Name:

Level 2 Further Maths

Equation of a Tangent to a Circle

Corbettmaths

Ensure you have: Pencil or pen

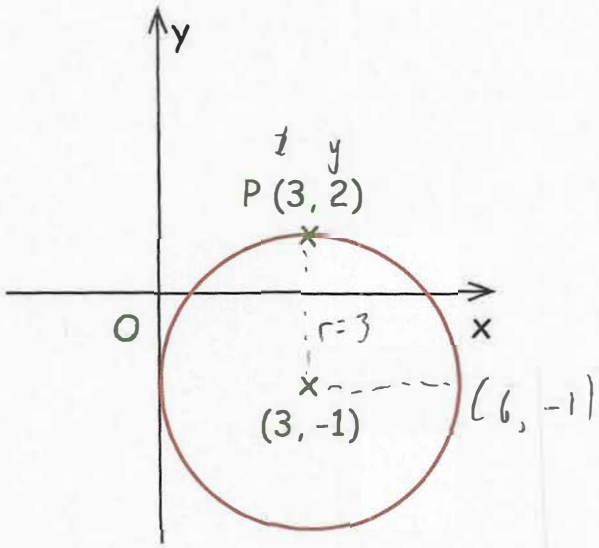
Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/

1. The diagram shows the circle with equation $(x-3)^2+(y+1)^2=9$



The point P has coordinates (3, 2)

(a) Write down the equation of the tangent to the circle at the point P

$y=2$

(1)

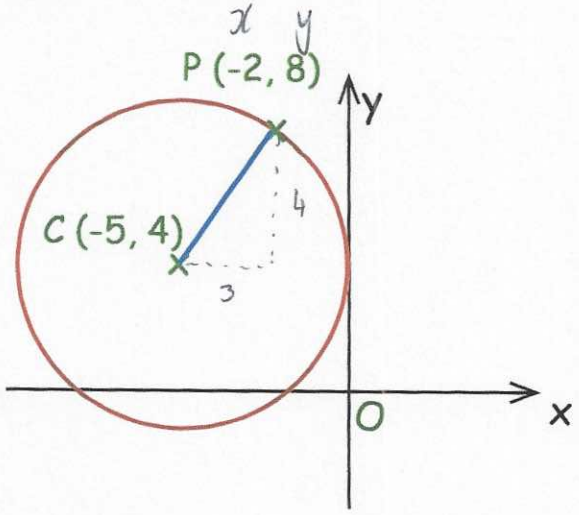
The equation of the tangent to the circle at the point Q is $x=6$

(b) Write down the coordinates of the point Q

$(6, -1)$

(1)

2. The diagram shows the circle, centre C, with equation $(x + 5)^2 + (y - 4)^2 = 25$ with a tangent at the point (–2, 8)



(a) Find the gradient of the line CP

$\frac{4}{3}$

.....

(1)

(b) Find the gradient of the tangent

$-\frac{3}{4}$

.....

(1)

(c) Find the equation of the tangent

$y = -\frac{3}{4}x + c$

$8 = \frac{6}{4} + c$

$c = 6.5$

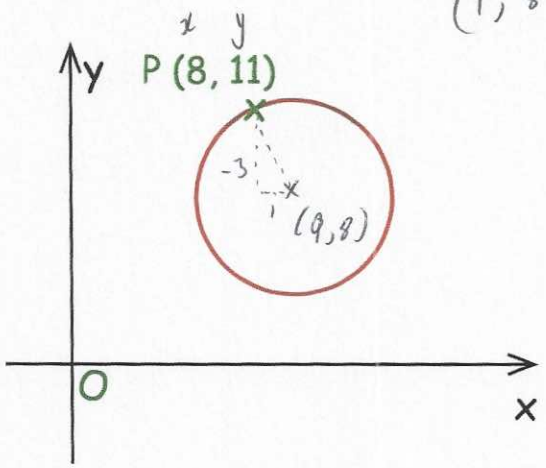
$y = -\frac{3}{4}x + 6\frac{1}{2}$

.....

(2)

3. The diagram shows the circle with equation $(x-9)^2+(y-8)^2=10$ with a tangent at the point (8, 11)

(9, 8)



Find the equation of the tangent to the circle at P

$y = \frac{1}{3}x + c$

$y = \frac{8}{3} + c$

$11 = \frac{8}{3} + c$

$c = \frac{25}{3}$

$y = \frac{1}{3}x + \frac{25}{3}$

(5)

4. The line l is a tangent to the circle $(x + 2)^2 + (y + 1)^2 = 20$ at the point P.
P is the point (−6, 1)
x_1 y_1

Work out the equation of the line l

C (−2, −1)
x_2 y_2

gradient of CP

$m = \frac{-1-1}{-2--6} = \frac{-2}{4} = -\frac{1}{2}$

gradient of l = 2

$y = 2x + c$

$1 = -12 + c$

$c = 13$

$y = 2x + 13$

(5)

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5. The line l is a tangent to the circle $(x - 5)^2 + (y + 12)^2 = 61$ at the point P.
P is the point (10, −6)
x_1 y_1

Work out the equation of the line l

C (5, −12)
x_2 y_2

gradient of CP

$m = \frac{-12--6}{5-10} = \frac{-6}{-5} = \frac{6}{5}$

gradient of l = $-\frac{5}{6}$

$y = -\frac{5}{6}x + c$

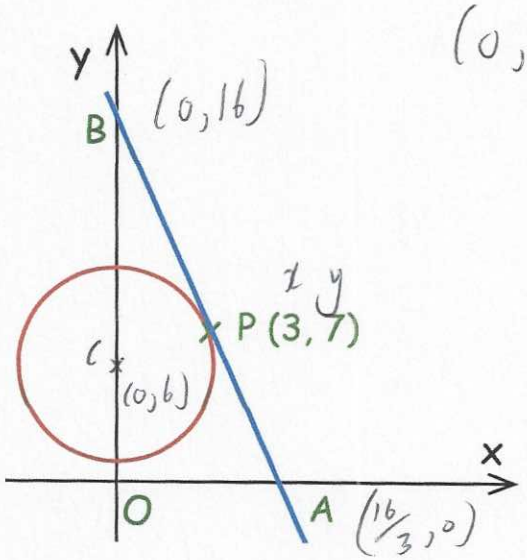
$-6 = -\frac{50}{6} + c$

$c = \frac{7}{3}$

$y = -\frac{5}{6}x + \frac{7}{3}$

(5)

6. Shown below is the circle with equation $x^2 + (y-6)^2 = 10$



The line AB is a tangent to the circle at the point P (3, 7)

Find the area of triangle OAB.

gradient of CP $= \frac{1}{3}$

gradient of AB $= -3$

$y = -3x + c$

$7 = -9 + c$

$c = 16$

AB $y = -3x + 16$

A $0 = -3x + 16$

$3x = 16$

$x = \frac{16}{3}$ $A(\frac{16}{3}, 0)$

B $(0, 16)$

Area of OAB

$\frac{1}{2} \times \frac{16}{3} \times 16$

$= \frac{128}{3}$

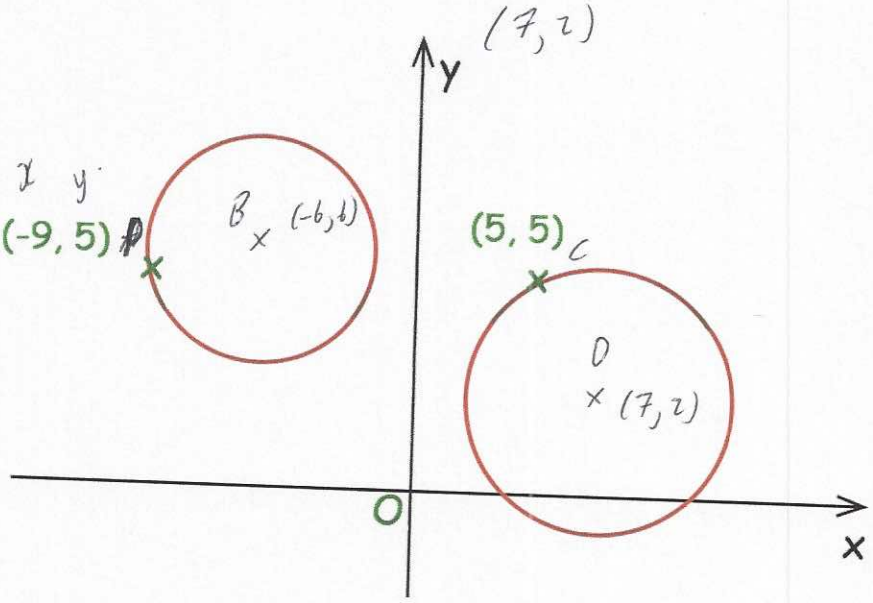
.....

(6)

7. Shown below are two circles. (-6, 6)

Circle 1 has equation $(x + 6)^2 + (y - 6)^2 = 10$

Circle 2 has equation $(x - 7)^2 + (y - 2)^2 = 13$



The line l_1 is a tangent to Circle 1 at the point (−9, 5)
The line l_2 is a tangent to Circle 2 at the point (5, 5)

The lines l_1 and l_2 intersect at the point A.

Find the coordinates of the point A.

Circle 1

gradient of PB $= \frac{1}{3}$

gradient of $l_1 = -3$

$y = -3x + c$

$5 = -3 \times -9 + c$

$5 = 27 + c$

$c = -22$

$y = -3x - 22$

Circle 2

gradient of CD $= -\frac{3}{2}$

gradient of $l_2 = \frac{2}{3}$

$y = \frac{2}{3}x + c$

$5 = \frac{10}{3} + c$

$c = \frac{5}{3}$

$y = \frac{2}{3}x + \frac{5}{3}$

$-3x - 22 = \frac{2}{3}x + \frac{5}{3}$

$-9x - 66 = 2x + 5$

$-11x = 71$

$x = -\frac{71}{11}$

$\left(-\frac{71}{11}, -\frac{29}{11}\right)$

.....

(8)