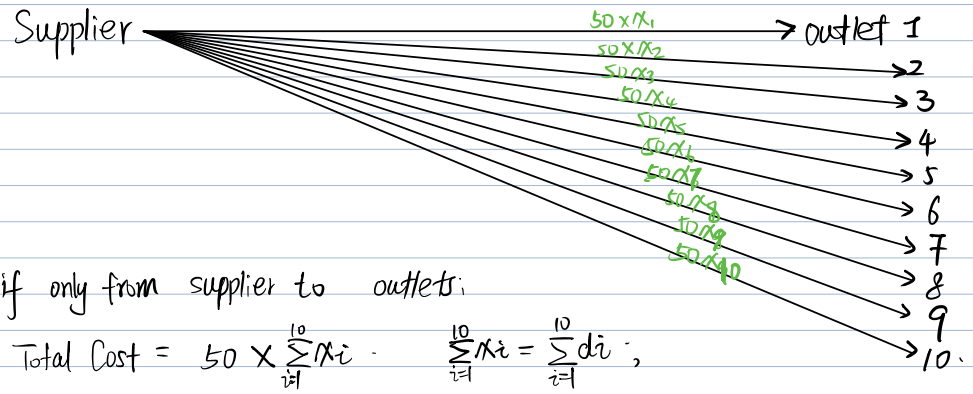
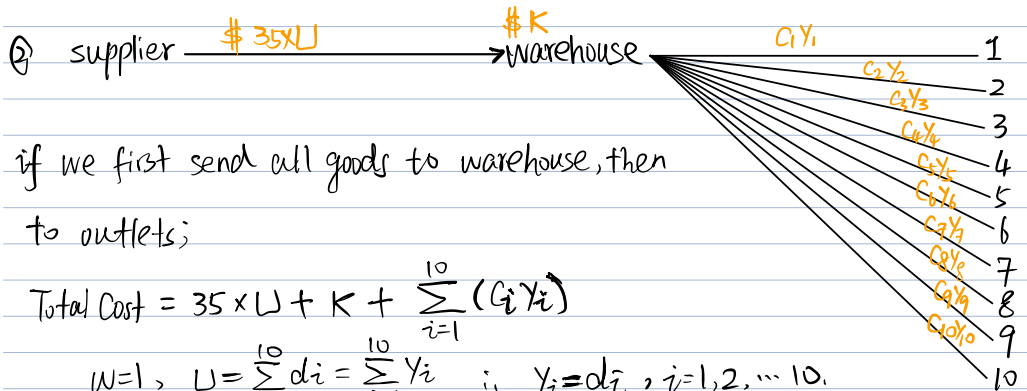
① 

if only from supplier to outlets:

Total Cost = $50 \times \sum_{i=1}^{10} x_i$. $\sum_{i=1}^{10} x_i = \sum_{i=1}^{10} d_i$,

$x_i = d_i$. $i = 1, 2, \cdots 10$.

$w=0$, $U=0$. $x_i \geq 0$.

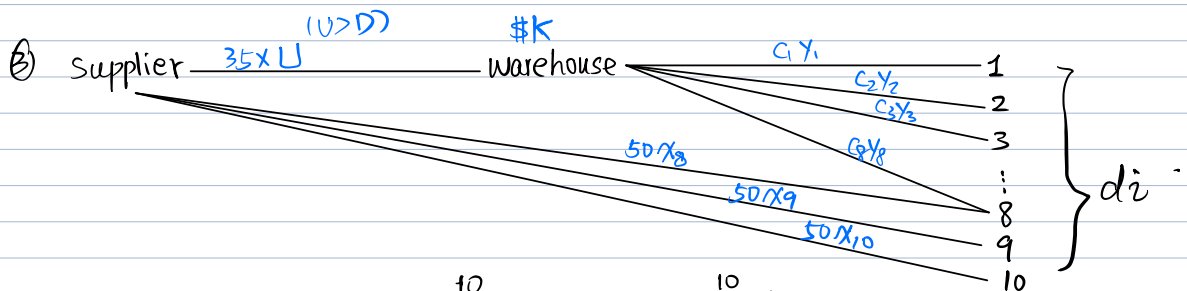
② 

if we first send all goods to warehouse, then to outlets;

Total Cost = $35 \times U + K + \sum_{i=1}^{10} (C_i Y_i)$

$w=1$, $U = \sum_{i=1}^{10} d_i = \sum_{i=1}^{10} Y_i$; $Y_i = d_i$, $i = 1, 2, \cdots 10$.

also: $U \geq D$. $Y_i \geq 0$

③ 

Total Cost = $35 \times U + K + \sum_{i=1}^{10} (C_i \cdot Y_i) + 50 \cdot \sum_{i=1}^{10} x_i$

$w=1$, $U \geq D$ $U \geq \sum_{i=1}^{10} Y_i$ $x_i + Y_i = d_i$ $i = 1, 2, \cdots 10$.

in General: Total 1 = $50 \times \sum_{i=1}^{10} x_i$. $(w=0)$

Total 2 = $35 \times U + K + \sum_{i=1}^{10} (C_i Y_i)$ $(w=1)$

10 10

Total $Z = 35XU + K + \sum_{i=1}(C_i \cdot Y_i) + 50 \cdot \sum_{i=1} X_i$ $(W=1)$

i. Generally: Total $= 35U + KW + \sum_{i=1}^{10}(C_i Y_i) + 50 \cdot \sum_{i=1}^{10} X_i$.

$X_i \geq 0$, $Y_i \geq 0$, $W = \begin{cases} 0 \\ 1 \end{cases}$ $i = 1, 2, \cdots 10$.

Constraints 1 $X_i = d_i$, $U = 0$, $W = 0$.

Constraints 2 $Y_i = d_i$, $U \geq D$ $W = 1$.

Constraints 3 $X_i + Y_i = d_i$ $U \geq D$, $W = 1$.

$U \leq \sum_{i=1}^{10} d_i$

$U \geq \sum_{i=1}^{10} Y_i$.

So in general:

$X_i + Y_i = d_i$.

$(U \geq 0)$

$\begin{cases} U \geq 0, W = 0 \\ U \geq D, W = 1 \end{cases} \Rightarrow U \geq D \cdot W$.

ii. Original Problem in abstract becomes:

$$\min Z = 35U + K \cdot W + \sum_{i=1}^{10}(C_i Y_i) + 50 \cdot \sum_{i=1}^{10} X_i$$

s.t. $X_i + Y_i = d_i$

$U \leq \sum_{i=1}^{10} d_i$ (Case ②)

$\sum_{i=1}^{10} Y_i \leq U$ (Case ③)

$U \geq D \cdot W$. (Case ①, ②)

$X_i \geq 0$, $Y_i \geq 0$, $W = \begin{cases} 1 & \text{warehouse leased} \\ 0 & \text{otherwise.} \end{cases}$