Standard Form

$\max z = 2x_1 + x_2$

s.t.

$x_1 + x_2 \leq 10$

$x_1 - x_2 \leq -2$

$x_1, x_2 \geq 0$

$\Longrightarrow$

Slack Form

$(x_1, x_2, s_1, s_2) = (0, 0, 10, -2)$

$\max z = 2x_1 + x_2$

s.t.

$s_1 = 10 - x_1 - x_2$

$s_2 = -2 - x_1 + x_2$

$x_1, x_2, s_1, s_2 \geq 0$

Use 2-Phase Method

Phase 1

$\max \{-x_0\}$, $\max z = 2x_1 + x_2$

s.t.

$s_1 = x_0 + 10 - x_1 - x_2$

$s_2 = x_0 - 2 - x_1 + x_2 \xrightarrow{\text{Pivot } x_0} x_0 = 2 + x_1 - x_2 + s_2$

Substitute x_0;

$\max: -2 - x_1 + x_2 - s_2$, $\max z = 2x_1 + x_2$

s.t.

$s_1 = 12 - 2x_2 + s_2 \longrightarrow x_2 \leq 6$

$x_0 = 2 + x_1 - x_2 + s_2 \longrightarrow x_2 \leq 2$ ✓

↳ Pivot on x_2 $\quad x_2 = 2 + x_1 - x_0 + s_2$

Substitute x_2;

$\max: -x_0$, $\max z = 2 - x_0 + 3x_1 + s_2$

s.t. $Opt = 0 \longrightarrow (x_1, x_2, s_1, s_2) = (0, 2, 8, 0)$

$s_1 = 8 - 2x_1 + 2x_0 - s_2$

$x_2 = 2 + x_1 - x_0 + s_2$

Phase II

$\max z = 2 + 3x_1 + s_2$

s.t.

$s_1 = 8 - 2x_1 - s_2$ $\xrightarrow{\text{Pivot } x_1}$ $x_1 = 4 - \frac{s_1}{2} - \frac{s_2}{2}$

$x_2 = 2 + x_1 + s_2$

Substitute x_1;

$\max z = 14 - \frac{3}{2}s_1 - \frac{1}{2}s_2$

s.t.

$x_1 = 4 - \frac{1}{2}s_1 - \frac{1}{2}s_2$

$x_2 = 6 - \frac{1}{2}s_1 + \frac{1}{2}s_2$

Ans $z = 14$

$x_1 = 4$

$x_2 = 6$