5. Consider the circle $\mathscr{C}$ of radius 3 units centred at O(0, 0) and the translation $t: (x, y) \to (x - 1, y + 2)$.

a) Find the equation of circle $\mathscr{C}$. $x^2 + y^2 = 9$

b) We draw circle $\mathscr{C}'$, image of circle $\mathscr{C}$, under translation t.

1. Determine the coordinates of the centre of circle $\mathscr{C}'$ and its radius.
   Centre (−1, 2); radius: 3
2. Find the equation of circle $\mathscr{C}'$. $(x + 1)^2 + (y - 2)^2 = 9$

6. Determine the centre ω and the radius r of the following circles.

a) $(x - 3)^2 + (y - 4)^2 = 16$ ω(3, 4); $r = 4$

b) $(x + 2)^2 + (y - 1)^2 = 9$ ω(−2, 1); $r = 3$

c) $(x + 3)^2 + (y + 1)^2 = 17$ ω(−3, −1); $r = \sqrt{17}$

d) $\frac{(x+2)^2}{3} + \frac{(y-7)^2}{3} = 12$ ω(−2, 7); [illegible]

7. Find the equation of the circle, in the standard form, knowing the centre ω and a point M on the circle.

a) ω(1, 3) and M(1, 7) $(x - 1)^2 + (y - 3)^2 = 16$

b) ω(−4, 5) and M(2, −3) $(x + 4)^2 + (y - 5)^2 = 100$

8. The points A(−1, 2) and B(−3, −4) are the endpoints of a diameter AB of a circle. Find the equation, in the standard form, of this circle.
$(x + 2)^2 + (y + 1)^2 = 10$

9. The equation of a circle centred at the origin is $x^2 + y^2 = 16$.
Describe the translation which associates, with this circle, the circle of equation

a) $(x - 1)^2 + (y + 4)^2 = 16$: $(x, y) \to (x + 1, y - 4)$

b) $x^2 + (y - 3)^2 = 16$: $(x, y) \to (x, y + 3)$

c) $(x + 2)^2 + y^2 = 16$: $(x, y) \to (x - 2, y)$

d) $(x + 1)^2 + (y + 3)^2 = 16$: $(x, y) \to (x - 1, y - 3)$

ACTIVITY 3 Equation of a circle: general form

a) Consider the circle of radius $r = 4$ centred at ω(−1, 2).

1. Find the equation of the circle in the standard form. $(x + 1)^2 + (y - 2)^2 = 16$
2. Expand the standard equation in order to write the equation in the form $x^2 + y^2 + ax + by + c = 0$, called **general form** of the equation of a circle.
   $(x + 1)^2 + (y - 2)^2 = 16 \Leftrightarrow x^2 + y^2 + 2x - 4y - 11 = 0$

b) Each of the following expressions is a perfect square trinomial. Complete it and then factor it.

1. $x^2 + 2x + \underline{1} = (x + 1)^2$
2. $x^2 - 6x + \underline{9} = (x - 3)^2$
3. $y^2 + 4y + \underline{4} = (y + 2)^2$
4. $y^2 - 8y + \underline{16} = (y - 4)^2$
5. $x^2 + 3x + \underline{\frac{9}{4}} = \left(x + \frac{3}{2}\right)^2$
6. $y^2 - 5y + \underline{\frac{25}{4}} = \left(y - \frac{5}{2}\right)^2$