I.E. 2001 OPERATIONS RESEARCH (Spring 2012)

(Solutions to Assignment 1)

Question 1

Define C = no. of chocolate cakes baked
V = no. of vanilla cakes baked

Maximize Revenue = $C + 0.5V$

st $20C + 40V \leq 480$ OR $(1/3)C + (2/3)V \leq 8$ (Limit on baking time available)

$4C + V \leq 30$ (Limit on eggs available)

$C, V \geq 0$

NOTE: This formulation assumes that all the cakes baked can be sold. Also, you could add integer restrictions on C and V (*this would make it an **integer** linear program*).

Question 2

Define X_1= no. of days spent per month in Mine 1
X_2= no. of days spent per month in Mine 2

Minimize $Z = X_1 + X_2$

st $2X_1 + X_2 \geq 12$ (Gold requirements)

$2X_1 + 3X_2 \geq 18$ (Silver requirements)

$X_1, X_2 \geq 0$

Question 3

Define X_1 = No. of Type 1 trucks produced each day
X_2 = No. of Type 2 trucks produced each day

Maximize Profit = $300X_1 + 500X_2$

st $(1/1500)X_1 + (1/1200)X_2 \leq 1$ (Engine shop capacity)

$(1/800)X_1 + (1/700)X_2 \leq 1$ (Paint shop capacity)

$X_1, X_2 \geq 0$

*NOTE: Like Question 1, we could also have integer restrictions on X_1 and X_2; of course, it would then be an **integer** linear program.*

Question 4

Define S = Dollars invested in stocks
B = Dollars invested in bonds

Maximize Profit = $0.1S + 0.15B$

st (1) $S + B = 1000$ (amount available)

Note that you can also use "≤" instead of "=" but not "≥" (…WHY?!)

(2) $S \geq 0.3(S+B)$, i.e., $0.7S - 0.3B \geq 0$ (at least 30% in stocks)

If you have an "=" for the first constraint you can also state this as $S \geq 300$

(3) $B \geq 400$ (at least \$400 in loans)

$S, B \geq 0$

...don't really need this here since it is implicit from the last two constraints.