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(1)

a) x = collegiate
y = mini

b) Max Profit
$\max Z = 32x + 24y$

c) Constraints
$3x + 2y \leq 5000$ ← material
$45x + 40y \leq (40 \cdot 35 \cdot 60) = 212400$ ← labor
non-negativity $x, y \geq 0$

d) $\max Z = 32x + 24y$

$3x + 2y \leq 5000$
$45x + 40y \leq 212400$
$x, y \geq 0$

(2)

a) L_{p1} L_{p2} L_{p3} = Large plants 1, 2, 3
m_{p1} m_{p2} m_{p3} = Medium plants
S_{p1} S_{p2} S_{p3} = Small plants

b) objective function

$\text{Max } Z = 420(L_{p1} + L_{p2} + L_{p3}) + 360(m_{p1} + m_{p2} + m_{p3}) + 300(S_{p1} + S_{p2} + S_{p3})$

Constraints

$L_{p1} + m_{p1} + S_{p1} \leq 750$
$L_{p2} + m_{p2} + S_{p2} \leq 900$
$L_{p3} + m_{p3} + S_{p3} \leq 450$
} capacity

$20(L_{p1}) + 15(m_{p1}) + 12(S_{p1}) \leq 13000$
$20(L_{p2}) + 15(m_{p2}) + 12(S_{p1}) \leq 12000$
$20(L_{p3}) + 15(m_{p3}) + 12(S_{p1}) \leq 5000$
} Storage

$L_{p1} + L_{p2} + L_{p3} \leq 900$
$m_{p1} + m_{p2} + m_{p3} \leq 1200$
$S_{p1} + S_{p2} + S_{p3} \leq 750$
} sales

all variables are non-negative ≥ 0