

```
In [16]: import pulp as pl
import collections as cl

# data
shift_requirements = [1, 4, 3, 5, 2]
workers = {
    "Melisandre": {
        "availability": [0, 1, 4],
        "cost": 20
    },
    "Bran": {
        "availability": [1, 2, 3, 4],
        "cost": 15
    },
    "Cersei": {
        "availability": [2, 3],
        "cost": 35
    },
    "Daenerys": {
        "availability": [3, 4],
        "cost": 35
    },
    "Theon": {
        "availability": [1, 3, 4],
        "cost": 10
    },
    "Jon": {
        "availability": [0, 2, 4],
        "cost": 25
    },
    "Tyrion": {
        "availability": [1, 3, 4],
        "cost": 30
    },
    "Jaime": {
        "availability": [1, 2, 4],
        "cost": 20
    },
    "Arya": {
        "availability": [0, 1, 3],
```

```
        "cost": 20
    }
}
```

In [17]: workers

```
Out[17]: {'Melisandre': {'availability': [0, 1, 4], 'cost': 20},
          'Bran': {'availability': [1, 2, 3, 4], 'cost': 15},
          'Cersei': {'availability': [2, 3], 'cost': 35},
          'Daenerys': {'availability': [3, 4], 'cost': 35},
          'Theon': {'availability': [1, 3, 4], 'cost': 10},
          'Jon': {'availability': [0, 2, 4], 'cost': 25},
          'Tyrion': {'availability': [1, 3, 4], 'cost': 30},
          'Jaime': {'availability': [1, 2, 4], 'cost': 20},
          'Arya': {'availability': [0, 1, 3], 'cost': 20}}
```

In [18]: shift\_requirements

```
Out[18]: [1, 4, 3, 5, 2]
```

In [19]: prob = pl.LpProblem("Scheduling",pl.LpMinimize)

In [20]:

```
shift_1 = pl.LpVariable("Shift_1",0,None,pl.LpInteger)
shift_2 = pl.LpVariable("Shift_2",0,None,pl.LpInteger)
shift_3 = pl.LpVariable("Shift_3",0,None,pl.LpInteger)
shift_4 = pl.LpVariable("Shift_4",0,None,pl.LpInteger)
shift_5 = pl.LpVariable("Shift_5",0,None,pl.LpInteger)
shift_6 = pl.LpVariable("Shift_6",0,None,pl.LpInteger)
```

In [21]: prob += shift\_1 + shift\_2 + shift\_3 + shift\_4 + shift\_5 + shift\_6 , "Total Nurses"

In [22]:

```
prob += shift_6 + shift_1 >= 70, "MinimumNurses6amTo10am"
prob += shift_1 + shift_2 >= 170, "MinimumNurses10amTo2pm"
prob += shift_2 + shift_3 >= 200, "MinimumNurses02pmTo6pm"
prob += shift_3 + shift_4 >= 85, "MinimumNurses06pmTo10pm"
prob += shift_4 + shift_5 >= 25, "MinimumNurses10pmTo2am"
```

```
prob += shift_5 + shift_6 >= 40, "MinimumNurses02amTo06am"
```

```
In [23]: prob.solve()
```

```
Out[23]: 1
```

```
In [24]: pl.LpStatus[prob.status]
```

```
Out[24]: 'Optimal'
```

```
In [25]: for i in prob.variables():  
         print(i.name, "=", i.varValue)
```

```
Shift_1 = 30.0  
Shift_2 = 140.0  
Shift_3 = 60.0  
Shift_4 = 25.0  
Shift_5 = 0.0  
Shift_6 = 40.0
```

```
In [27]: print("Total number of nurses = ", pl.value(prob.objective))
```

```
Total number of nurses = 295.0
```

```
In [ ]:
```