \frac{25}{4}$

(b) $x^2 + y^2 = 25$ at (-4, 3)

Answer: $y = \frac{4x}{3} + \frac{25}{3}$

(c) $x^2 + y^2 = 169$ at (5, 12)

Answer: $y = -\frac{5x}{12} + \frac{169}{12}$

(d) $x^2 + y^2 = 100$ at $(-6, -8)$

Answer: $y = -\frac{3x}{4} - \frac{25}{2}$

7 Find the equation of the tangent to the circle at the given point.

(a) $x^2 + y^2 = 49$ at $(7, 0)$

Answer: $x = 7$

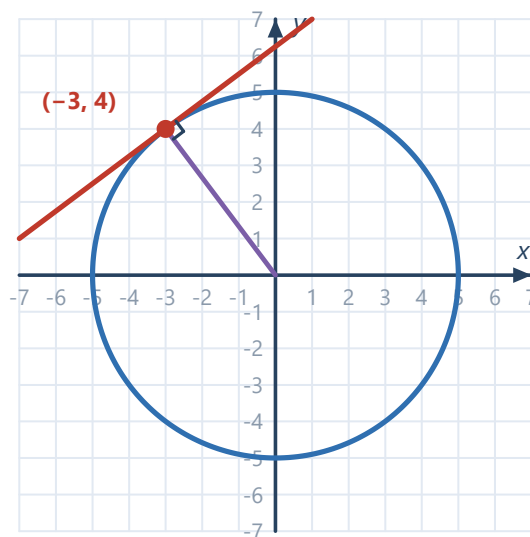
(b) $x^2 + y^2 = 36$ at $(0, -6)$

Answer: $y = -6$

(c) $x^2 + y^2 = 64$ at $(-8, 0)$

Answer: $x = -8$

8 The diagram shows the circle $x^2 + y^2 = 25$ and a tangent at $P(-3, 4)$. Find the equation of the tangent.



Answer: $y = \frac{3x}{4} + \frac{25}{4}$

9 The tangent to $x^2 + y^2 = r^2$ at the point shown meets the axes at two points. Find the area of the triangle formed by the tangent and the two axes.

(a) $x^2 + y^2 = 25$, tangent at $(3, 4)$

Answer: $\frac{625}{24}$

(b) $x^2 + y^2 = 100$, tangent at $(6, 8)$

Answer: $\frac{625}{6}$

10 Show that each line is a tangent to the circle $x^2 + y^2 = r^2$, by substituting and showing that there is only one solution.

(a) $3x + 4y = 25$ and $x^2 + y^2 = 25$

Answer: Tangent (one repeated solution)

(b) $4x + 3y = 25$ and $x^2 + y^2 = 25$

Answer: Tangent (one repeated solution)

(c) $5x + 12y = 169$ and $x^2 + y^2 = 169$

Answer: Tangent (one repeated solution)

- 11 A circular pond has its centre at the origin and a radius of 8 m. Distances are in metres from the centre, with x east and y north.

(a) Is a tree at (5, 6) inside the pond?

Answer: inside

(b) A straight path touches the pond at (4.8, 6.4). Find the equation of the line of the path.

Answer: $y = -\frac{3x}{4} + 10$

- 12 A radio mast at the origin has a range of 10 km. Distances are in kilometres. Is each town within range (inside or on the edge)?

(a) Town at (6, 8)

Answer: on

(b) Town at (7, 7)

Answer: inside

(c) Town at (-9, 4)

Answer: inside

- 13 Show that the point $(\sqrt{7}, 3)$ lies on the circle $x^2 + y^2 = 16$.

Answer: $7 + 9 = 16$

- 14 AB is a diameter of the circle $x^2 + y^2 = 25$, where A is (3, 4) and B is (-3, -4). Show that the tangents at A and B are parallel.

Answer: Both tangents have gradient $-3/4$

- 15 Dev says: "The tangent to $x^2 + y^2 = 25$ at (3, 4) has gradient $4/3$, because the gradient is $y \div x$." Explain his mistake and give the correct gradient.

Answer: Gradient $-3/4$

- 16 Find the equation of the tangent to the circle $x^2 + y^2 = 20$ at the point (4, 2).

Answer: $y = -2x + 10$

- 17 The tangent to the circle $x^2 + y^2 = 25$ has gradient $-3/4$ at two points on the circle. Find the coordinates of both points.

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

- 18 The tangents to $x^2 + y^2 = 25$ at (3, 4) and at (4, 3) meet at a point T. Find the coordinates of T.

Answer: $T = (25/7, 25/7)$

© Websink Prep UK. Free for classroom and home use; please do not resell. websink.site