2) Say there are 3 plants ; P_1, P_2, P_3
the sizes of units are S, M, L

a) The decision variables are —

	P_1	P_2	P_3
S	P_{S_1}	P_{S_2}	P_{S_3}
M	P_{M_1}	P_{M_2}	P_{M_3}
L	P_{L_1}	P_{L_2}	P_{L_3}

Z is the total net profit per day

b) Maximize $Z = 420P_{L_1} + 360P_{M_1} + 300P_{S_1} + 420P_{L_2} + 360P_{M_2} + 300P_{S_2} + 420P_{L_3} + 360P_{M_3} + 300P_{S_3}$

Constraints

$$P_{L_1} + P_{M_1} + P_{S_1} \leq 750$$
$$P_{L_2} + P_{M_2} + P_{S_2} \leq 900$$
$$P_{L_3} + P_{M_3} + P_{S_3} \leq 450$$

$$20P_{L_1} + 15P_{M_1} + 12P_{S_1} \leq 13000$$
$$20P_{L_2} + 15P_{M_2} + 12P_{S_2} \leq 12000$$
$$20P_{L_3} + 15M_3 + 12P_{S_3} \leq 5000$$

$$P_{L_1} + P_{L_2} + P_{L_3} \leq 900$$
$$P_{M_1} + P_{M_2} + P_{M_3} \leq 1200$$
$$P_{S_1} + P_{S_2} + P_{S_3} \leq 750$$

$$1/750\,(P_{L_1} + P_{M_1} + P_{S_1}) - 1/900\,(P_{L_2} + P_{M_2} + P_{S_2}) = 0$$
$$1/750\,(P_{L_1} + P_{M_1} + P_{S_1}) - 1/450\,(P_{L_3} + P_{M_3} + P_{S_3}) = 0$$

and $P_{L1} \geq 0$ $P_{L2} \geq 0$ $P_{L3} \neq 0$

$P_{M1} \neq 0$ $P_{M2} \neq 0$ $P_{M3} \neq 0$

$P_{S1} \neq 0$ $P_{S2} \neq 0$ $P_{S3} \neq 0$

We can say the last equality constraint is redundant

$$1/900 (P_{L2} + P_{M2} + P_{S2}) - 1/450 (P_{L3} + P_{M3} + P_{S3}) = 0$$