[Name of the Writer]

[Name of Instructor]

MANAGEMENT SCIENCES

[Date]

**Linear Programming Modeling Using Excel**

For each case of large cups

Labors= 0.75 hours/ case

Materials= 16 Units/ case

For each case of small cups

Labors= 1 hours per case

Materials= 11 Units per case

|  |  |  |  |
| --- | --- | --- | --- |
|  | Labor | Material | Profit |
| X | 0.75 | 16 | 35 |
| Y | 1 | 11 | 30 |
| Total | 120 | 2000 |  |

0.75x + Y = 120 equation 1

16x + 11y = 2000 equation 2

X ≥ 0

Y ≥ 0

To find the value of x multiply equation 1 by 11

8.25x + 11y = 1320 equation 3

Now subtract equation 3 from equation 2

16x + 11y = 2000

-8.25x -11y = -1320

7.75x = 680

X = 87.74

To find the value of y put the value of x in equation 1

0.75 \* 87.74 + y = 120

65.8 + y = 120

Y= 54.2

At Constraint 1 (C1) for equation 1

if the value of x is zero y will be 120

and if the value of y is zero x will be 160

C2 for equation 2

If value of X is zero y will be 181.81

And if Y is zero the value of x will be 125.

The graphical representation of these values is as under.

The highest profit is at the point of intersection of these two lines,at this point the value of X is 87.7 and the value of Y is 54.2, so the profit at this point will be:

Profit= 35x + 30y

Profit = (35 \* 87.7) + (30 \* 54.2)

Profit = $ 4685.5

So the profit at this point is $ 4685.5

Lets find the profit at other points

Profit (0,0) = 35 \* 0 + 30 \* 0

Profit (0,0) = 0

Profit (125,0) = 4375

Profit (0, 120) = 3600

So the maximum profit is at the point of intersection.

The optimal solution will be the same as the maximum profit. At this point, the company can earn maximum profit.

The binding constraints in this question are both the constraints because the slack value for both equations is zero.

To find the binding constraint put the values of x and y in both equations.

0.75x + y = 120

0.75 (87.7) + 54.2 + S1 = 120

65.8 + 54.2 + S1 = 120

120 + S1 = 120

So S1 = 0

In equation 2 put the values of x and y we get:

(16 \* 87.7) + (11 \* 54.2) + S2 = 2000

1403.6 + 596.4 + S2 = 2000

2000 + S2 = 2000

So the value of S2 is 0, hence it proved that both the constraints are bindings.