Question 1

(a)   The line k is defined as $x - 3y - 10 = 0$.
        The circle c is defined as $x^2 + y^2 = 10$.
        (i)   Show that the line k is a tangent to the circle c.
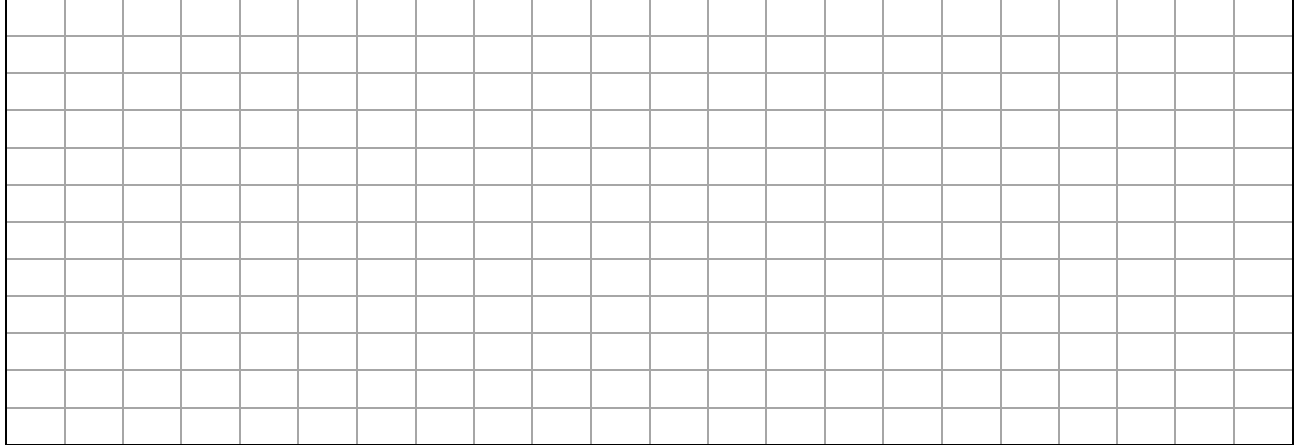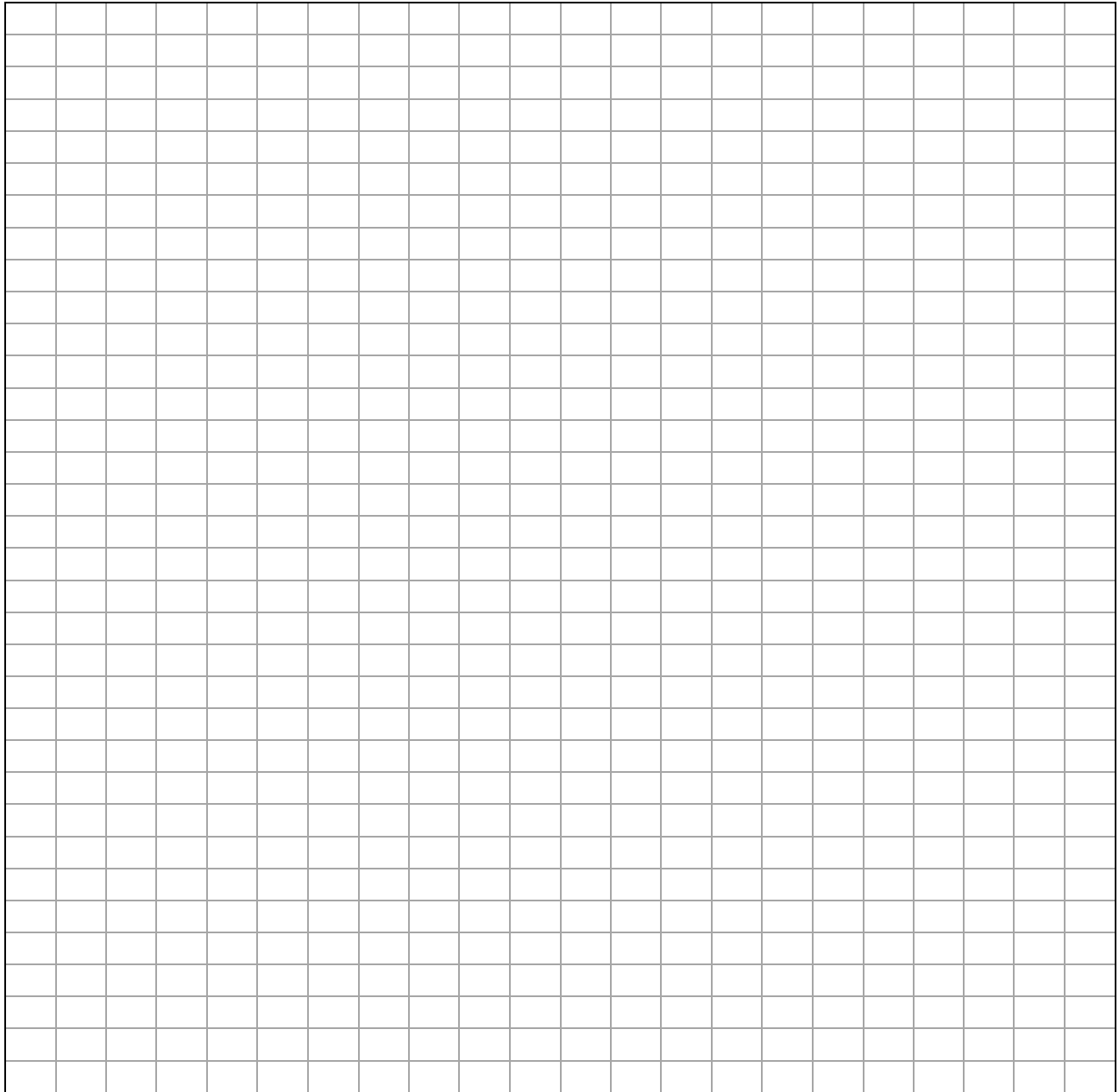
        (ii)   Find the co-ordinates of M, the point of contact.

(b)   The circle c has centre $(4,2)$.

The circle c makes a chord 6 units in length along the y-axis.

Find the equation of the circle c.

Question 2

(a) c_1 is the circle $x^2 + y^2 + 2x + 2y - 23 = 0$.

       c_2 is the circle $x^2 + y^2 - 10x - 7y + 31 = 0$.

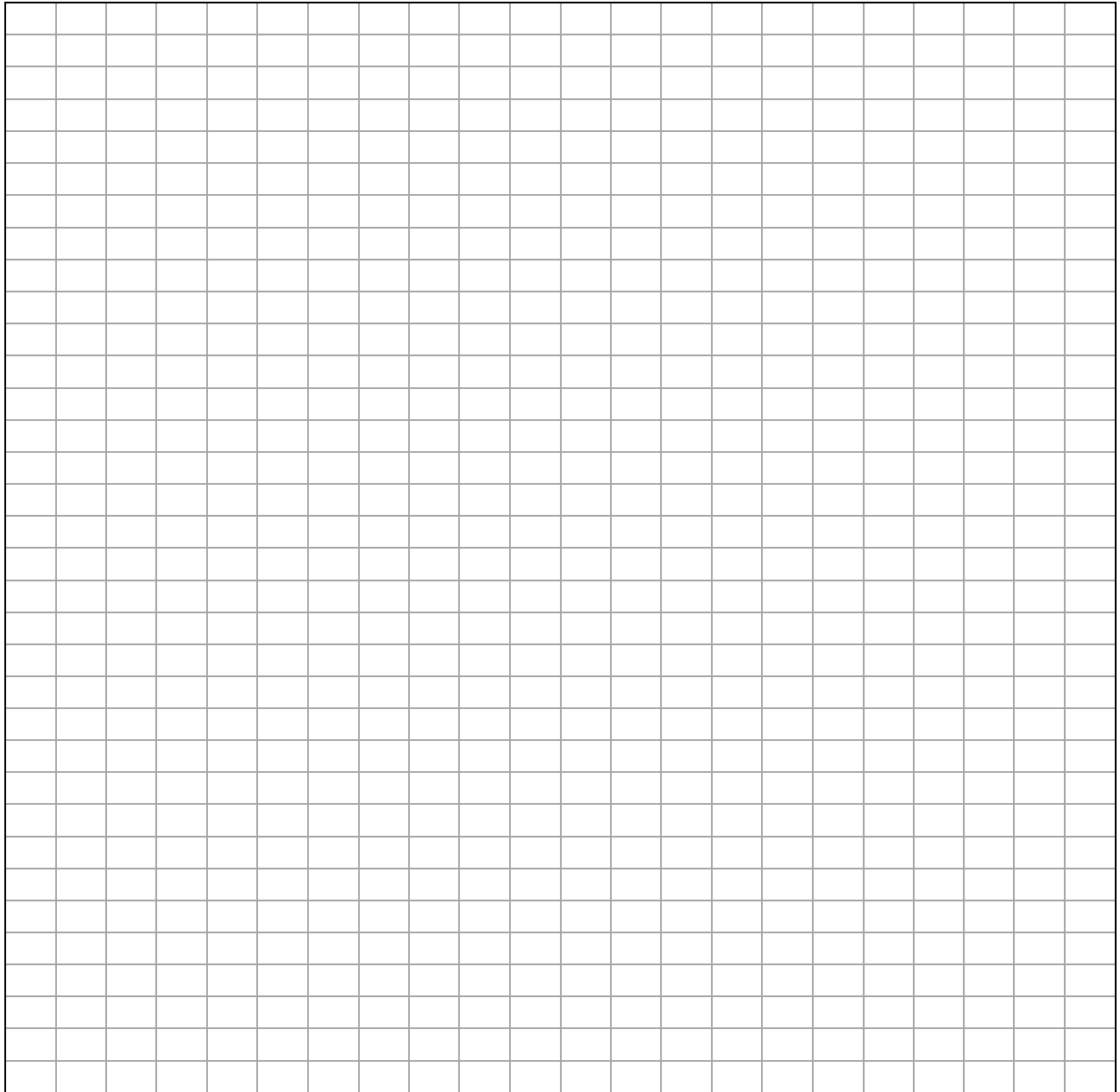(i)   Show that the circles c_1 and c_2 touch externally.

(ii)   Find the equation of their common tangent.

(b)   The circle c_3 passes through the points $(4,5)$ and $(-2,3)$.
        The centre of the circle c_3 is on the x-axis.
        Find the equation of the circle c_3.

Question 3

A circle has a radius of length $\sqrt{20}$ units.

The centre of the circle lies on the line $x + y = 0$.

The circle also passes through the point $(-1,3)$.

Find the equations of the two circles that satisfy these conditions.