

## Pure 6 – Equation of a Circle

Please **complete** this homework by \_\_\_\_\_. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

### Section 1 – Review of previous topics. Please complete all questions.

- For each quadratic equation below:
  - State the number of real roots
  - Find the root(s), if they exist
  - Rearrange into completed square form and find the maximum or minimum point
  - Sketch the curve, labelling all intercepts and the max/min point
    - $x^2 + 4x - 5 = y$
    - $x^2 + 4x + 5 = y$
    - $2x^2 + x - 5 = y$
    - $3x^2 + 4x + 2 = y$
    - $4x^2 - 25 = y$
    - $36 + 12x + x^2 = y$
- The points A, B, and C have coordinates (5, -2), (2, 9) and (9, 2) respectively.
  - Find the equation of  $l$ , the perpendicular bisector of BC.
  - Find the co-ordinates of the point where  $l$  meets AB.
- The points D and E have coordinates  $(h, k)$  and  $(3h, -5k)$  respectively.
  - Find the coordinates of the midpoint of DE.
  - Find the gradient of DE.
  - Hence, find the equation of the perpendicular bisector of DE

### Section 2 – Consolidation of this week's topic. Please complete all questions.

- Write down the equations of each of these circles.

Expand your answers into the form  $ax^2 + bx + cy^2 + dy + e = 0$

- Centre (1, 8) ; radius 5
- Centre (6, -7) ; radius 3

**(8 Marks)**

- Work out the centre and radius of each of these circles

- $x^2 + 18x + y^2 - 14y + 30 = 0$
- $x^2 + 12x + y^2 + 10y - 25 = 0$

**(6 Marks)**

3.  $(-3, 9)$  is the midpoint of a chord within a circle with centre  $(7, -1)$  and radius 18

(a) Calculate the equation of the circle

(b) Calculate the length of the chord

(c) Complete the square to find the exact coordinates of the ends of the chord

**(10 marks)**

4. Write down equations in the form  $ax^2 + bx + cy^2 + dy + e = 0$  of each of the circles with diameters from:

(a)  $(2, 6)$  to  $(6, 2)$

(b)  $(4, -2)$  to  $(-3, 16)$

**(8 Marks)**

**(Total 32 Marks)**

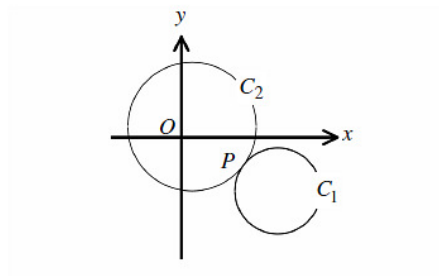
**Section 3 – Extension question. If you are aiming for a top grade, you should attempt these questions.**

1.

(a) Show that if  $(a, c)$  and  $(b, d)$  are the ends of the diameter of a circle, the equation of the circle is  $(x - a)(x - b) + (y - c)(y - d) = 0$

(b) The line segment with endpoints  $(-3, 12)$  and  $(13, 0)$  is the diameter of a circle. Work out the equation of the circle. Fully expand your answer.

2.



The figure above shows a circle  $C_1$  with equation

$$x^2 + y^2 - 18x + ky + 90 = 0,$$

where  $k$  is a positive constant.

a) Determine, in terms of  $k$ , the coordinates of the centre of  $C_1$  and the size of its radius. **(2)**

Another circle  $C_2$  has equation

$$x^2 + y^2 - 2x - 2y = 34.$$

b) Given that  $C_1$  and  $C_2$  are touching externally at the point  $P$ , find ...

i. ... the value of  $k$ .

ii. ... the coordinates of  $P$ .

**(10)**