



## **The Circle**

### **Maths Past Exam Questions**

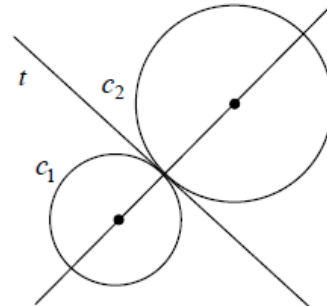
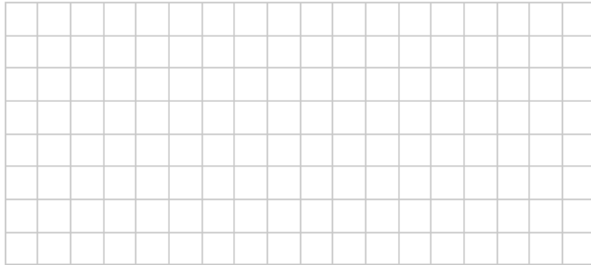
### **Higher Level**

Paper 2 – Project Maths – Section A Q4

Question 4

(25 marks)

The circles  $c_1$  and  $c_2$  touch externally as shown.



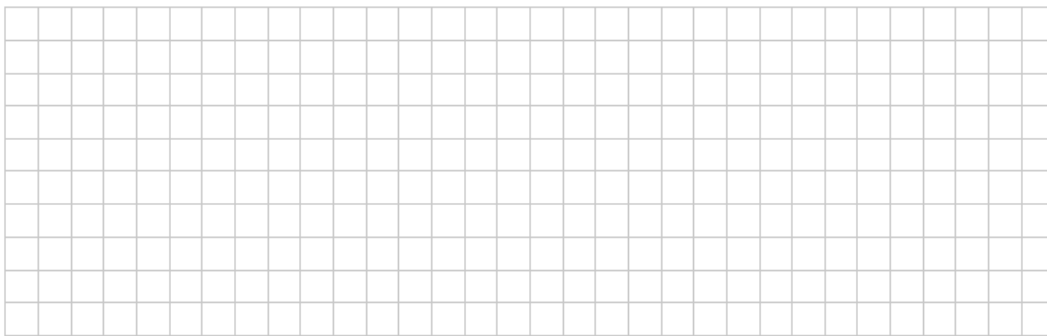
(a) Complete the following table:

Circle	Centre	Radius	Equation
$c_1$	$(-3, -2)$	2	
$c_2$			$x^2 + y^2 - 2x - 2y - 7 = 0$

(b) (i) Find the co-ordinates of the point of contact of  $c_1$  and  $c_2$ .

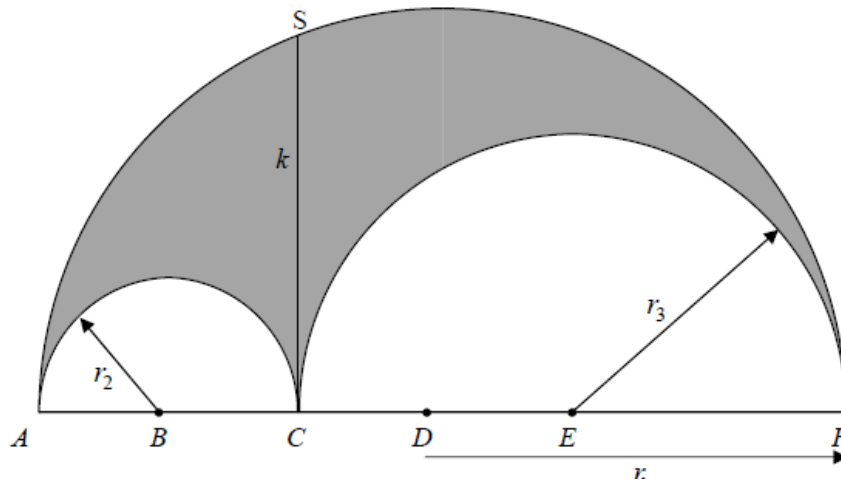


(ii) Hence, or otherwise, find the equation of the tangent,  $t$ , common to  $c_1$  and  $c_2$ .



**Paper 2 – Project Maths – Section B Q9 B-D**

- (b) The shaded region in the diagram below is called an **arbelos**. It is a plane semicircular region of radius  $r_1$  from which semicircles of radius  $r_2$  and  $r_3$  are removed, as shown. In the diagram  $SC \perp AF$  and  $|SC| = k$ .



- (i) Show that, for fixed  $r_1$ , the perimeter of the arbelos is independent of the values of  $r_2$  and  $r_3$ .

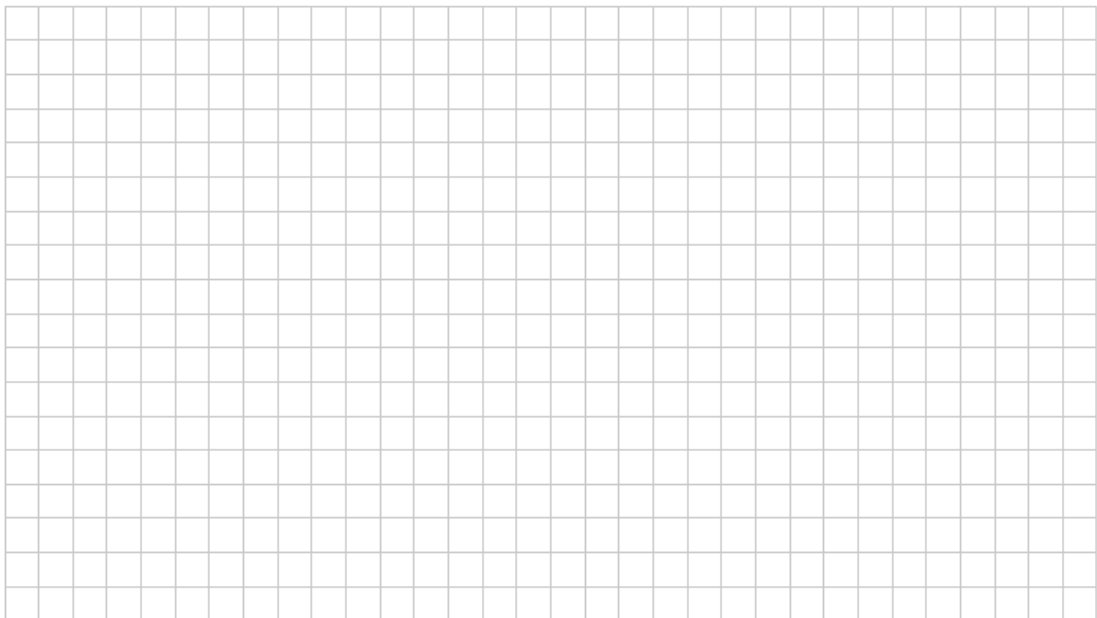
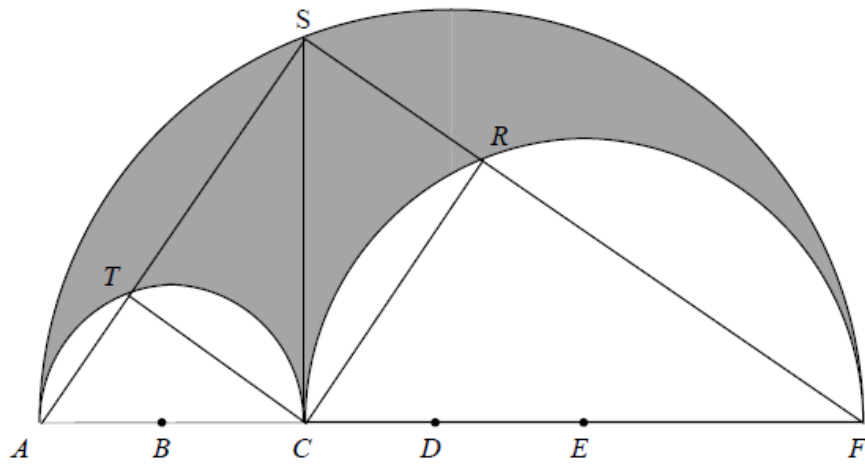


- (ii) If  $r_2 = 2$  and  $r_3 = 4$ , show that the area of the arbelos is the same as the area of the circle of diameter  $k$ .



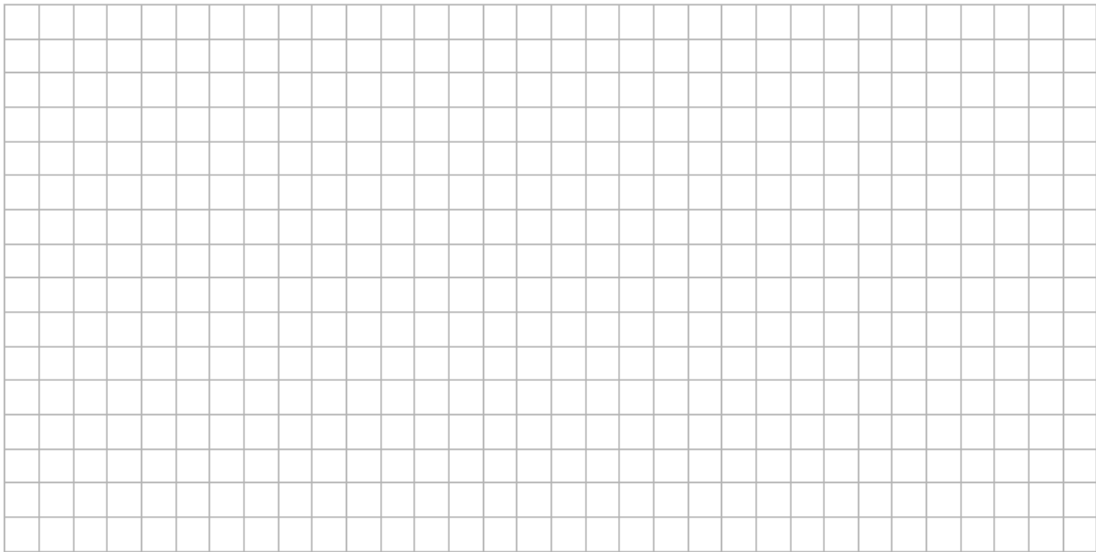


- (d)  $AS$  and  $FS$  cut the two smaller semicircles at  $T$  and  $R$  respectively.  
Prove that  $RSTC$  is a rectangle.

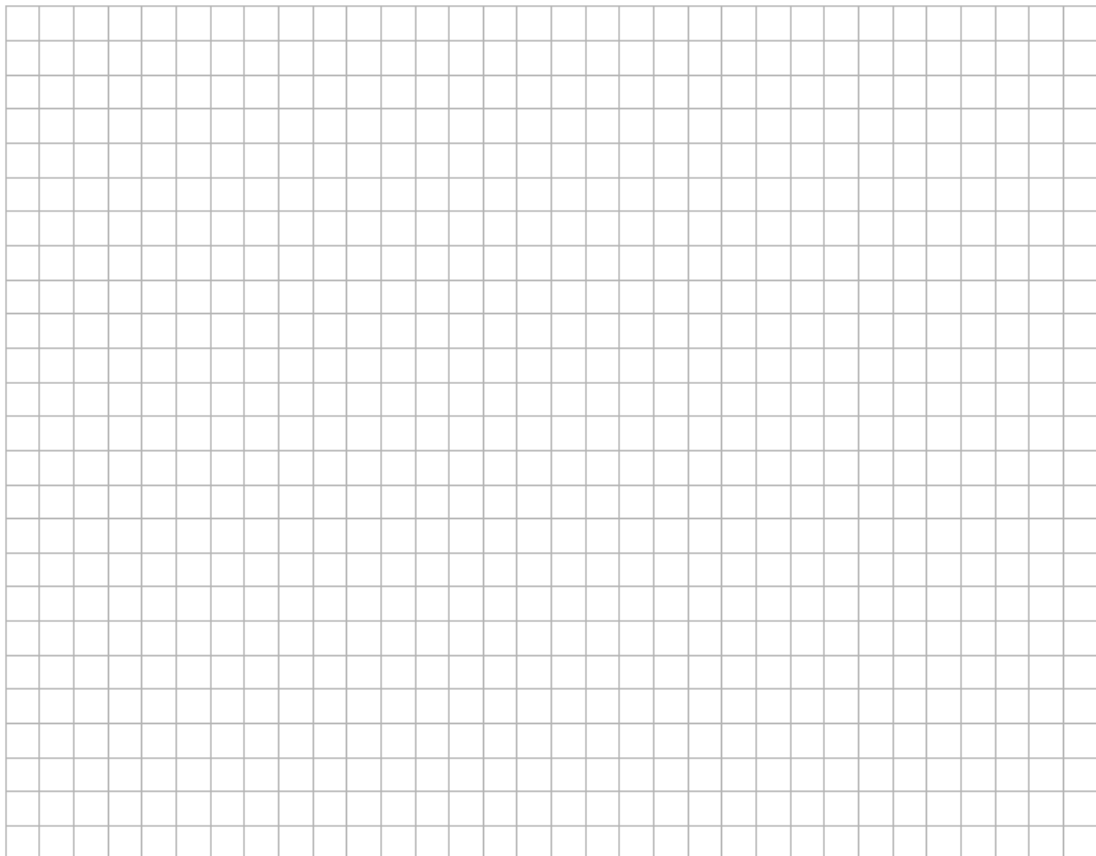




(c) Verify that  $(4, 7)$  is the point that they have in common.



(d) Find the equation of the common tangent.



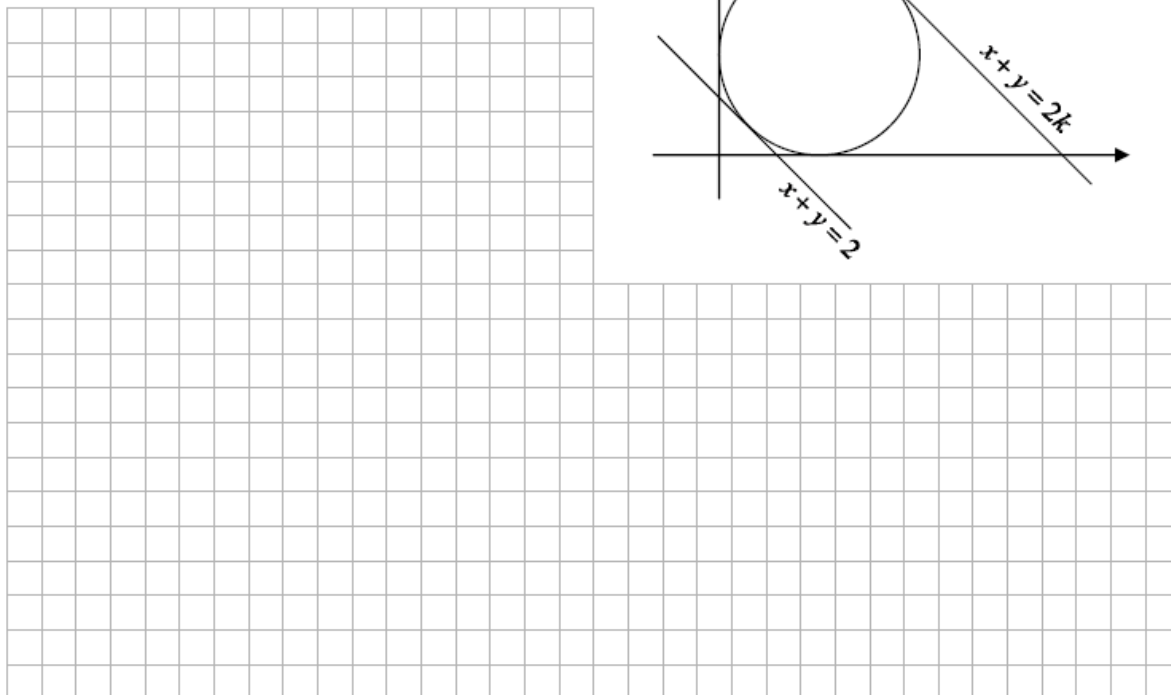
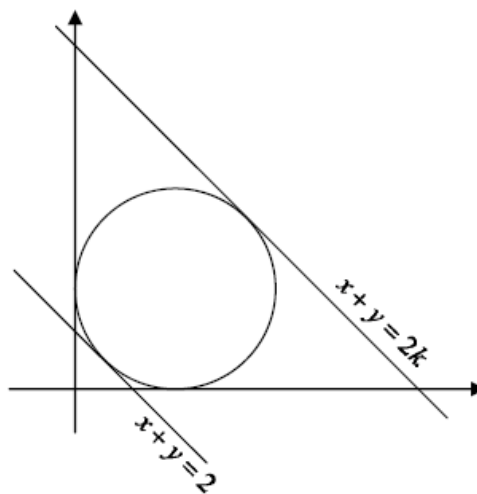
Paper 2 – Project Maths – Section A Q3

Question 3

(25 marks)

The circle shown in the diagram has, as tangents, the  $x$ -axis, the  $y$ -axis, the line  $x + y = 2$  and the line  $x + y = 2k$ , where  $k > 1$ .

Find the value of  $k$ .







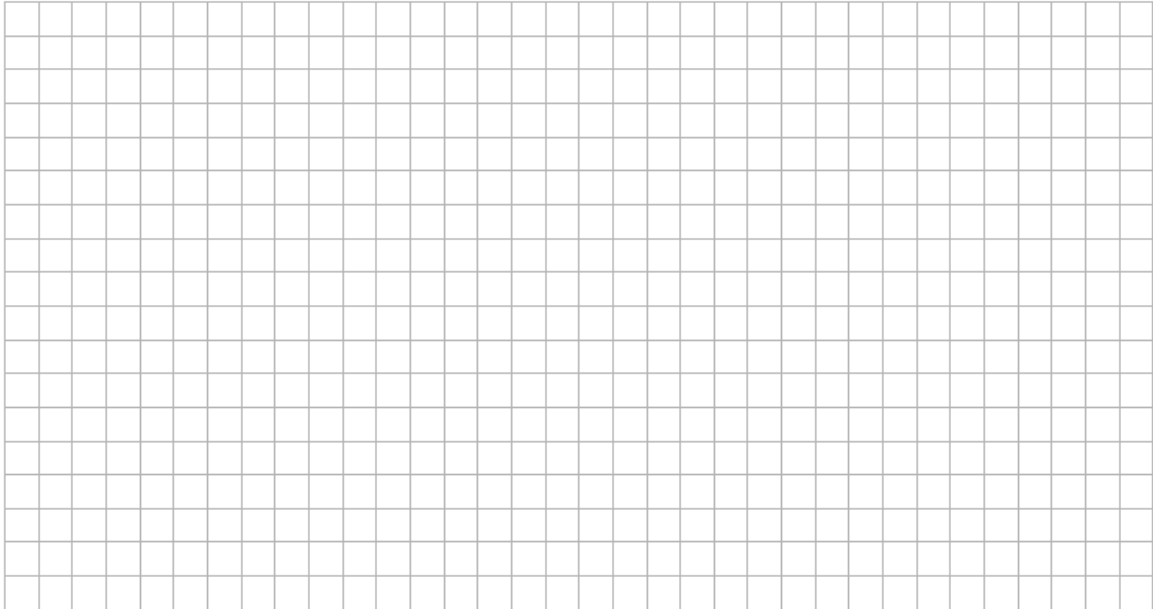
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Paper 2 – Project maths – Q5

Question 5

(25 marks)

The line  $x + 3y = 20$  intersects the circle  $x^2 + y^2 - 6x - 8y = 0$  at the points  $P$  and  $Q$ .  
Find the equation of the circle that has  $[PQ]$  as diameter.



Paper 2 – Project Maths – Q4

Question 4

(25 marks)

- (a) The centre of a circle lies on the line  $x - 2y - 1 = 0$ . The  $x$ -axis and the line  $y = 6$  are tangents to the circle. Find the equation of this circle.

- (b) A different circle has equation  $x^2 + y^2 - 6x - 12y + 41 = 0$ . Show that this circle and the circle in part (a) touch externally.