Assignment 3, Module 6

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Heart Start produces automated external defibrillators (AEDs) in each of two different plants (A and B). The unit production costs and monthly production capacity of the two plants are indicated in the table below. The AEDs are sold through three wholesalers. The shipping cost from each plant to the warehouse of each wholesaler along with the monthly demand from each wholesaler are also indicated in the table. How many AEDs should be produced in each plant, and how should they be distributed to each of the three wholesaler warehouses so as to minimizethe combined cost of production and shipping? Formulate and solve this transportation problem.

Define the decision variables

x1 = plant A, warehouse 1 x2 = plant A, warehouse 2 x3 = plant A, warehouse 3 x4 = plant A, dummy warehouse x5 = plant B, warehouse 1 x6 = plant B, warehouse 2 x7 = plant B, warehouse 3 x8 = plant B, dummy warehouse

Supply is 220 and demand is 210. Because this is the case, we will use a dummy warehouse that has a monthly demand of 10. Thus, supply (220) = demand (220).

#Define the objective function

MIN Y = 22(x1) + 14(x2) + 30(x3) + 16(x5) + 20(x6) + 24(x7) + 600(x1 + x2 + x3 + x4) + 625(x5 + x6 + x7 + x8)

#Define the constraints Production Capacity x1 + x2 + x3 + x4 = 100 x5 + x6 + x7+ x8 = 120

Monthly Demand x1 + x5 = 80 x2 + x6 = 60 x3 + x7 = 70 x4 + x8 = 10

#Solve, identify variables and objective funtion

```
dvar <- make.lp(0,8)
set.objfn(dvar,c(622,614,630,0,641,645,649,0))
lp.control(dvar,sense='min')
```

```
## $anti.degen
## [1] "fixedvars" "stalling"
##
## $basis.crash
## [1] "none"
##
## $bb.depthlimit
## [1] -50
##
## $bb.floorfirst
## [1] "automatic"
```

```
##
## $bb.rule
## [1] "pseudononint" "greedy"       "dynamic"      "rcostfixing"
##
## $break.at.first
## [1] FALSE
##
## $break.at.value
## [1] -1e+30
##
## $epsilon
##       epsb       epsd      epsel     epsint epsperturb   epspivot
##      1e-10      1e-09      1e-12      1e-07      1e-05      2e-07
##
## $improve
## [1] "dualfeas" "thetagap"
##
## $infinite
## [1] 1e+30
##
## $maxpivot
## [1] 250
##
## $mip.gap
## absolute relative
##    1e-11    1e-11
##
## $negrange
## [1] -1e+06
##
## $obj.in.basis
## [1] TRUE
##
## $pivoting
## [1] "devex"    "adaptive"
##
## $presolve
## [1] "none"
##
## $scalelimit
## [1] 5
##
## $scaling
## [1] "geometric"   "equilibrate" "integers"
##
## $sense
## [1] "minimize"
##
## $simplextype
## [1] "dual"   "primal"
##
## $timeout
## [1] 0
##
```

```
## $verbose
## [1] "neutral"
```

#Add constraints Production Capacity

```
add.constraint(dvar, c(1, 1, 1, 1, 0, 0, 0, 0), "=", 100)
add.constraint(dvar, c(0, 0, 0, 0, 1, 1, 1, 1), "=", 120)
```

Monthly Demand

```
add.constraint(dvar, c(1, 0, 0, 0, 1, 0, 0, 0), "=", 80)
add.constraint(dvar, c(0, 1, 0, 0, 0, 1, 0, 0), "=", 60)
add.constraint(dvar, c(0, 0, 1, 0, 0, 0, 1, 0), "=", 70)
add.constraint(dvar, c(0, 0, 0, 1, 0, 0, 0, 1), "=", 10)
```

#Solve and Describe Results

```
solve(dvar)
```

```
## [1] 0
```

```
get.objective(dvar)
```

```
## [1] 132790
```

```
get.variables(dvar)
```

```
## [1]  0 60 40  0 80  0 30 10
```

```
get.constraints(dvar)
```

```
## [1] 100 120  80  60  70  10
```

Results: Costs will equal $132,790

x1 = 0 units x2 = 60 units x3 = 40 units x4 = 0 units x5 = 80 units x6 = 0 units x7 = 30 units x8 = 10 units (dummy capacity)