Please attempt the following questions in preparation for the online session on 14th March 2019.

Q1
A circle has equation $x^2 + y^2 + 8x + 6y - 75 = 0$.
What is the radius of this circle?

Q2
The point K(8,-5) lies on the circle with equation $x^2 + y^2 - 12x - 6y - 23 = 0$.
Find the equation of the tangent to the circle at K.

Q3
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.

Q4
The circle with equation $x^2 + y^2 - 12x - 10y + k = 0$ meets the coordinate axes at exactly three points.
What is the value of k?

Q5
Circles C_1 and C_2 have equations $(x + 5)^2 + (y - 6)^2 = 9$ and $x^2 + y^2 - 6x - 16 = 0$ respectively.

(a) Write down the centres and radii of C_1 and C_2 .

(b) Show that C_1 and C_2 do not intersect.

Q6
Circle C_1 has equation $(x - 13)^2 + (y + 4)^2 = 100$.
Circle C_2 has equation $x^2 + y^2 + 14x - 22y + c = 0$.
(a)
(i) Write down the coordinates of the centre of C_1.

(ii) The centre of C_1 lies on the circumference of C_2.
Show that $c = -455$.

The line joining the centres of the circles intersects C_1 at P.

(b)
(i) Determine the ratio in which P divides the line joining the centres of the circles.

(ii) Hence, or otherwise, determine the coordinates of P.

P is the centre of a third circle C_3.
C_2 touches C_3 internally.

(c) Determine the equation of C_3.