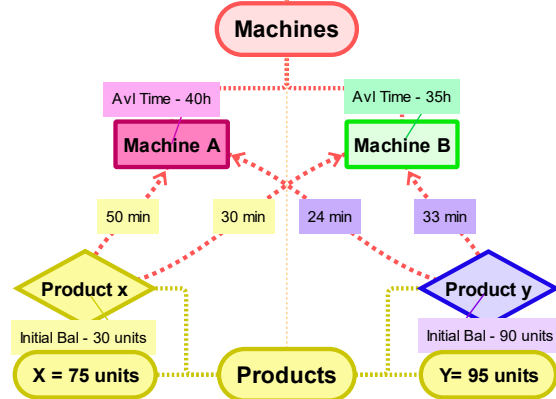


Case Diagram View



Links

Case : Solve this linear program

A company makes two products (X and Y) using two machines (A and B). Each unit of X that is produced requires 50 minutes processing time on machine A and 30 minutes processing time on machine B. Each unit of Y that is produced requires 24 minutes processing time on machine A and 33 minutes processing time on machine B.

At the start of the current week there are 30 units of X and 90 units of Y in stock. Available processing time on machine A is forecast to be 40 hours and on machine B is forecast to be 35 hours.

The demand for X in the current week is forecast to be 75 units and for Y is forecast to be 95 units. Company policy is to maximise the combined sum of the units of X and the units of Y in stock at the end of the week.

Formulate the problem of deciding how much of each product to make in the current week as a linear program.

LP Case : Machine Items

R Code

```

f.obj <- c(1, 1)
f.con <- matrix(c(50, 24, 30, 33, 1, 0, 0, 1, 1, 1), ncol=2, byrow=TRUE)
f.dir <- c("<=", "<=", ">=", ">=", ">=")
f.rhs <- c(2400, 2100, 45, 5, 50)
cbind(f.con, f.dir, f.rhs)
lp("max", f.obj, f.con, f.dir, f.rhs)
lp("max", f.obj, f.con, f.dir, f.rhs)$solution
#x=45, y=6.25
  
```

Formulation

x & y be the number of units of X & Y produced in the current week

Constraints

Machine A Time $40 \times 60 \text{ min}$
 $50x + 24y \leq 40(60)$

Machine B Time $30x + 33y \leq 35(60)$

x Quantity
 i.e. $x \geq 45$ so production of X \geq demand (75) - initial stock (30), which ensures we meet demand

$x \geq 75 - 30$ $x \geq 45$

y Quantity
 i.e. $y \geq 5$ so production of Y \geq demand (95) - initial stock (90), which ensures we meet demand

$y \geq 95 - 90$ $y \geq 5$

Objective Function

maximise $(x+30-75) + (y+90-95)$ Maximise : $(x+y-50)$

to maximise the number of units left in stock at the end of the week

Equations

$50x + 24y \leq 2400$

$30x + 33y \leq 2100$

$x \geq 45$ $y \geq 5$

max: $x + y - 50$

Graphical Solution

$x=45$ and $y=6.25$ with the value of the objective function being 1.25