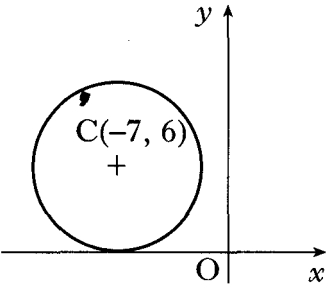
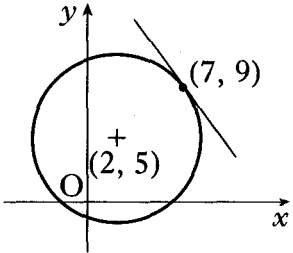
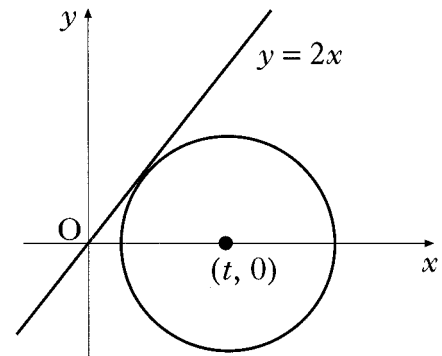
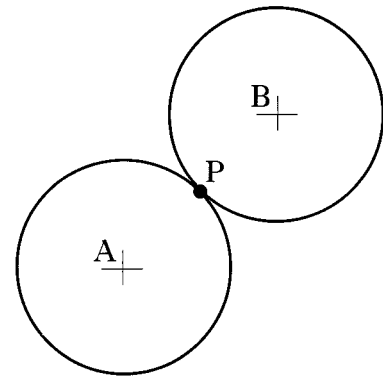


2008 P1	<p>2. The x-axis is a tangent to a circle with centre $(-7, 6)$ as shown in the diagram.</p>  <p>What is the equation of the circle?</p> <p>A $(x + 7)^2 + (y - 6)^2 = 1$ B $(x + 7)^2 + (y - 6)^2 = 49$ C $(x - 7)^2 + (y + 6)^2 = 36$ D $(x + 7)^2 + (y - 6)^2 = 36$</p>	2
Ans	D	
2008 P1	<p>5. The diagram shows a circle, centre $(2, 5)$ and a tangent drawn at the point $(7, 9)$. What is the equation of this tangent?</p>  <p>A $y - 9 = -\frac{5}{4}(x - 7)$ B $y + 9 = -\frac{4}{5}(x + 7)$ C $y - 7 = \frac{4}{5}(x - 9)$ D $y + 9 = \frac{5}{4}(x + 7)$</p>	2
Ans	A	

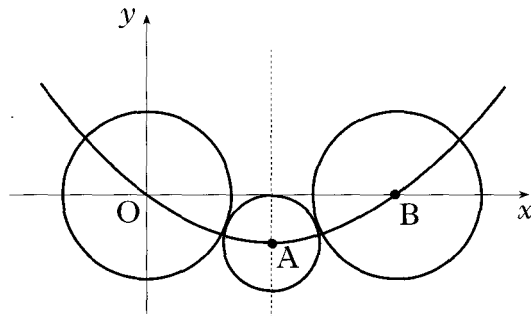
2008 P2	<p>4. (a) Write down the centre and calculate the radius of the circle with equation $x^2 + y^2 + 8x + 4y - 38 = 0$.</p> <p>(b) A second circle has equation $(x - 4)^2 + (y - 6)^2 = 26$. Find the distance between the centres of these two circles and hence show that the circles intersect.</p> <p>(c) The line with equation $y = 4 - x$ is a common chord passing through the points of intersection of the two circles. Find the coordinates of the points of intersection of the two circles.</p>	2 4 5
<p>Ans (a) (-4,-2), $\sqrt{58}$ (b) $d = \sqrt{128}$ (c) (3,1), (-1,5)</p>		
2007 P1	<p>5. The large circle has equation $x^2 + y^2 - 14x - 16y + 77 = 0$. Three congruent circles with centres A, B and C are drawn inside the large circle with the centres lying on a line parallel to the x-axis. This pattern is continued, as shown in the diagram. Find the equation of the circle with centre D.</p>	5
<p>Ans $(x - 15)^2 + (y - 8)^2 = 2^2$</p>		
2007 P2	<p>3. Show that the line with equation $y = 6 - 2x$ is a tangent to the circle with equation $x^2 + y^2 + 6x - 4y - 7 = 0$ and find the coordinates of the point of contact of the tangent and the circle.</p>	6
Ans	<p>$x^2 + (6 - 2x)^2 + 6x - 4(6 - 2x) - 7 = 0$ $x^2 + 36 - 24x + 4x^2 + 6x - 24 + 8x - 7 = 0$ $5x^2 - 10x + 5 = 0$ $5(x^2 - 1) = 0$ Only one root so line is tangential to circle. Point of contact is (1,4).</p>	
2006 P1	<p>2. A circle has centre C(-2, 3) and passes through P(1, 6). (a) Find the equation of the circle. (b) PQ is a diameter of the circle. Find the equation of the tangent to this circle at Q.</p>	2 4

Ans	(a) $r^2 = 18$ (b) $y - 0 = -(x - (-5))$	
2006 P2	<p>4. The circles with equations $(x - 3)^2 + (y - 4)^2 = 25$ and $x^2 + y^2 - kx - 8y - 2k = 0$ have the same centre.</p> <p>Determine the radius of the larger circle.</p>	5
Ans	$\sqrt{37}$, 5 and "2nd" circle	
2005 P1	<p>2. Two congruent circles, with centres A and B, touch at P.</p> <p>Relative to suitable axes, their equations are</p> $x^2 + y^2 + 6x + 4y - 12 = 0$ $x^2 + y^2 - 6x - 12y + 20 = 0.$ <p>(a) Find the coordinates of P.</p> <p>(b) Find the length of AB.</p>	<p>3</p> <p>2</p>
Ans	<p>(a) $P = (0, 2)$</p> <p>(b) $AB = 10$</p>	
2005 P1	<p>11. (a) A circle has centre $(t, 0)$, $t > 0$, and radius 2 units.</p> <p>Write down the equation of the circle.</p> <p>(b) Find the exact value of t such that the line $y = 2x$ is a tangent to the circle.</p>	<p>1</p> <p>5</p>
Ans	<p>(a) $(x - t)^2 + (y - 0)^2 = 2^2$</p> <p>(b) $t = \sqrt{5}$</p>	



2003 P1

11. • O, A and B are the centres of the three circles shown in the diagram below.
 • The two outer circles are congruent and each touches the smallest circle.
 • Circle centre A has equation $(x - 12)^2 + (y + 5)^2 = 25$.
 • The three centres lie on a parabola whose axis of symmetry is shown by the broken line through A.



- (a) (i) State the coordinates of A and find the length of the line OA.
 (ii) Hence find the equation of the circle with centre B.
 (b) The equation of the parabola can be written in the form $y = px(x + q)$.
 Find the values of p and q .

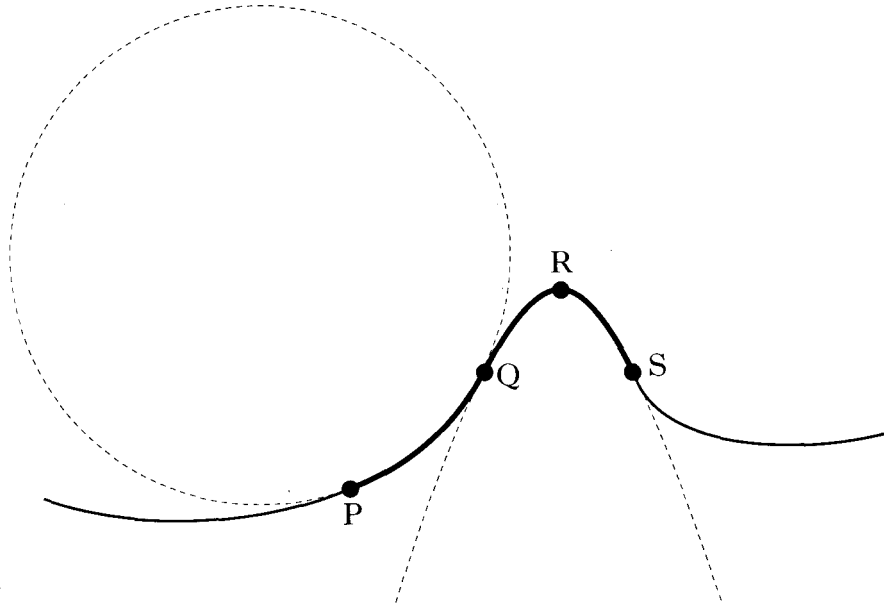
2
3
2

Ans

- (a) (i) $A(12, -5)$, $OA = 13$
 (ii) $(x - 24)^2 + y^2 = 64$
 (b) $p = \frac{5}{144}$, $q = -24$

2002WP1

6. The side view of part of a roller coaster ride is shown by the path PQRS. The curve PQ is an arc of the circle with equation $x^2 + y^2 + 4x - 10y + 9 = 0$. The curve QRS is part of the parabola with equation $y = -x^2 + 6x - 5$. The point Q has coordinates (2, 3).



- (a) Find the equation of the tangent to the circle at Q.
 (b) Show that this tangent to the circle at Q is also the tangent to the parabola at Q.

4
2

Ans

- (b) proof
 For parabola
- $\frac{dy}{dx} = -2x + 6$
 - $m = 2$
- (same as gradient of tangent to circle)
- (a) $y - 2x = -1$

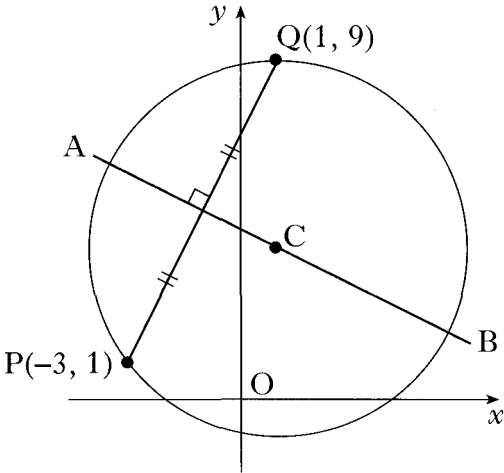
2002WP2

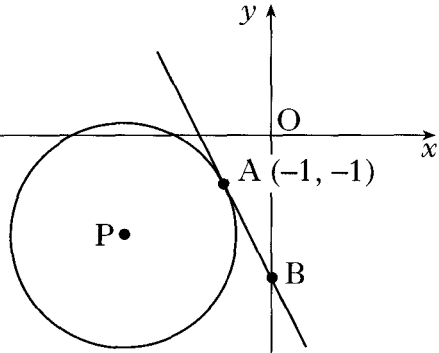
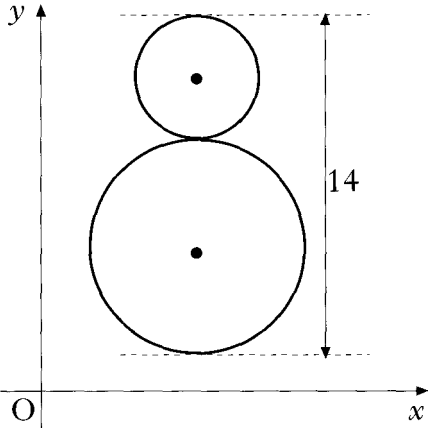
10. The line $y + 2x = k$, $k > 0$, is a tangent to the circle $x^2 + y^2 - 2x - 4 = 0$.
- (a) Find the value of k .
 (b) Deduce the coordinates of the point of contact.

7
2

Ans

- (a) $x^2 + (k - 2x)^2 - 2x - 4 = 0$ and
 apply discriminant
 $k=7$
- (b) (3, 1)

2002 P1	<p>1. The point P(2, 3) lies on the circle $(x + 1)^2 + (y - 1)^2 = 13$. Find the equation of the tangent at P.</p>	4
Ans	$2y + 3x = 12$	
2001 P1	<p>11. Circle P has equation $x^2 + y^2 - 8x - 10y + 9 = 0$. Circle Q has centre $(-2, -1)$ and radius $2\sqrt{2}$.</p> <p>(a) (i) Show that the radius of circle P is $4\sqrt{2}$. (ii) Hence show that circles P and Q touch.</p> <p>(b) Find the equation of the tangent to circle Q at the point $(-4, 1)$.</p> <p>(c) The tangent in (b) intersects circle P in two points. Find the x-coordinates of the points of intersection, expressing your answers in the form $a \pm b\sqrt{3}$.</p>	4 3 3
Ans	<p>(a) $r_P = 4\sqrt{2}$ $r_P + r_Q = 6\sqrt{2}$ $C_P = (4, 5)$ $C_P C_Q = \sqrt{6^2 + 6^2} = 6\sqrt{2}$ and "so touch"</p> <p>(b) $y = x + 5$</p> <p>(c) $x = 2 \pm 2\sqrt{3}$</p>	
2000 P1	<p>6. For what range of values of k does the equation $x^2 + y^2 + 4kx - 2ky - k - 2 = 0$ represent a circle?</p>	5
Ans	for all k	
2000 P2	<p>2. (a) Find the equation of AB, the perpendicular bisector of the line joining the points P(-3, 1) and Q(1, 9).</p> <p>(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.</p> <p>(c) The tangents at P and Q intersect at T.</p> <p>Write down</p> <p>(i) the equation of the tangent at Q</p> <p>(ii) the coordinates of T.</p>	 <p style="text-align: right;">4 3 2</p>

Ans	<p>(a) $x + 2y = 9$</p> <p>(b) $(x - 1)^2 + (y - 4)^2 = 25$</p> <p>(c) (i) $y = 9$ (ii) $T = (-9, 9)$</p>	
Specimen 2 PI	<p>5. (a) The diagram shows a circle, centre P, with equation $x^2 + y^2 + 6x + 4y + 8 = 0$. Find the equation of the tangent at the point A $(-1, -1)$ on the circle.</p>  <p>(b) The tangent crosses the y-axis at B. Find the equation of the circle with AB as diameter.</p>	4 3
Ans	<p>(a) $P = (-3, -2)$ $m_{PA} = \frac{1}{2} \Rightarrow m_{tgt} = -2$ $y - 1 = -2(x - (-1))$</p> <p>(b) $B = (0, 3)$ centre $C = \text{mid}_{AB} = (-\frac{1}{2}, -2)$ radius² = $CB^2 = \frac{5}{4}$ $(x + \frac{1}{2})^2 + (y + 2)^2 = \frac{5}{4}$</p>	
Specimen 1 PI	<p>6. A bakery firm makes ginger-bread men each 14 cm high with a circular “head” and “body”. The equation of the “body” is $x^2 + y^2 - 10x - 12y + 45 = 0$ and the line of centres is parallel to the y-axis. Find the equation of the “head”.</p> 	5
Ans	$(x - 5)^2 + (y - 13)^2 = 9$	