

Surfboards

DV = # of each type of surfboard to produce.

X_1 = Fish

X_2 = thrusters

X_3 = Quads

X_4 = N-riders.

Obj. Func:

$$\max(z) = \left(2000 X_1 + 2200 X_2 + 2000 X_3 + 2500 X_4 \right)$$

Sum-product

s.t. (constraints)

Resources {

$$\begin{aligned} 0.5 X_1 + 1.5 X_2 + 1.5 X_3 + 1 X_4 &\leq 100 \text{ [shaping]} \\ 0.3 X_1 + 1 X_2 + 2 X_3 + 3 X_4 &\leq 120 \text{ [gluing]} \\ 0.2 X_1 + 4 X_2 + 1 X_3 + 2 X_4 &\leq 140 \text{ [sanding]} \\ 0.5 X_1 + 1 X_2 + 0.5 X_3 + 0.5 X_4 &\leq 50 \text{ [polishing]} \end{aligned}$$

Max demand {

$$\begin{aligned} 1 X_1 + 0 X_2 + 0 X_3 + 0 X_4 &\leq 25 \\ 1 X_2 &\leq 40 \\ 1 X_3 &\leq 25 \\ 1 X_4 &\leq 20 \end{aligned}$$

non-neg {

$$X_1, X_2, X_3, X_4 \geq 0$$

Fertilizer mixing

$$x_4 \geq 0.15x_1 + 0.15x_2 + 0.15x_3 + 0.15x_4$$
$$-0.15x_1 - 0.15x_2 - 0.15x_3 - \underline{0.15x_4} + 1x_4 \geq 0$$

$$-0.15x_1 - 0.15x_2 - 0.15x_3 + 0.85x_4 \geq 0$$

NB: always variables on the left, constants right!

$$\underline{C92 + C30}$$

$$x_1 + x_2 \geq 0.45(\sum x_i)$$

$$x_1 + x_2 \geq 0.45x_1 + 0.45x_2 + 0.45x_3 + 0.45x_4$$

$$0.55x_1 + 0.55x_2 - 0.45x_3 - 0.45x_4 \geq 0$$

$$\underline{D21 \text{ and } C92}$$

$$x_2 + x_3 \leq 0.3(x_1 + x_2 + x_3 + x_4)$$

$$-0.3x_1 + 0.7x_2 + 0.7x_3 - 0.3x_4 \leq 0$$

$$\underline{50 \text{ lb bag}}$$

$$x_1 + x_2 + x_3 + x_4 = 50$$

Portfolio

Gold + constr.

$$x_3 + x_4 \geq 55\% \text{ of the funds invested}$$

$$x_3 + x_4 \geq 0.55(x_1 + x_2 + x_3 + x_4)$$

$$-0.55x_1 - 0.55x_2 + 45x_3 + 0.45x_4 \geq 0$$

trade credits

$$x_1 \geq 0.15(\sum x_i)$$

$$0.85x_1 - 0.15x_2 - 0.15x_3 - 0.15x_4 \geq 0$$