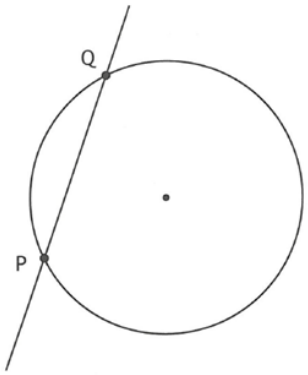
SQA Past paper questions

2022 – Paper 2 – Question 9

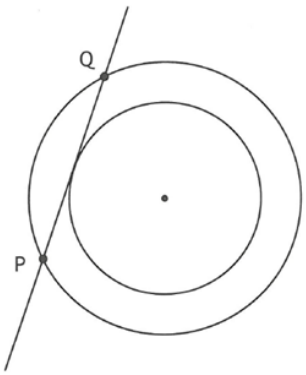
The line $y = 3x + 7$ intersects the circle $x^2 + y^2 - 4x - 6y - 7 = 0$ at the points P and Q.

(a) Find the coordinates of P and Q. 5



PQ is a tangent to a second, smaller circle. This circle is concentric with the first.

(b) Determine the equation of the smaller circle. 4



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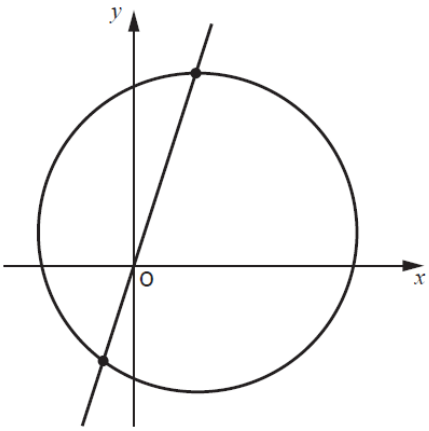
2017 – Paper 2 – Question 3

The line $y = 3x$ intersects the circle with equation $(x-2)^2 + (y-1)^2 = 25$.



Find the coordinates of the points of intersection. 5

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2016 – Paper 1 – Question 8

Show that the line with equation $y = 3x - 5$ is a tangent to the circle with equation $x^2 + y^2 + 2x - 4y - 5 = 0$ and find the coordinates of the point of contact. 5

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2013 – Paper 1 – Question 22

A circle C_1 has equation $x^2 + y^2 + 2x + 4y - 27 = 0$.

(a) Write down the centre and calculate the radius of C_1. 2

(b) The point P(3, 2) lies on the circle C_1.
Find the equation of the tangent at P. 3

(c) A second circle C_2 has centre (10, –1). The radius of C_2 is half of the radius of C_1.
Show that the equation of C_2 is $x^2 + y^2 - 20x + 2y + 93 = 0$. 3

(d) Show that the tangent found in part (b) is also a tangent to circle C_2. 4

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2012 – Paper 2 – Question 2

(a) Relative to a suitable set of coordinate axes, Diagram 1 shows the line $2x - y + 5 = 0$ intersecting the circle $x^2 + y^2 - 6x - 2y - 30 = 0$ at the points P and Q.

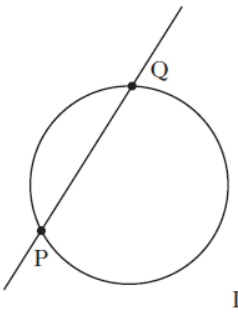


Diagram 1

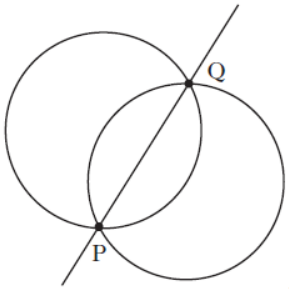


Diagram 2

Find the coordinates of P and Q. 6

(b) Diagram 2 shows the circle from (a) and a second congruent circle, which also passes through P and Q.

Determine the equation of this second circle. 6

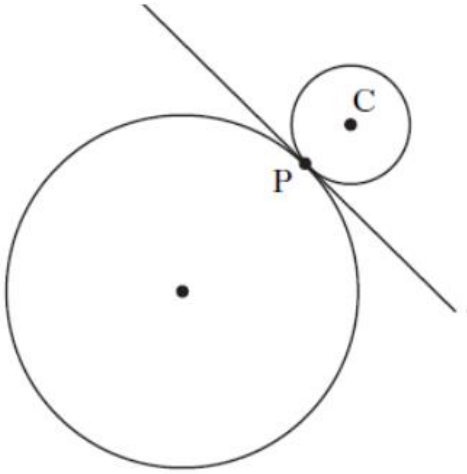
Click here for video solution.

2010 – Paper 2 – Question 3

(*a*) (i) Show that the line with equation $y = 3 - x$ is a tangent to the circle with equation $x^2 + y^2 + 14x + 4y - 19 = 0$. **5**

(ii) Find the coordinates of the point of contact, P.

(*b*) Relative to a suitable set of coordinate axes, the diagram below shows the circle from (*a*) and a second smaller circle with centre C.



The line $y = 3 - x$ is a common tangent at the point P.
The radius of the larger circle is three times the radius of the smaller circle.
Find the equation of the smaller circle. **6**

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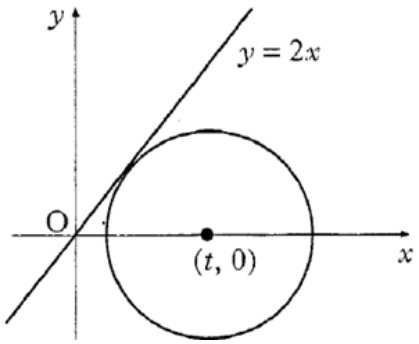
2005 – Paper 1 – Question 11

(*a*) A circle has centre $(t, 0)$, $t > 0$, and radius 2 units.
Write down the equation of the circle.

(*b*) Find the exact value of t such that the line $y = 2x$ is a tangent to the circle.



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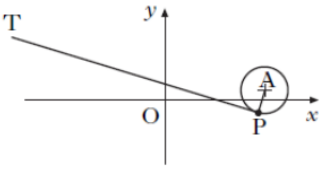
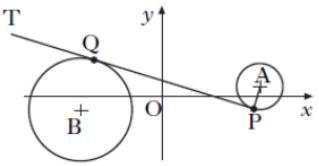
2004 – Paper 2 – Question 8

The circle with centre A has equation $x^2 + y^2 - 12x - 2y + 32 = 0$. The line PT is a tangent to this circle at the point P(5, –1).



(a) Show that the equation of this tangent is $x + 2y = 3$. **4**

The circle with centre B has equation $x^2 + y^2 + 10x + 2y + 6 = 0$.



(b) Show that PT is also a tangent to this circle. **5**

(c) Q is the point of contact. Find the length of PQ. **2**

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2003 – Paper 2 – Question 4

(a) Find the equation of the tangent to the curve with equation $y = x^3 + 2x^2 - 3x + 2$ at the point where $x = 1$. **5**

(b) Show that this line is also a tangent to the circle with equation $x^2 + y^2 - 12x - 10y + 44 = 0$ and state the coordinates of the point of contact. **6**

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1994 – Paper 1 – Question 8

Diagram 1 shows a circle with equation $x^2 + y^2 + 10x - 2y - 14 = 0$ and a straight line, l_1, with equation $y = 2x + 1$.
The line intersects the circle at A and B.

Diagram 1

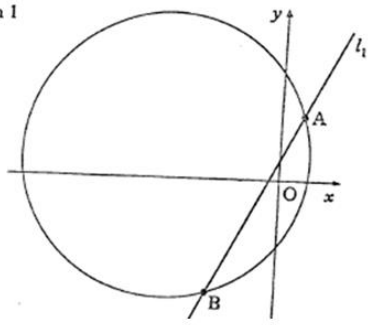
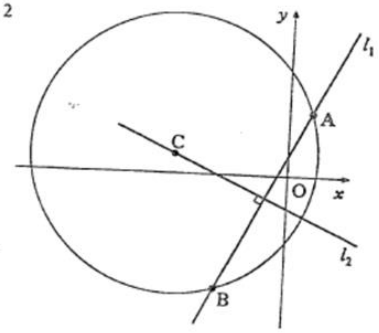


Diagram 2



Find the coordinates of the points A and B. **(5)**

(b) Diagram 2 shows a second line, l_2, which passes through the centre of the circle, C, and is at right angles to line l_1.

(i) Write down the coordinates of C. **(1)**

(ii) Find the equation of the line l_2. **(3)**

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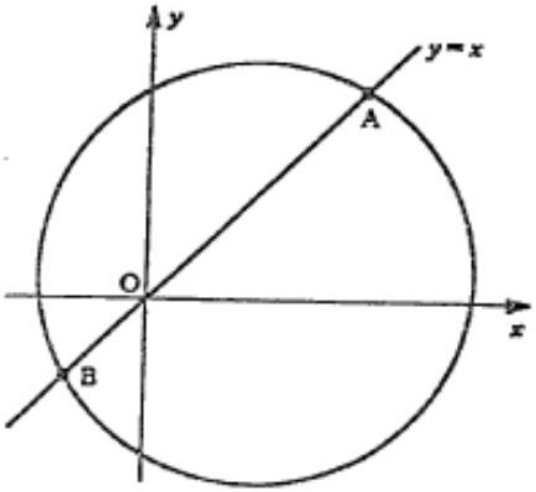
1993 – Paper 1 – Question 8

The straight line $y = x$ cuts the circle $x^2 + y^2 - 6x - 2y - 24 = 0$ at A and B.

(a) Find the coordinates of A and B. (3)

(b) Find the equation of the circle which has AB as diameter. (3)



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1988 – Paper 2 – Question 6

The line with equation $x - 3y = k$ is a tangent to the circle $x^2 + y^2 - 6x + 8y + 15 = 0$.

(a) Find the two possible values for k. 6

(b) Find the equation of the diameter joining the points of contact. 5

Click here for video solution.