HW#4

3/5/2019

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#1

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1 cup of flour = 120 grams, 1 gram = 0.0022046 pounds
1 dough = 0.859802 pounds of flour
1 sack = 58.1529 doughs
1 truck = 51174.58 doughs
```

```
dough = 3.25 * 120 * 0.00220462
```

```
0.859802 <- lbs / dough
```

```
sack = 50 / dough
```

```
58.1529 <- doughs / sack
```

```
truck = 880 * sack
```

```
51174.5846 <- doughs / truck
```

Indices and Data :

m ϵ mills = [Ardent1, ..., Ardent38]$_m$
d ϵ dcenters = [DC1, ..., DC16]$_d$
cf ϵ distcost = [distcost]$_d$ - in $/mile
dem ϵ weeklydemand = [weeklydemand]$_d$ - in doughs
ucf ϵ sackcost = [unitcost]$_m$ -in $/sack
supply = [supplycap]$_m$ -in sacks
miles = [distance]$_{m,d}$ -in miles
startcost = [700 000]$_m$ - in $

Decision Variables:

$$y_m = \begin{cases} 1, & \text{mill is open} \\ 0, & \text{otherwise} \end{cases}$$

$$K_{m,d} = \begin{cases} 1, & \text{mill sends dough to dcenter} \\ 0, & \text{otherwise} \end{cases}$$

Objective Function:

$$\text{MIN} \sum_{m \in \text{mills}} \sum_{d \in \text{dcenters}} \left(2 * \frac{\frac{\text{dem}_d}{58.1529} * \text{cf}_d * \text{miles}_{m,d}}{880} + \text{ucf}_m * \frac{\text{dem}_d}{58.1529} \right) * K_{b,d} + \sum_{m \in \text{mills}} \text{startcost}_m * y_m$$

Sum of the truck(s) traveling from distribution center to mill and back, mill producing sacks of flour at a cost per sack to put on trucks, and the retooling cost for putting each mill which is put into operation. This is weekly cost including start up costs.

ST:

1) DC served by single Mill

$$\sum_{m \in \text{mills}} K_{m,d} = 1; \ \forall \ d \in \text{dcenters}$$

A distribution center can only be served by a single mill.

2) Mills supply less than SupplyCap:

$$\sum_{d \in \text{dcenters}} K_{m,d} * \frac{\text{dem}_d}{58.1529} \leq \text{supply}_m * y_m; \ \forall \ m \in \text{mills}$$

A mill cannot supply more than their supply cap (in sacks) to all distribution centers (a single one in this case) per week.