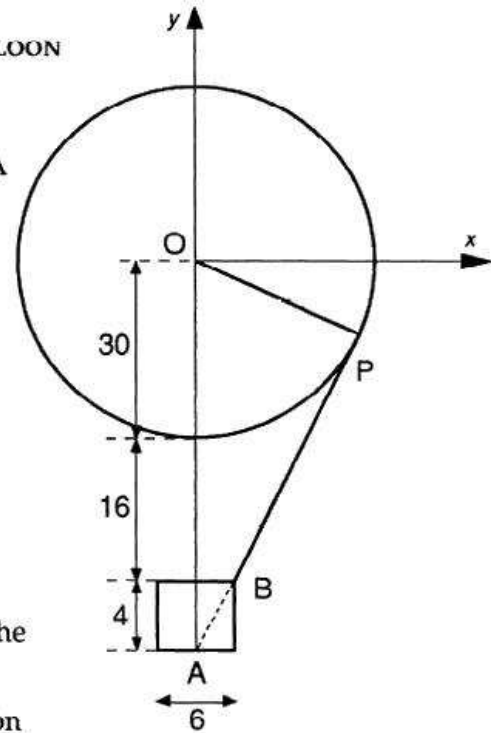


Marked Homework 10 - Circles 2

- [SQA] 1. Find the equation of the tangent at the point $(3,4)$ on the circle $x^2 + y^2 + 2x - 4y - 15 = 0$. 4

- [SQA] 2. A spherical hot-air balloon has radius 30 feet. Cables join the balloon to the gondola which is cylindrical with diameter 6 feet and height 4 feet. The top of the gondola is 16 feet below the bottom of the balloon.



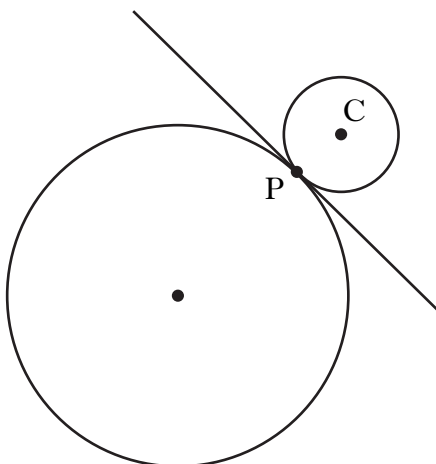
Co-ordinate axes are chosen as shown in the diagram. One of the cables is represented by PB and PBA is a straight line.

- (a) Find the equation of the cable PB. (3)
 (b) State the equation of the circle representing the balloon. (1)
 (c) Prove that this cable is a tangent to the balloon and find the co-ordinates of the point P. (5)

- [SQA] 3. 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 $4\sqrt{2}$. 4
 (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 your answers in the form $a \pm b\sqrt{3}$. 3

4. (a) (i) Show that the line with equation $y = 3 - x$ is a tangent to the circle with equation $x^2 + y^2 + 14x + 4y - 19 = 0$.
- (ii) Find the coordinates of the points of contact, P. 5
- (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

- [SQA] 5. Find the possible values of k for which the line $x - y = k$ is a tangent to the circle $x^2 + y^2 = 18$. 5

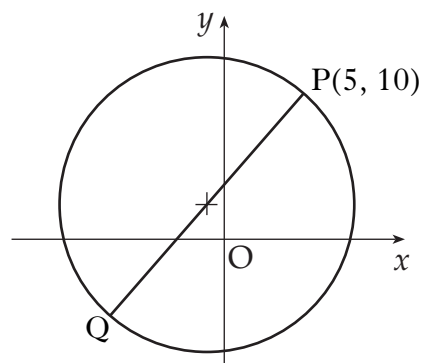
[SQA] 6.

(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

[END OF QUESTIONS]