p 015 qC3

C3 The roots of the quadratic equation $x^2 - x - 12 = 0$ are -3 and 4.
Determine the roots of the equation $(x-5)^2 - (x-5) - 12 = 0$.

$g(x)$

$f(x)$

Notice the relationship between $f(x)$ & $g(x)$, they have the same pattern:

$\square^2 - \square - 12 = \emptyset$

but different parameters

$\square^2 - \square - 12 = \emptyset$

$f(x)$ has simply x

$g(x)$ has $(x-5)$

This is just like a transformation, i.e.:

$$g(x) = f(x-5)$$

which translates into a shift to the right by 5 units for $g(x)$.

This means the following mapping:

$$(x, \ldots) \rightarrow (x+5, \ldots)$$

This transformation will move everything to the right, including the original roots which were : -3 & 4.

Therefore the transformed roots move based on the mapping:

$$(-3, \ldots) \rightarrow (-3+5, \ldots)$$
$$\text{and} \quad (+4, \ldots) \rightarrow (+4+5, \ldots)$$

$$-3 \longrightarrow -3+5 = +2$$
$$+4 \rightarrow +4+5 = +9$$

The answer is: $+2$ & $+9$ are the roots of the new equation.