Optimization Assignment

Case Study on Sholay Cars

A Report submitted to the

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For Certificate Programme in Business Analytics

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Executive Summary

This is an optimization case study about Sholay Cars, Jay and Veeru in which our objective is to maximize the profit. We have found profits for different scenarios and tried to figure out when our profit is maximum and what should be the number of Jays and Veerus.

We have followed the below steps for different scenarios:

The first step is defining the decision variables In this case study, **x** is the **number** of Jay model and **y** is the **number** of Veerus model.

The second step is defining the **Resource constraints**:

Labour Constraints: 12x + 6y <= 48000

Doors constraints: x + 2y <= 10000

Demand constraints: x <= 3000

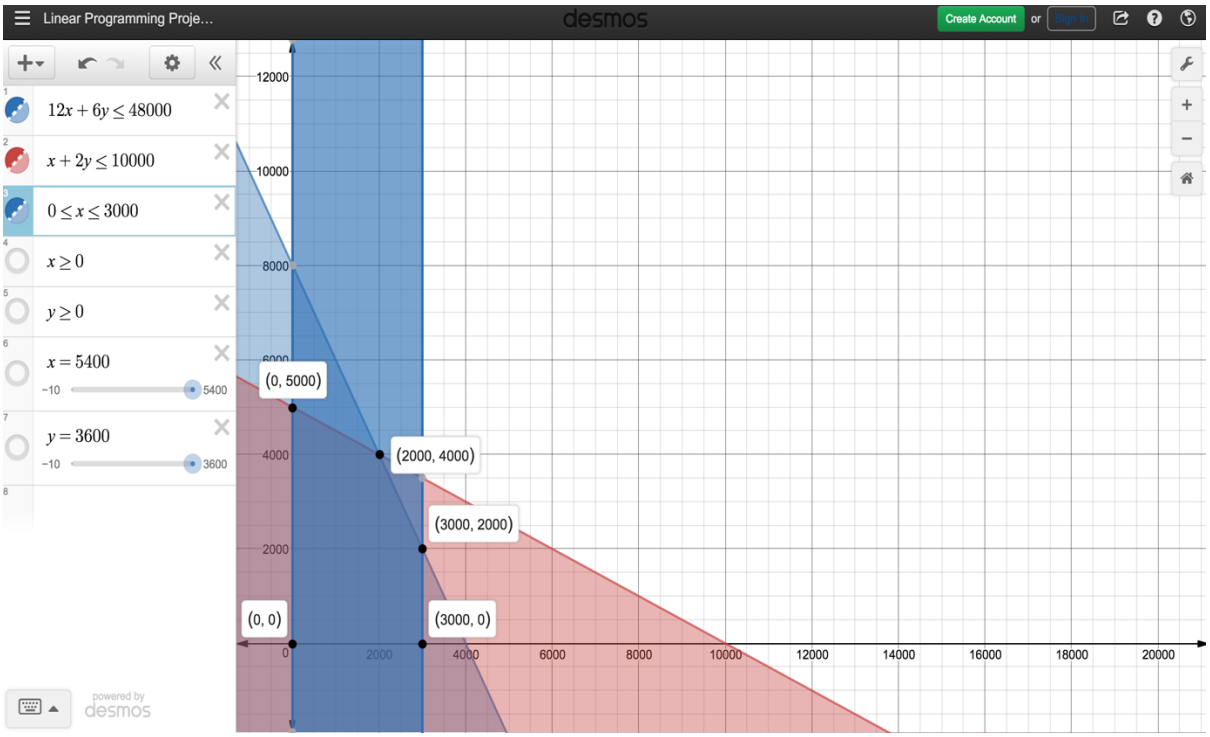
The third step is defining the Objective constraints. The objective constraint according to our case study is:

Maximize: (5400*x)+(3600*y) ← **Objective Function**

The above functions will keep on changing as we proceed and try to maximize profits along the different cases given to us.

Solutions

a) As per the case study, the constraints are written and highlighted in the graph below,

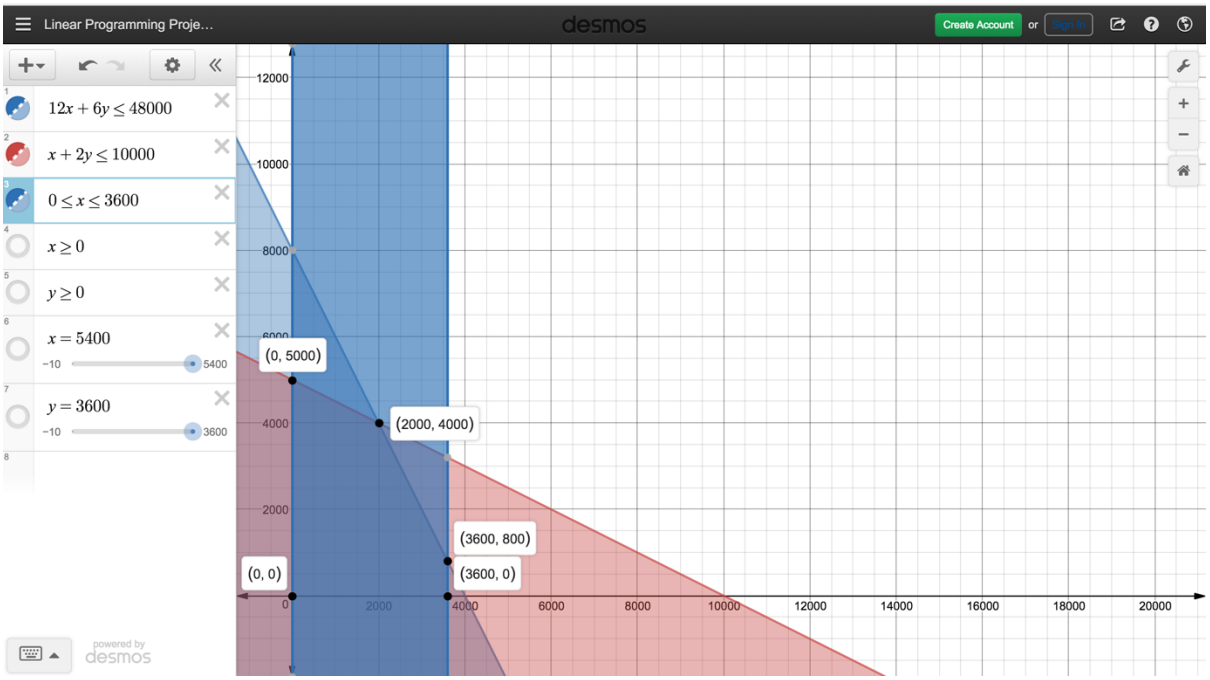


Here we can see that, the optimal solution is x= 2000 and y=4000 as the profit is maximum in the case.

Substituting the values in Objective function

Z=5400*3000 + 3600*2000 =23400000 ← Profit

b) Since demand is increased for Jay models by 20% i.e, it changes to 3600 from 3000.The constraints will change as follows:



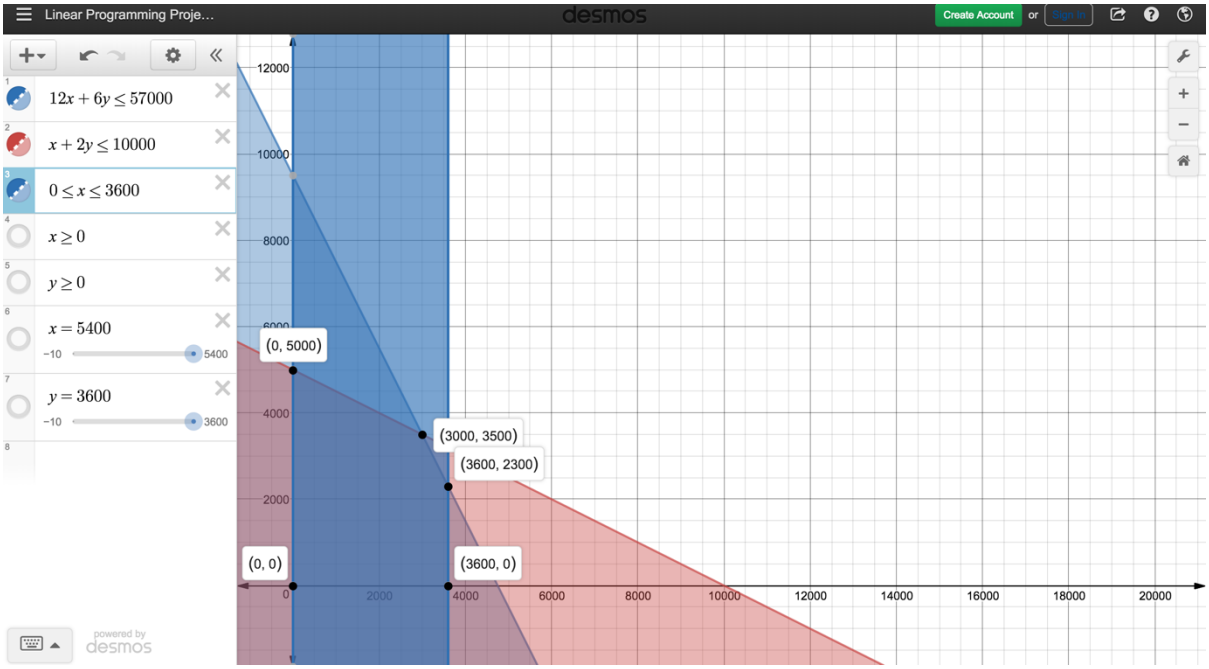
Here we can see that, the optimal solution is x= 3000 and y=2000 as the profit is maximum in the case. Substituting the values in Objective function

Z = (5400*3000) + (3600*2000) = 23400000

Cost=	5,00,000
Net profit=	2,29,00,000

Since the net profit after paying advertisement cost is less than profit in case (a). Hence we should not take advertisement campaign.

c) Now since the capacity hours have increased, the new graph along with the updated constraints are as follows:



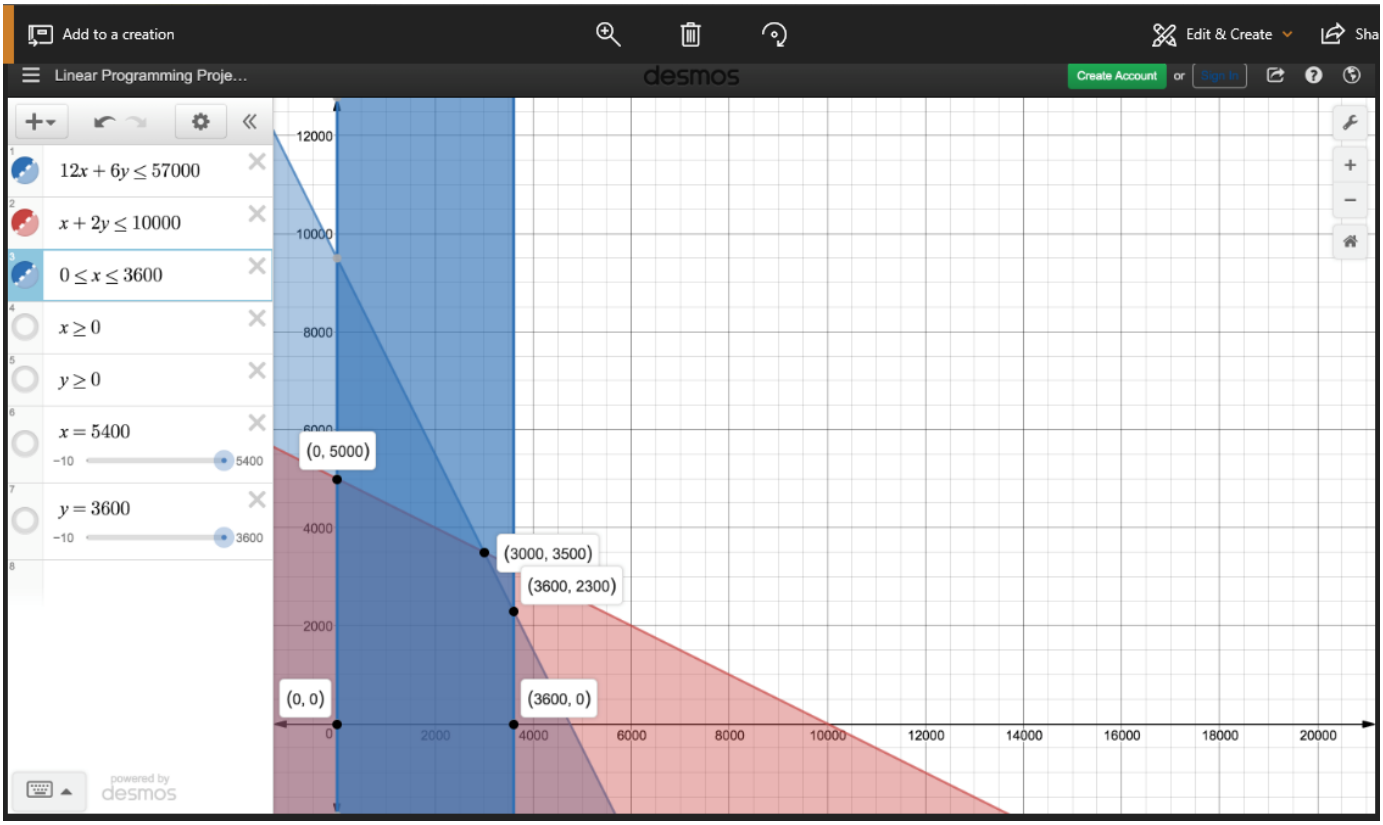
Here we can see that, the optimal solution is x= 3000 and y=3500 as the profit is maximum in the case. Substituting the values in Objective function

Z = (5400*3000)+(3600*3500)= 28800000

Also increased capacity has led to additional profit.

Additional profit = 5400000

d)



Our optimal solution is (3000,3500). With both targeted audience and increased labor hours, the number of Jay should be 3000 and Veerus's should be 3500.

The profit with this technique: (5400*3000)+(3600*3500)= 28800000

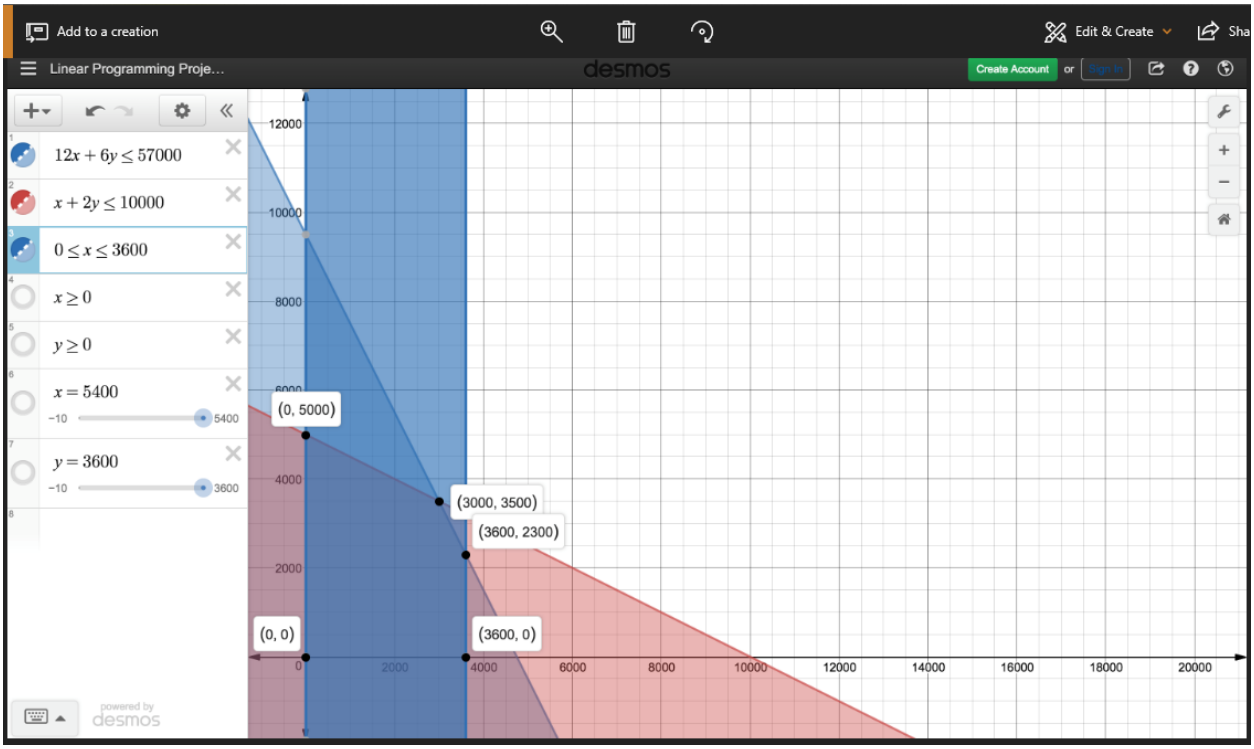
The cost is 500,000

The net profit is 28,300,000

e) The approach in d) is good as we still have some profit as compared to a) approach.
Also up till now we have observed the ad campaign alone doesn't give us any additional profits but increasing labor hours alone does increase them and even the combination as we saw still remain profitable although less than c) case where labor hours was increased alone.

So our approach for maximum profits is to increase labor hours and probably not go with ad campaign alone.

f)



The objective function changes as per the question and is (5400*x)+(2400*y), x is the number of Jay models and y is the number of Veeru model.

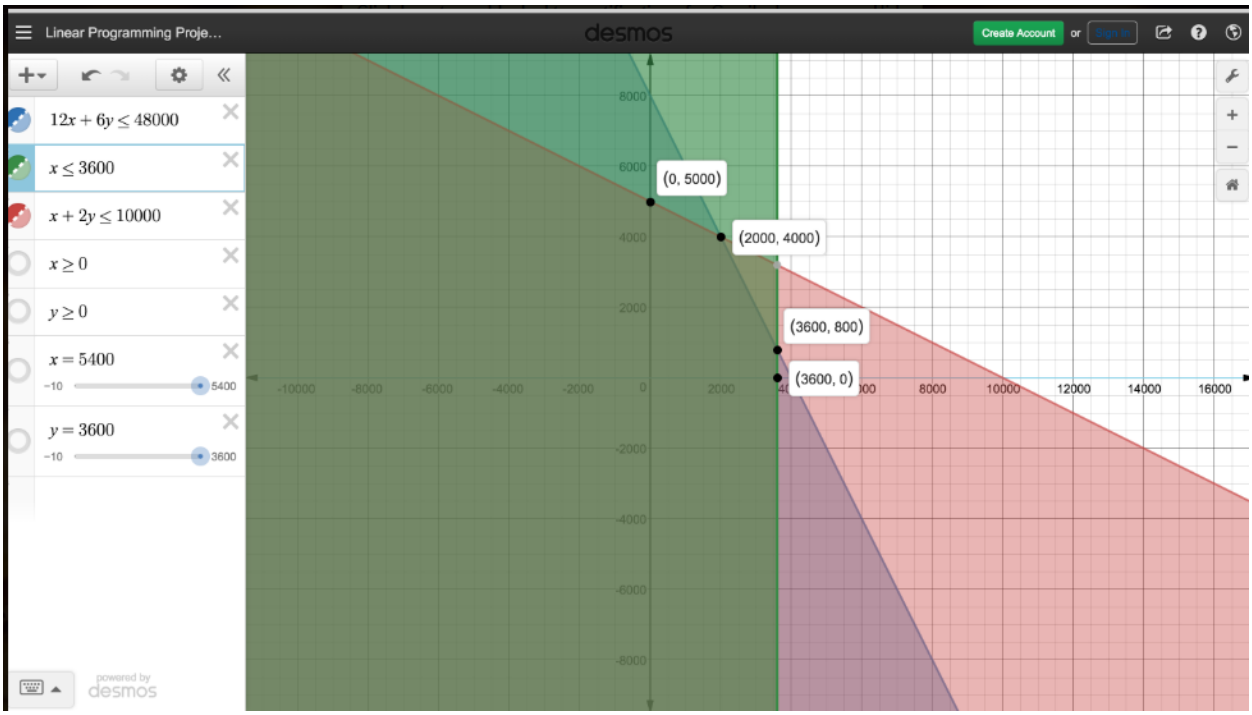
So, the optimal solution for this would be (3600,2300).

The number of Jays should be 3600 and number of Veerus should be 2300 for maximizing the profit.

And corresponding profit would be 24960000. Since the adverstising campaign needed us to spend 500,000 so the profit will become 24,460,000.

- The profit as compared to part (d) has decreased.

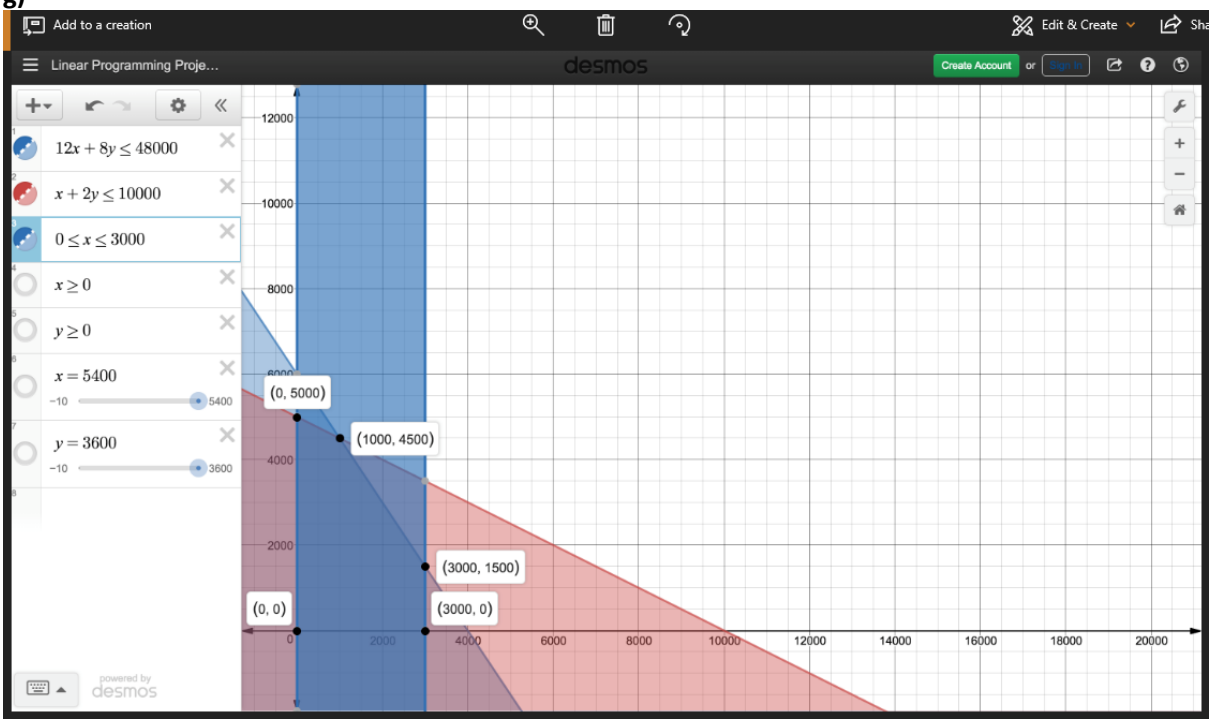
The next graph shows if we just consider the advertising campaign with the new objective function, the optimum solution will change as seen from below graph:-



Our optimal solution is (3600,800). The total profit will now become :-
(5400*3600)+(2400*800) = 21360000 – 50000 = 20,860,000.

Since this is less than the earlier case so we should take the constraints we took in (d) part.

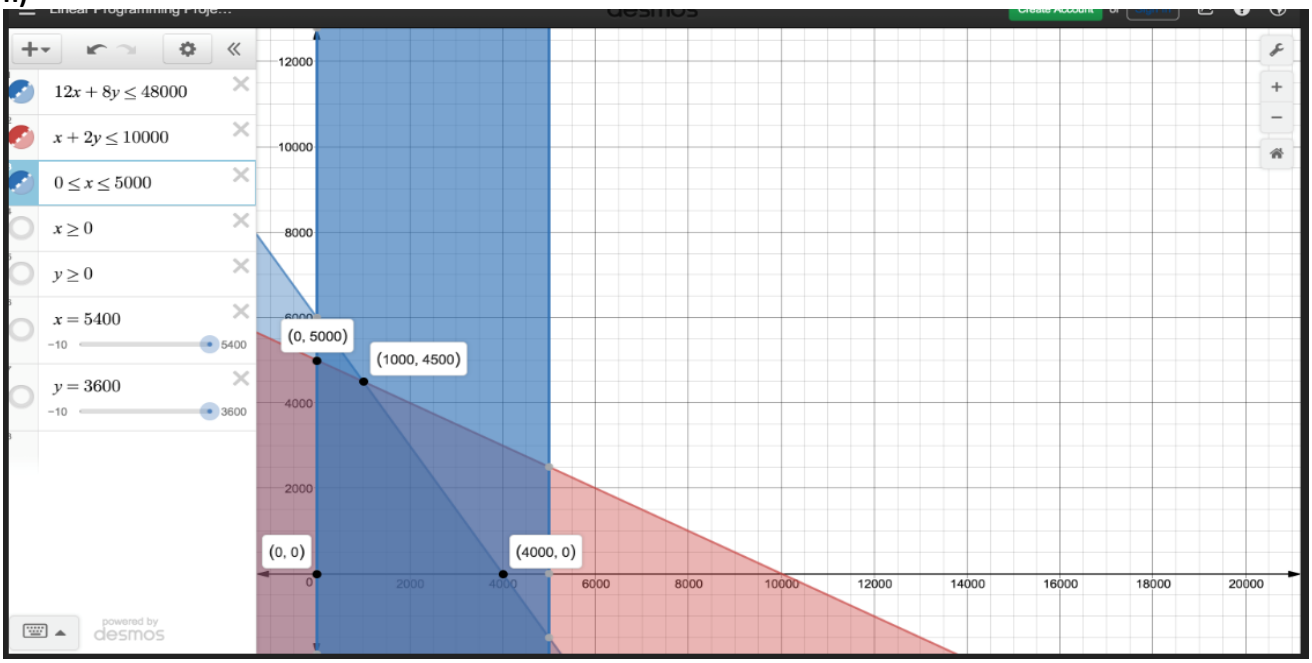
g)



From the above, we get two optimal solutions (1000,4500) and (3000,1500). At both the points we get a maximum profit of 21600000. This is a case of multiple optima.

The number of Jays and Veerus could be 1000 and 4500 OR 3000 and 1500 respectively.

h)



Our optimum solution for this scenario is (1000,4500).

The profit for this point will be (5400*1000)+(3600*4500)= 21600000

The Reduction in profit will be 23400000- 2160000 = 180000 which is less than $20,000,00 hence the company might take on this strategy.

i)

From the above, b- h parts we have observed that

- Using ad campaign alone reduces our profit
- Increasing labor hours increases our profit the highest which is 28800000
- When we introduce both labour hours increase and the ad campaign we see that there is a dip from the above case. So we can clearly see that the increment effect that increasing labour hours is doing to the profit is decreased by ad campaign introduction. But labour hours increase

is more prevalent and still we have more profit than the case a) where we do not apply these changes in labour capacity hours and ad campaign.

- When we increase the demand in Jay model to capture share of the market, the profit is actually the least which is 21600000.

The above shows how the profit varies in different cases.

----------THANK YOU----------