Gandhi Clothing Company (GCC)

GCC manufactures 3 types of clothing: **shirts**, **shorts**, and **pants**; and each requires certain machinery.

The machinery must be rented at the following rates:

- shirt machinery, \$200 per week
- shorts machinery, \$150 per week
- pants machinery, \$100 per week

Rent

Each type of clothing requires specific amounts of cloth and labor, and have different sales price and variable costs:

Clothing	Labor (hours)	Cloth (sq. yd.)	Sales Price	Variable Cost
Shirt	3	4	\$12	\$6
Shorts	2	3	\$8	\$4
Pants	6	4	\$15	\$8

Each week 150 hours of labor and 160 sq. yd. of cloth are available.

Formulate an IP to maximize Gandhi's weekly profits.

	RENT	LABOR	CLOTH	SALE	VAR COST
Shirt	\$200	3	4	\$12	\$6
Shorts	\$150	2	3	\$8	\$4
pants	\$100	6	4	\$15	\$8
		150	160		

X_1 = # of shirts
X_2 = # of shorts
X_3 = # of pants

Code LHS by doing this

$$y_1 = \begin{cases} 1, & \text{if shirt machinery} \\ 0, & \text{otherwise} \end{cases}$$

$$y_2 = \begin{cases} 1, & \text{if shorts machinery} \\ 0, & \text{otherwise} \end{cases}$$

$$y_3 = \begin{cases} 1, & \text{if pants machinery} \\ 0, & \text{otherwise} \end{cases}$$

Objective max: $6x_1 + 4x_2 + 7x_3 - 200y_1 - 150y_2 - 100y_3$

Constraints S.t. $3x_1 + 2x_2 + 6x_3 \le 150$

$4x_1 + 3x_2 + 4x_3 \le 160$

Integer $x_1, x_2, x_3 \ge 0$; integer

Binary $y_1, y_2, y_3 \in [0,1]$

Map x's to y's →

$$\boxed{\begin{aligned} X_1 &\le M_1 \cdot y_1 \\ X_2 &\le M_2 \cdot y_2 \\ X_3 &\le M_3 \cdot y_3 \end{aligned}}$$

$$\boxed{\begin{aligned} M_1 &= 40 \\ M_2 &= 53 \\ M_3 &= 25 \end{aligned}}$$

Must define M's, which will not constrain the model, INF?, this is the BIG M method