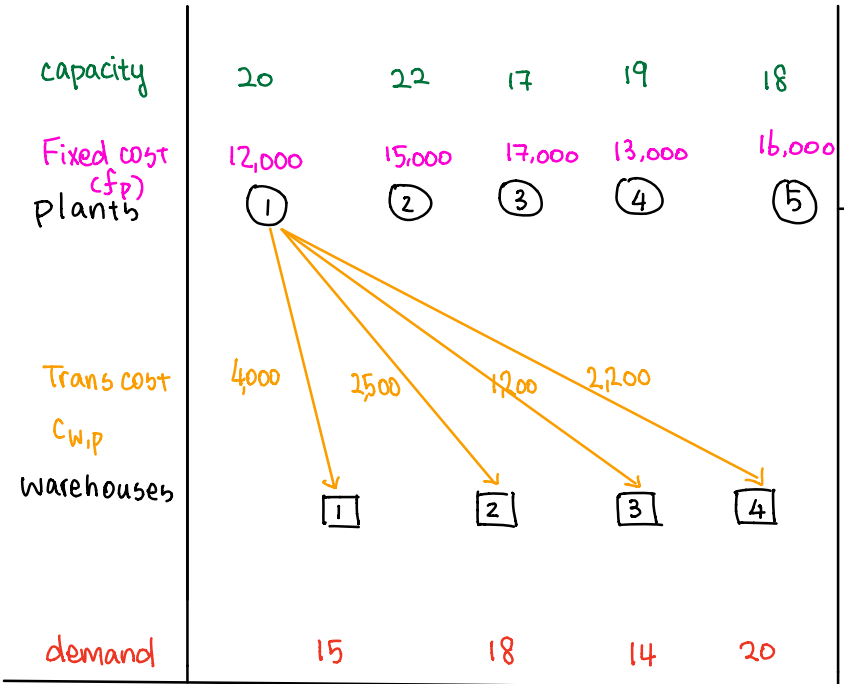


Q: Which plant(s) should we close to minimize transportation + fixed costs while still satisfying warehouse demand?

Decision variables:

- $open[p] = \begin{cases} 1 & \text{plant } p \text{ open} \\ 0 & \text{plant } p \text{ closed} \end{cases}$ binary vars
- $transport[w][p]$ = quantity to transport from plant $p$ to warehouse $w$

| | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ |
|---|---|---|---|---|---|
| $W_1$ | | | | | |
| $W_2$ | | | | | |
| $W_3$ | | | | | |
| $W_4$ | | | | | |

Objective: Minimize

$$\sum_{p=1}^{5} f_p \cdot open[p] + \sum_{p=1}^{5} \sum_{w=1}^{4} c_{w,p} \cdot transport[w][p]$$

Constraints:

- capacity respected: $\sum_{w=1}^{4} transport[w][p] \leq capacity[p]$ $\forall\ p = 1,2,3,4,5$
- if $\sum_{w=1}^{4} transport[w][p] > 0$, then $open[p] > 0$
  - linear constraint: $\sum_{w=1}^{4} transport[w][p] \leq open[p] \cdot capacity[p]$

→ can be combined

Note: we don't need if $\sum_{w=1}^{4} transport[w][p] = 0$, then $open[p] = 0$

Since minimization objective will guarantee $open[p] = 0$ whenever possible

- demand satisfied: $\sum_{p=1}^{5} transport[w][p] \geq demand[w]$ $\forall\ w = 1,2,3,4$