

The equation of a circle

About 45 minutes Calculator allowed 48 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/gcse-the-equation-of-a-circle/

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 15 [2 marks]
- An isosceles triangle has two sides of 30 cm and a base of 36 cm. Find its area.
- Solve $4x + 2y = 20$ and $3x + y = 17$.

Answer

Answer

- A3** From chapter 21 [2 marks] **A4** From chapter 22 [2 marks]
- y is directly proportional to the square root of x . When $x = 25$, $y = 35$. Find y when $x = 64$.
- In triangle ABC , $BA = 21$ cm, $BC = 16$ cm and angle $ABC = 60^\circ$. Find the length AC .

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

A circle has centre O and passes through $(6, -11)$. Find its equation and its radius, to 1 d.p.

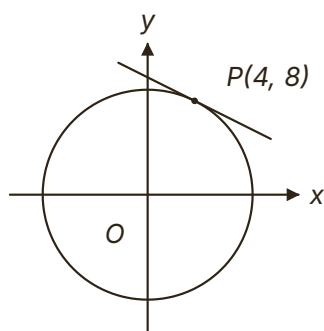
Hint r^2 is the square of the distance from O to the point.

- B1** A circle has centre O and passes through $(-8, 13)$. Find its equation and its radius, to 1 d.p. [3 marks]

Answer

EXAMPLE 2

$P(4, 8)$ lies on the circle $x^2 + y^2 = 80$. Find the equation of the tangent at P .

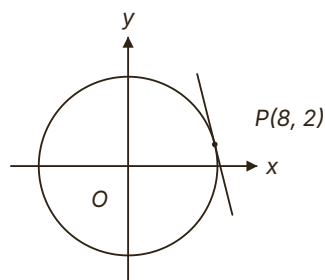


Not drawn accurately

Hint The tangent is perpendicular to the radius OP .

B2 $P(8, 2)$ lies on the circle [3 marks]

$x^2 + y^2 = 68$. Find the equation of the tangent at P .



Not drawn accurately

Answer

c Practice

C1 Is the point $(7, -8)$ inside, on or outside the circle $x^2 + y^2 = 110$? [2 marks]
Show how you decide.

Answer

C3 Find the radius of the circle [2 marks]
 $x^2 + y^2 = 63$. Give your answer in the form $a\sqrt{b}$.

Answer

C5 How many points with whole-number coordinates lie on the circle $x^2 + y^2 = 53$? [2 marks]

Answer

C2 The point $(p, 9)$ lies on the circle [2 marks]
 $x^2 + y^2 = 130$, and p is negative.
Find p .

Answer

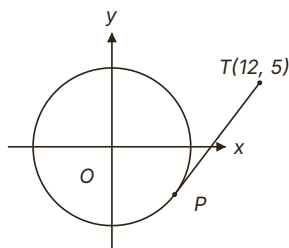
C4 The point $(k, 3k)$ lies on the [2 marks]
circle $x^2 + y^2 = 160$, and $k > 0$.
Find k .

Answer

C6 $A(-5, 8)$ and $B(5, -8)$ are the [2 marks]
ends of a diameter of a circle.
Find the equation of the circle.

Answer

- C7** $T(12, 5)$ is outside the circle $x^2 + y^2 = 58$. A tangent from T touches the circle at P . Find TP , to 1 d.p. [3 marks]



Not drawn accurately

- C8** Find the exact circumference of the circle $x^2 + y^2 = 48$. Give your answer in the form $k\sqrt{3}\pi$. [2 marks]

Answer

Answer

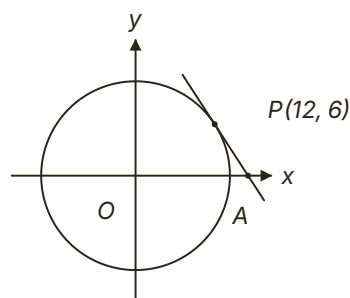
D Exam-style questions

- D1** $P(8, 9)$ lies on the circle $x^2 + y^2 = 145$. Dan says, "The tangent to the circle at P has gradient $\frac{9}{8}$." [3 marks]

Explain why Dan is wrong. Find the equation of the tangent in the form $ax + by = c$, where a , b and c are integers.

Answer

- D2** The point $P(12, 6)$ and the circle $x^2 + y^2 = 180$. The tangent at P meets the x -axis at A .



Not drawn accurately

- (a) Show that P lies on the circle. [1 mark]

Answer

- (b) Find the equation of the tangent at P , in the form $y = mx + c$. [3 marks]

Answer

(c) Work out the area of triangle OPA .

[2 marks]

Answer

Total for D2: 6 marks

- D3** The line L has gradient -3 and is a tangent to the circle $x^2 + y^2 = 250$. Find the two possible equations of L . [4 marks]

Answer

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** The line $3x + 4y = 100$ is a tangent to a circle with centre O . Find the equation of the circle and the point where the line touches it. [4 marks]

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The radius to the touching point is perpendicular to the line.
Hint 2 So the radius lies on the line $y = \frac{4}{3}x$.
Hint 3 Solve $y = \frac{4}{3}x$ with $3x + 4y = 100$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can use $x^2 + y^2 = r^2$. ☐ ☐ ☒
- I can tell if a point is inside or outside. ☐ ☐ ☒
- I can find a tangent to a circle. ☐ ☐ ☒