ANSWERS TO ISYE6669 - HOMEWORK 6

In [4]:
```
#Import Library Section
import cvxpy as cp
import numpy as np
```

ANSWER 1 -

Variables -

a = number of units produced for A

b = number of units produced for B

z = value to be minimized

Minutes for production per machine -

	Drill Press	Milling Machine
A	3	4
B	5	3

Objective function to be minimized -

z

Constraints -

1. a + b >= 50
2. a >= 30
3. a <= 100
4. b <= 100
5. -z <= ((3a + 5b) - (4a + 3b)) <= z
6. b >= 0

In [2]:
```
x = cp.Variable(3)

a = x[0]
b = x[1]
z = x[2]

objective = cp.Minimize(z)

constraints = [a + b >= 50,
               a >= 30,
               a <= 100,
               b <= 100,
               -z <= ((3*a + 5*b) - (4*a + 3*b)),
               ((3*a + 5*b) - (4*a + 3*b)) <= z,
               b >= 0
              ]

model = cp.Problem(objective, constraints)
model.solve()
print("\nThe optimal value is", round(model.value,2))
print("Rounded x values:", [round(i,2) for i in x.value],"\n")

#sanity check
#drill = 57.95*(3) + 28.97*(5)
#miller = 57.95*(4) + 28.97*(3)
#print(drill, miller)
```

```
The optimal value is 0.0
Rounded x values: [57.95, 28.97, 0.0]
```

Hence, the minimum absolute difference possible between the two machines within the constraints given is 0. And this case with no difference in their times to produce occurs when there are 57.95 units of A and 28.97 units of B produced.

ANSWER 2 -

Variables -

a = number of suitcases from supplier 1

b = number of suitcases from supplier 2

cost = minimize total cost = cost_a + cost_b (sum of cost incurred by a and b)

Objective function to be minimized -

cost_b + 10a

Constraints -

1. a + b = 500
2. fx = max{(1200 + 5(b-100)), 1200}

   which could be rewritten as...

   (1200 + 5(b-100)) <= cost_b

   1200 <= cost_b

1. a >= 0
2. b >= 0

In [3]:
```
x = cp.Variable(3)

a = x[0]
b = x[1]
cost = x[2]

objective = cp.Minimize(cost)

constraints = [a + b == 500,
               (1200 + 5*(b-100))+10*a <= cost,
               1200+(10*a) <= cost,
               a >= 0,
               b >= 0
              ]

model = cp.Problem(objective, constraints)
model.solve()
print("\nThe optimal value is", round(model.value,2))
print("Rounded x values:", [round(i,2) for i in x.value],"\n")
```

```
The optimal value is 3200.0
Rounded x values: [0.0, 500.0, 3200.0]
```

Hence, minimum cost of 3200 USD would be achieved by buying no units from supplier 1 and all 500 units from supplier 2.

THE END
