IE3035 Operating Research Quiz #1

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Q1) 2 types of cowboy hats

1) type 1 requires 3 times as much labor as type 2
2) only Type 2 alone → 450 type 2 hats a day
3) market limits → +1 → 100, +2 → 300 hats per day
4) profit → $8 per T_1, $5 per T_2

i) build math model of problem
ii) solve graphically

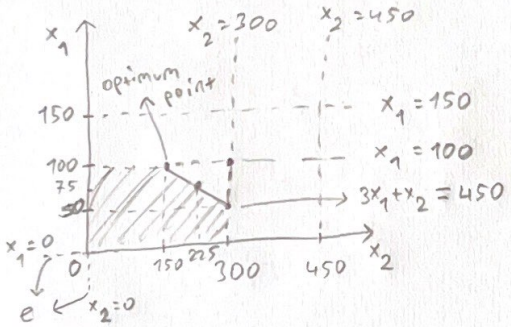
- max profit

Decision Variables

x_1 = Type 1 hat count per day
x_2 = Type 2 hat count per day

Maximize Profit

Profit = $8x_1 + 5x_2$ (from 4)



Optimum Point

$x_1 = 50$
$x_2 = 300$
Profit = $1900

Constraints

a) $x_2 \leq 450$ (comes from 2)
b) $x_1 \leq 150$ (comes from 1 & 2)
c) $x_1 \leq 100$ (" " 3)
d) $x_2 \leq 300$ (" " 3)
e) $x_1, x_2 \geq 0$ (non-negativity)
f) labor $x_{1l} = 3x_{2l}$

$l_{max} = 450 x_{2l} = 150 x_{1l}$ $\quad 8x_1+5x_2$

$x_2 = 150$, $x_1 = 100$, $profit_1 = 8\times100+5\times150$

$x_2 = 300$, $x_1 = 50$, $profit_2 = 8\times50+5\times300$

g) $3x_1 + x_2 \leq 450$ (from labor condition)

$profit_1 = 800 + 750 = 1550$ → feasible

$profit_2 = 400 + 1500 = 1900$ → optimum

$x_2 = 225$, $x_1 = 75$, $profit_3 = 8\times75+5\times225$

75 225 $\quad profit_3 = 1725$ → feasible

× 8 × 5

600 + 1125 = 1725

150

75

225