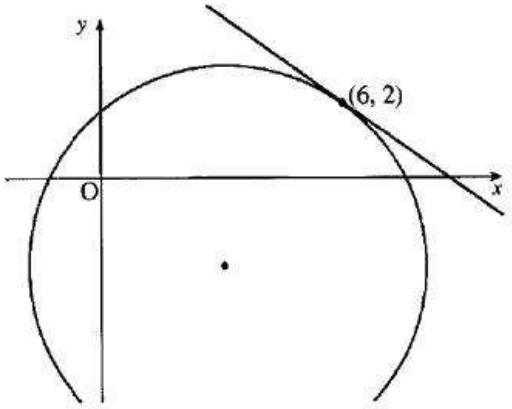
circle tangents

[SQA] 1. The circle shown has equation
$(x-3)^2+(y+2)^2=25$.
Find the equation of the tangent at the point (6, 2). 4



[SQA] 2. Circle P has equation $x^2+y^2-8x-10y+9=0$. Circle Q has centre $(-2,-1)$ and radius $2\sqrt{2}$.

(a) (i) Show that the radius of circle P is $4\sqrt{2}$.

(ii) Hence show that circles P and Q touch. **4**

(b) Find the equation of the tangent to the circle Q at the point $(-4,1)$. **3**

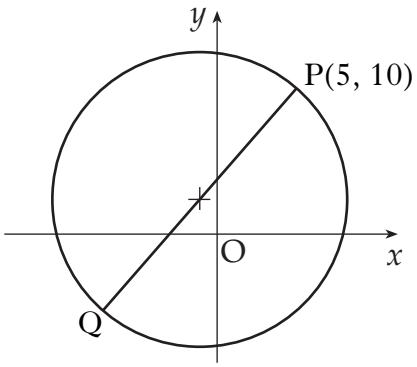
(c) The tangent in (b) intersects circle P in two points. Find the x-coordinates of the points of intersection, expressing you answers in the form $a\pm b\sqrt{3}$. **3**

[SQA] 3. The point $P(2,3)$ lies on the circle $(x+1)^2+(y-1)^2=13$. Find the equation of the tangent at P. **4**

[SQA] 4.

(*a*) Show that the point $P(5, 10)$ lies on circle C_1 with equation $(x+1)^2 + (y-2)^2 = 100$. **1**

(*b*) PQ is a diameter of this circle as shown in the diagram. Find the equation of the tangent at Q. **5**



(*c*) Two circles, C_2 and C_3, touch circle C_1 at Q.

The radius of each of these circles is twice the radius of circle C_1.

Find the equations of circles C_2 and C_3. **4**

[SQA] 5. Find the equation of the tangent at the point $(3, 1)$ on the circle $x^2 + y^2 - 4x + 6y - 4 = 0$. **5**

[SQA] 6. (*a*) Find the equation of AB, the perpendicular bisector of the line joing the points $P(-3, 1)$ and $Q(1, 9)$. **4**

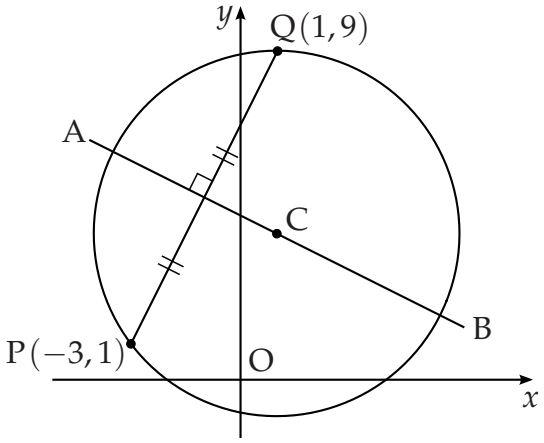
(*b*) C is the centre of a circle passing through P and Q. Given that QC is parallel to the y-axis, determine the equation of the circle. **3**

(*c*) The tangents at P and Q intersect at T.

Write down

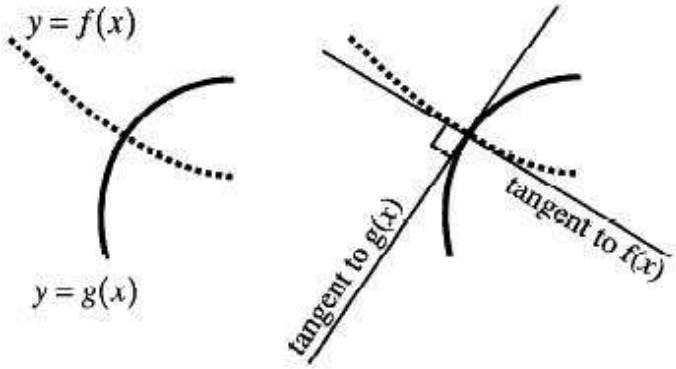
(i) the equation of the tangent at Q

(ii) the coordinates of T. **2**



[SQA] 7.

Two curves, $y = f(x)$ and $y = g(x)$, are called orthogonal if, at each point of intersection, their tangents are at right angles to each other.



(*a*) Diagram 1 shows the parabola with equation $y = 6 + \frac{1}{9}x^2$ and the circle M with equation $x^2 + (y-5)^2 = 13$.
These two curves intersect at (3, 7) and (–3, 7).
Prove that these curves are orthogonal. **(6)**

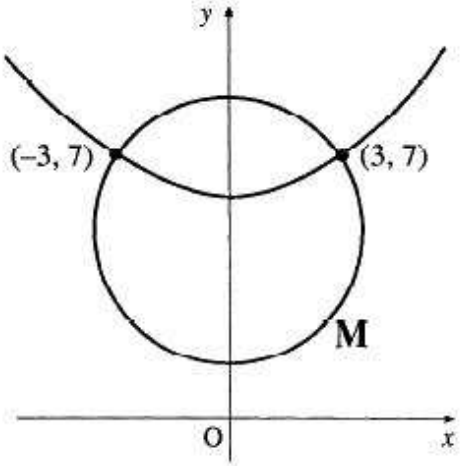


Diagram 1

(*b*) Diagram 2 shows the circle M, from (*a*) above, which is orthogonal to the circle N. The circles intersect at (3, 7) and (–3, 7).

(i) Write down the equation of the tangent to circle M at the point (–3, 7). **(1)**

(ii) Hence find the equation of circle N. **(3)**

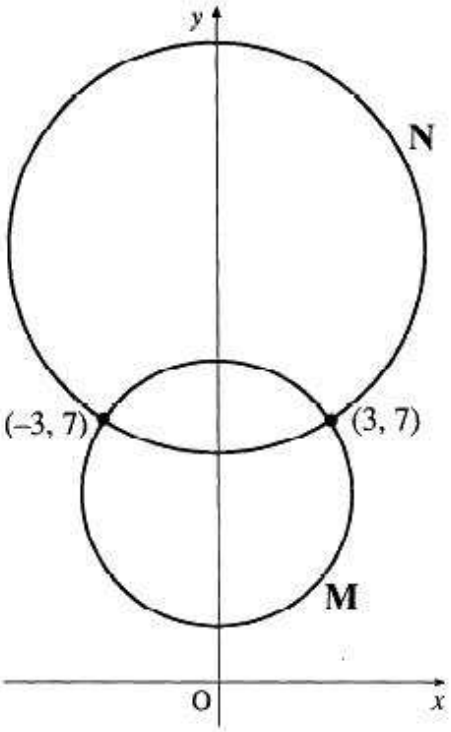


Diagram 2