Name:

Exam Style Questions

Equation of Tangent to a Circle

Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You may use tracing paper if needed

Guidance

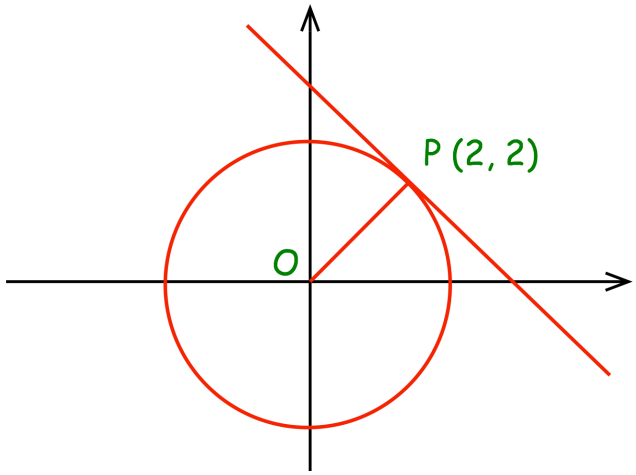
1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Revision for this topic

www.corbettmaths.com/contents

Video 372

1. The diagram shows the circle $x^2 + y^2 = 8$ with a tangent at the point (2, 2)



(a) Find the gradient of the line OP.

$\frac{\Delta y}{\Delta x} = \frac{2}{2} = 1$

1

(1)

(b) Find the gradient of the tangent

-1

(1)

(c) Find the equation of the tangent

$y = -x + c$

when $x = 2$, $y = 2$

$2 = -2 + c$

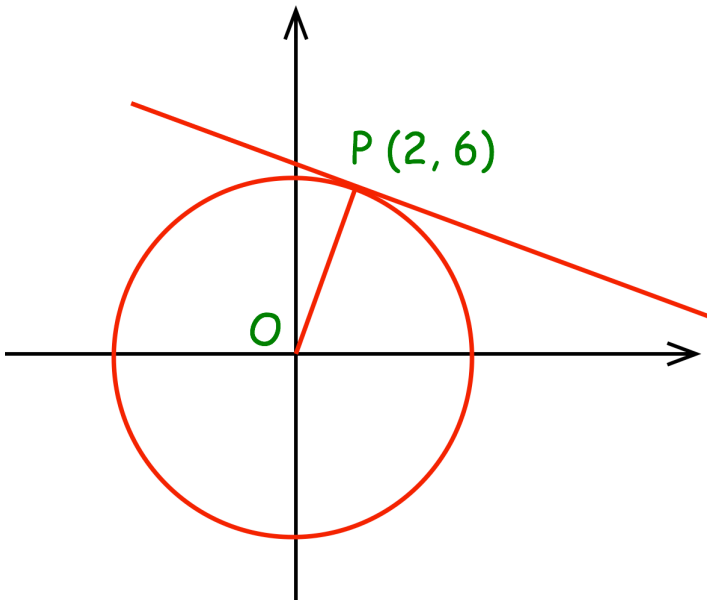
$c = 4$

$y = -x + 4$

$y = -x + 4$

(2)

2. The diagram shows the circle $x^2 + y^2 = 40$ with a tangent at the point (2, 6)



(a) Find the gradient of the line OP.

$\frac{\Delta y}{\Delta x} = \frac{6}{2} = 3$

3

.....

(1)

(b) Find the gradient of the tangent

$-\frac{1}{3}$

.....

(1)

(c) Find the equation of the tangent

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

when $x = 2$, $y = 6$

$6 = -\frac{1}{3}(2) + c$

$18 = -2 + 3c$

$3c = 20$

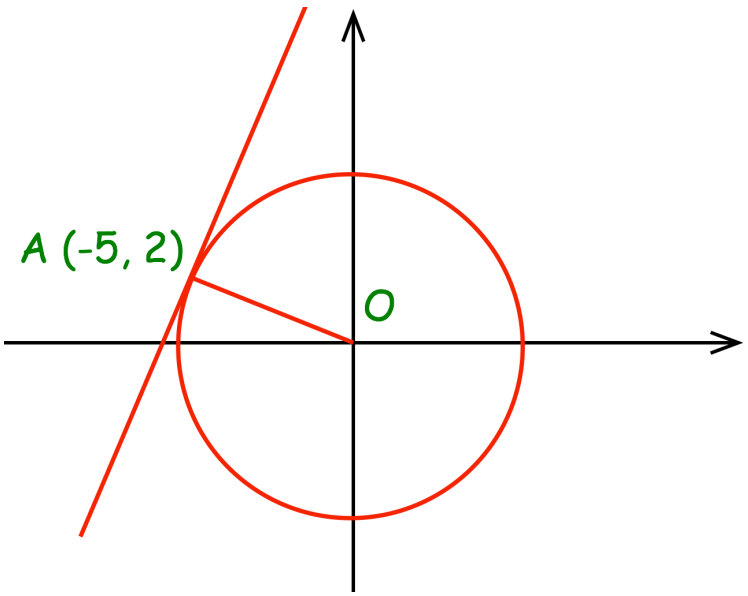
$c = \frac{20}{3}$

$y = -\frac{1}{3}x + \frac{20}{3}$

.....

(2)

3. The diagram shows the circle $x^2 + y^2 = 40$ with a tangent at the point (2, 6)



(a) Find the gradient of the line AO.

$\frac{\Delta y}{\Delta x} = \frac{2}{-5}$

$-\frac{2}{5}$

.....

(1)

(b) Find the gradient of the tangent

$\frac{5}{2}$

.....

(1)

(c) Find the equation of the tangent

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

When $x = -5$, $y = 2$

$2 = \frac{5}{2}(-5) + c$

$4 = -25 + 2c$

$2c = 29$

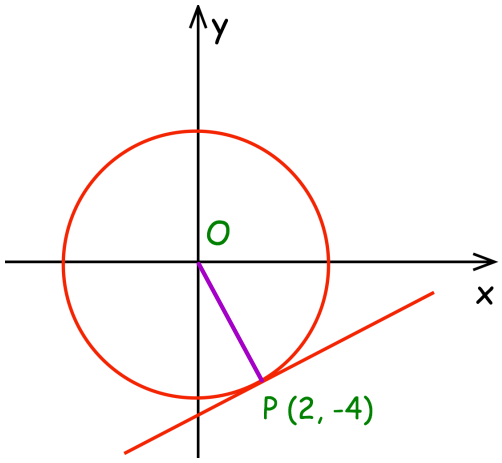
$c = \frac{29}{2}$

$y = \frac{5}{2}x + \frac{29}{2}$

.....

(2)

4. Here is a circle, centre O, and the tangent to the circle at the point (2, –4).



$\frac{\Delta y}{\Delta x} = \frac{-4}{2} = -2$

$M_{tangent} = \frac{1}{2}$

$y = \frac{1}{2}x + c$

when $x = 2$, $y = -4$

$-4 = 1 + c$

$c = -5$

$y = \frac{1}{2}x - 5$

Find the equation of the tangent at the point P.

$y = \frac{1}{2}x - 5$

(3)

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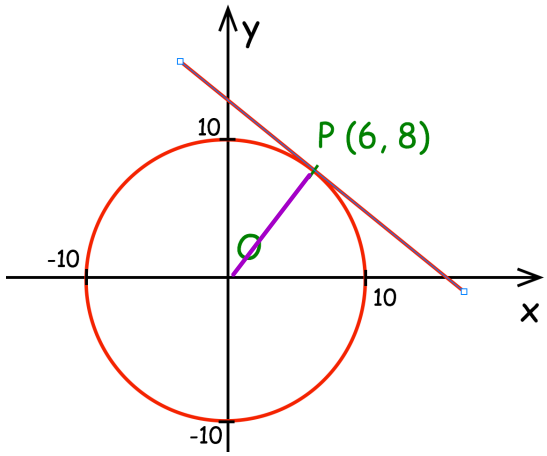
5. Here is a circle, centre O, and the tangent to the circle at the point (6, 8).



$\frac{\Delta y}{\Delta x} = \frac{8}{6} = \frac{4}{3}$

$M_{tangent} = -\frac{3}{4}$

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

when $x = 6$, $y = 8$

$8 = -\frac{3}{4}(6) + c$

$32 = -18 + 4c$

$4c = 50$

$c = \frac{25}{2}$

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

Find the equation of the tangent at the point P.

(3)

6. The line l is a tangent to the circle $x^2 + y^2 = 68$ at the point P.
P is the point (2, 8)

Work out the equation of the line l

$\frac{\Delta y}{\Delta x} = \frac{8}{2} = 4$

$M_{tangent} = -\frac{1}{4}$

$y = -\frac{1}{4}x + c$

when $x = 2$, $y = 8$

$8 = -\frac{1}{4}(2) + c$

$8 = -\frac{1}{2} + c$

$16 = -1 + 2c$

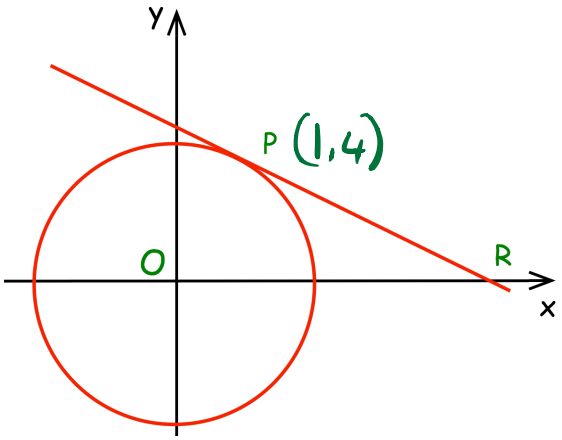
$2c = 17$

$c = \frac{17}{2}$

$y = \frac{1}{4}x + \frac{17}{2}$

(3)

7. The diagram shows the circle $x^2 + y^2 = 17$



P lies on the circle and has x-coordinate 1.
The tangent at P intersects the x-axis at R.

Work out the coordinates of R

when $x = 1$

$1 + y^2 = 17$

$y^2 = 16$

$y = 4$

$\frac{\Delta y}{\Delta x} = \frac{4}{1} = 4$

$M_{tangent} = -\frac{1}{4}$

$y = -\frac{1}{4}x + c$

when $x = 1$, $y = 4$

$4 = -\frac{1}{4} + c$

$16 = -1 + 4c$

$4c = 17$

$c = \frac{17}{4}$

$y = -\frac{1}{4}x + \frac{17}{4}$

At R, $y = 0$

$\therefore 0 = -\frac{1}{4}x + \frac{17}{4}$

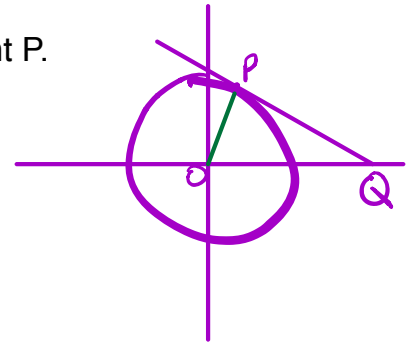
$0 = -x + 17$

$x = 17$

R (17, 0)

(5)

8. The line l is a tangent to the circle $x^2 + y^2 = 90$ at the point P.
P is the point with x-coordinate of ~~2~~ 3
The line l crosses the x-axis at the point Q.

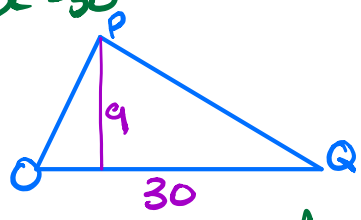


Work out the area of triangle OPQ.

When $x = 3$
$y^2 = 81$
$y = 9$
$\frac{\Delta y}{\Delta x} = \frac{9}{3} = 3$
$M_{tangent} = -\frac{1}{3}$

$y = -\frac{1}{3}x + c$
When $x = 3$, $y = 9$
$9 = -\frac{1}{3}(3) + c$
$9 = -1 + c$
$c = 10$
$y = -\frac{1}{3}x + 10$

When $y = 0$
$0 = -\frac{1}{3}x + 10$
$0 = -x + 30$
$x = 30$



Area $= \frac{9 \times 30}{2}$

Area = 135

(5)

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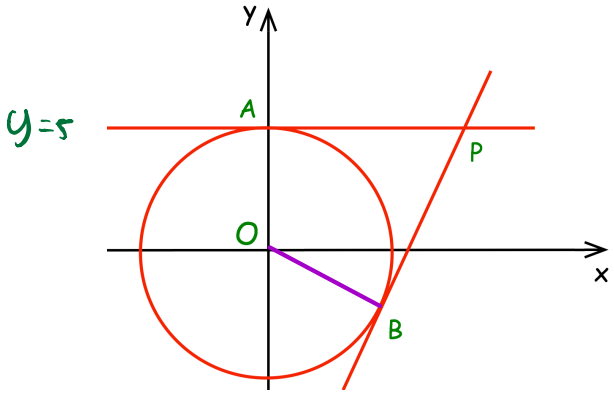
9. The circle $x^2 + y^2 = 25$ has tangents at the points A and B.
The point A has coordinates (0, 5)
The point B has coordinates (3, –4)



The tangents meet at the point P.

$\frac{\Delta y}{\Delta x} = \frac{-4}{3}$
$M_{tangent} = \frac{3}{4}$
$y = \frac{3}{4}x + c$
When $x = 3$, $y = -4$
$-4 = \frac{3}{4}(3) + c$
$-16 = 9 + 4c$
$4c = -25$
$c = -\frac{25}{4}$
$y = \frac{3}{4}x - \frac{25}{4}$

Work out the coordinates of the point P.

At P, $y = 5$
$\therefore 5 = \frac{3}{4}x - \frac{25}{4}$
$20 = 3x - 25$
$3x = 45$
$x = 15$

P (15, 5)

(5)