Zero Product Rule

$$ab = 0$$

$$a = 0 \quad \text{or} \quad b = 0$$

Ex: $3x^2 + 10x = 25$

$3x^2 + 10x - 25 = 0$

$3x^2 + 15x - 5x - 25 = 0$

$3x(x+5) + 5(-x-5)$

$3x(x+5) - 5(x+5) = 0$

$(3x-5)(x+5) = 0$

$3x - 5 = 0$ or $x + 5 = 0$

$\boxed{x = \frac{5}{3}}$ $\boxed{x = -5}$

$\therefore$ Solution set $= \{-5, \frac{5}{3}\}$

(4) $9x^2 - 22x + 8 = 0$ (i) when $x \in N$

$x \in Q$

$9x^2 - 18x - 4x + 8 = 0$

$9x(x-2) - 4(x-2) = 0$

$(9x-4)(x-2) = 0$

$x - 2 = 0$ or $9x - 4 = 0$

$\boxed{x = 2}$ $\boxed{x = \frac{4}{9}}$

(i) N : solution set $\{2\}$

(ii) Q : solution set $\{\frac{4}{9}, 2\}$

Ex : 5 $\quad 3a^2x^2 + 11abx + 6b^2 = 0$

$3a^2x^2 + 9abx + 2abx + 6b^2 = 0$

$3ax(ax + 3b) + 2b(ax + 3b) = 0$

$(3ax + 2b)(ax + 3b) = 0$

$3ax + 2b = 0$ $\quad$ or $\quad$ $ax + 3b = 0$

$3ax = -2b$ $\quad$ $ax = -3b$

$$x = \frac{-2b}{3a}$$ $\quad$ $$x = \frac{-3b}{a}$$

$\therefore$ solution set : $\left\{ \frac{-2b}{3a}, \frac{-3b}{a} \right\}$

⑥ $\sqrt{3}x^2 + 10x + 7\sqrt{3} = 0$

$\sqrt{3}x^2 + 3x + 7x + 7\sqrt{3} = 0$

$\sqrt{3}x(x + \sqrt{3}) + 7(x + \sqrt{3}) = 0$

$(x + \sqrt{3})(\sqrt{3}x + 7) = 0$

$x + \sqrt{3} = 0$ or $\sqrt{3}x + 7 = 0$

$\boxed{x = -\sqrt{3}}$ $\boxed{x = -\frac{7}{\sqrt{3}}}$

$\therefore$ Solution set : $\left\{-\sqrt{3}, -\frac{7}{\sqrt{3}}\right\}$

Ex: Solve $\frac{x}{x+1} + \frac{x+1}{x} = \frac{34}{15}$

$\Rightarrow \frac{x^2 + x^2 + x + x + 1}{(x+1)(x)} = \frac{34}{15}$

$\Rightarrow \frac{2x^2 + 2x + 1}{x^2 + x} = \frac{34}{15}$

$\Rightarrow 4x^2 + 4x - 15 = 0$

$\Rightarrow 4x^2 + 10x - 6x - 15 = 0$

$\Rightarrow 2x(2x+5) - 3(2x+5) = 0$

$2x - 3 = 0 \qquad 2x + 5 = 0$

$x = \frac{3}{2} \qquad x = -\frac{5}{2}$

g) $\left(\frac{x}{x+1}\right)^2 - 5\left(\frac{x}{x+1}\right) + 6 = 0$

$n^2 - 5n + 6 = 0$

$n^2 - 2n - 3n + 6 = 0$

$n(n-2) - 3(n-2) = 0$

$(n-2)(n-3) = 0$

$n = 2 \qquad n = 3$

$\therefore \frac{x}{x+1} = 2 \qquad \frac{x}{x+1} = 3$

$x = 2x + 2 \qquad x = 3x + 3$

$-x = 2 \qquad -2x = 3$

$x = -2 \qquad x = -\frac{3}{2}$