In each pair of polynomials given below, find the number to be subtracted from the first to get a polynomial for which the second is a factor.

Find also the second factor of the polynomial got on subtracting the number.

(i) $x^2 + 5x - 7, x - 1$

(ii) $x^2 - 4x - 3, x - 1$

(i) $x^2 + 5x - 7, x - 1$

$p(x) = x^2 + 5x - 7$

$p(1) = 1^2 + 5 \times 1 - 7 = 1 + 5 - 7 = -1$

Number to be subtracted $= -1$

New polynomial $q(x) = (x^2 + 5x - 7) - (-1)$

$= x^2 + 5x - 7 + 1$

$= x^2 + 5x - 6$

$x - 1$ is a factor of $q(x)$.

If the second factor is $x - a$,

$x^2 + 5x - 6 = (x - 1)(x - a) = x^2 - (1 + a)x + a$

Comparing, $-6 = a$ or $a = -6$

Second factor $= x - a = x - (-6) = x + 6$

(ii) $x^2 - 4x - 3, x - 1$

$p(x) = x^2 - 4x - 3$

$p(1) = 1 - 4 - 3 = -6$

Number to be subtracted $= -6$

New polynomial $q(x) = x^2 - 4x - 3 - (-6)$

$= x^2 - 4x - 3 + 6$

$= x^2 - 4x + 3$

$x - 1$ is a factor of $q(x)$.

If the second factor is $x - a$,

$x^2 - 4x + 3 = (x - 1)(x - a) = x^2 - (1 + a)x + a$

Comparing, $3 = a$

Second factor $= x - a = x - 3$