Math 340 HW2
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1) steel company in LP problem in standard form

Bands 200 tons/h Bands $25/ton Bands make up to 6000 tons
Coils 140 tons/h Coils $30/ton Coils make up to 4000 tons

40 h of production time available

let x_1 = tons of bands produced per hour
x_2 = tons of coils produced per hour

$$\max \quad 25x_1 + 30x_2$$
$$\text{s.t.} \quad x_1 \leq 6000$$
$$x_2 \leq 4000$$
$$\frac{x_1}{200} + \frac{x_2}{140} \leq 40$$
$$x_1, x_2 \geq 0$$

b) Pulp code

See attached code snippet screenshot / ipynb notebook / pdf in canvas submission

2) Write this LP problem Vanderbei 5th edition, Ex 1.2

a) Passengers traveling from Ithaca to Newark seats 30 passengers
b) Passengers " " Newark to Boston in the aircraft
c) " " " Ithaca to Boston

Three towers drawn
a) Y drawn
b) B drawn
c) C drawn

hw2-question-1

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1 HW2 pulp coding answer

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[1]:
```
# imports
import pulp
from pulp import *
```

1.0.1 Question 1 Vanderbei 5th. Edition ex 1.1

Maximize $25x_1 + 30x_2$

Subject to

$\frac{x_1}{200} + \frac{x_2}{140} \leq 40$

$x_1 \leq 6000$

$x_2 \leq 4000$

$x_1, x_2 \geq 0$

[2]:
```
# Create LP problem
# Name of problem is first param
# LpMaximize or LpMinimize(default) is second param
Lp_prob = LpProblem("Steel_Company", LpMaximize)
Lp_prob
```

[2]:
```
Steel_Company:
MAXIMIZE
None
VARIABLES
```

[3]:
```
# create problem decision variables
# add bounds by adding extra argument
# you could add lower bound by: lowBound = 0 --> x >= 0 (Default)
# you could add upper bound by: upBound = 0 --> x <= 10
x1 = LpVariable("x1") # create varibale x >= 0
x2 = LpVariable("x2")
```

[4]:
```
# Setup the problem
# ALWAYS put objective function first with variable names created earlier
# then add constraints

# objective function
Lp_prob += 25 * x1 + 30 * x2

# constraints
# hours of x1 and x2 less than max hours allowed
Lp_prob += (7 * x1) + (10*x2 ) <= 56000
# upper bound of x1
Lp_prob += x1 <= 6000
# upper bound of x2
Lp_prob += x2 <= 4000

# display problem
print(Lp_prob)
```

```
Steel_Company:
MAXIMIZE
25*x1 + 30*x2 + 0
SUBJECT TO
_C1: 7 x1 + 10 x2 <= 56000

_C2: x1 <= 6000

_C3: x2 <= 4000

VARIABLES
x1 free Continuous
x2 free Continuous
```

[5]:
```
# Solve the lp problem
Lp_prob.solve()
# check lp problem status if equals Optimal,
if not LpStatus[Lp_prob.status] == "Optimal":
    print(f"Optimal Solution was not found, the problem was {LpStatus[Lp_prob.
 ↪status]}")
else:
    for variable in Lp_prob.variables():
        print(variable.name, "=", variable.varValue)
    print("Optimal value is z = ", value(Lp_prob.objective))
```

```
x1 = 6000.0
x2 = 1400.0
Optimal value is z =  192000.0
```