Graphical method example 2

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Investment Problem

Model :

Minimize $Z = x_1 + x_2$

s.t.

$$0.1x_1 + 0.25x_2 \geq 10000$$
$$0.6x_1 - 0.4x_2 \geq 0$$
$$x_1, x_2 \geq 0$$

Graphical Solution

Step 1 : Feasible Solution

Replacing inequality by equality

(i) $0.1x_1 + 0.25x_2 = 10000$

When $x_1 = 0$, $x_2 = \frac{10000}{0.25} = 40000$

(i.e) $(0, 40000)$

When $x_2 = 0$, $x_1 = \frac{10000}{0.1} = 100000$

(i.e) $(100000, 0)$

$\therefore$ Coordinates $(0, 40000)$ & $(100000, 0)$

(ii) $0.6x_1 - 0.4x_2 = 0$

$x_1 = 0 \Rightarrow x_2 = 0$ (0,0)

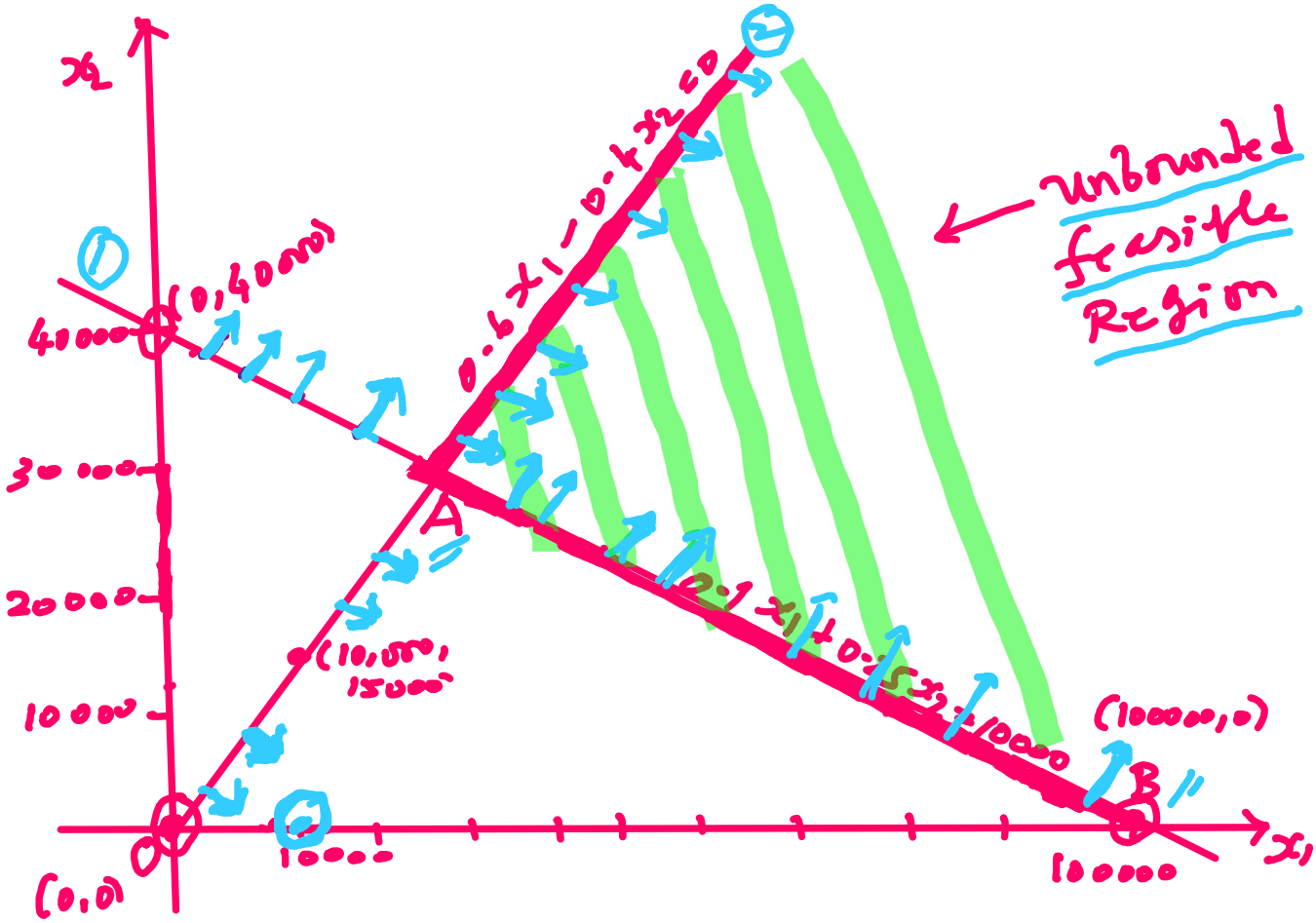
Passes through origin.

$\therefore$ Let $x_1 = 10000$

$\therefore x_2 = \frac{0.6 \times 10000}{0.4} = 15000$

(or) (10000, 15000)

$\therefore$ Pts (0,0) & (10,000, 15000)



Take Reference Point (10000, 0)

Constraint 1

$0.1x_1 + 0.25x_2 \geq 10000$

$(0.1 \times 10000) + 0 \geq 10000$

$1000 \geq 10000$

False.

∴ Reference point not included.
Above the line.

Constraint 2

$$0.6x_1 - 0.4x_2 \geq 0$$

$$(0.6 \times 10000) - 0 \geq 0$$

$$6000 \geq 0$$

True ✓

Reference point included.
∴ Below the line

Step 2 : Optimum

The Corner Points are A, B

To find A

Solve

$$0.6x_1 - 0.4x_2 = 0$$
$$0.1x_1 + 0.25x_2 = 10000$$

$$\Rightarrow x_1 = 31578.94$$
$$x_2 = 21052.63$$

Coordinate B is (100000, 0)

Evaluating $Z = x_1 + x_2$

$$Z_A = 31578.94 + 21052.63$$
$$= \boxed{52631.57} \text{ min}$$

$Z_B = 100000 + 0 = 100\,000$

∴ Min is

$Z = 52631.57$

$x_1 = 31578.94$

$x_2 = 21052.63$

Minimum amount to be invested is $\$52631.57$, with $\$31578.94$ in Blue chip and $\$21052.63$ in high tech Company.