Dive Shop Model

INPUTS:

I = set of classes, A = set of afternoon classes ($A \subseteq I$)

D = set of days

b = number of boats available

For every class $i \in I$, we have:

f_i, v_i = fixed and variable cost of class i

d_{it} = demand for class i on day $t \in D$

m_i = max # of students per offering of i

p_i = price each student pays to take i

a_i = # dives class i needs

l_i, u_i = min & max # of times to offer the class over horizon of D days.

VARIABLES:

$$x_{it} = \begin{cases} 1 & \text{if offer class } i \in I \text{ on day } t \in D \\ 0 & \text{otherwise} \end{cases}$$

y_{it} = # of students assigned to class $i \in I$ on day $t \in D$

OBJECTIVE FUNCTION:

$$\max \sum_{i \in I} \sum_{t \in D} \left(p_i y_{it} - f_i x_{it} - v_i y_{it} \right)$$

CONSTRAINTS:

$$y_{it} \leq m_i x_{it}, \quad \forall i, t$$ (class capacity & relationship between x & y)

$$\boxed{(1-\varepsilon_1) d_{it} \leq} \sum_{t \in D} y_{it} \leq (1+\varepsilon_2) d_{it}, \quad \forall i$$ (satisfy demand)

input parameters

$$\sum_{i \in A} x_{it} \leq b, \quad \forall t$$ (At most b afternoon classes per day)

$$l_i \leq \sum_{t \in D} x_{it} \leq u_i, \quad \forall i$$ (satisfy required # of offerings)

$\sum_{t \in D} x_{it}$: # of times class i is offered over the D days

When doing the high-demand month, make $l_i = 0$ for all $i \neq$ environmental, make $u_i = 30$, & drop the part that is inside the red rectangle above.