**(Makeup)** A company manufactures two types of makeup, lipstick and blush. Each makeup product must go through the pigmenting factory and the assembly shop. If the pigmenting shop were completely devoted to putting pigment into lipstick, 650 per day could be pigmented, whereas if the pigmenting factory were completely devoted to putting pigment into blush, 550 per day could be pigmented. If the assembly shop were completely devoted to assembling lipstick containers, 1400 per day could be assembled, whereas if the assembly shop were completely devoted to assembling blush containers, 1000 per day could be assembled. It is possible, however, to pigment both types of makeup in the pigmenting factory. Similarly, it is possible to assemble both types of makeup in the assembly shop. Each lipstick contributes $2500 to profit; each blush contributes $3000. Use Solver to maximize the company’s profit.

# Discussion:

From question we are clear that there are two makeup products and there are two steps involved in manufacturing it. Unit profit for each type of makeup is clear and our objective is to maximize the profit. So, we should decide on the numbers of each product that could be produced by the company to maximize the profit. We have two types of makeup products but only one pigment shop and one assembly shop. Once the lipstick gets its pigmentation, it will flow to assembling shop. Per day limits of pigmenting shop and assembling shops were given, but the inputs given illustrates the capacity of shops if they could completely have devoted to one type of makeup product. We can understand from question that a company can pigment/assemble both types of makeup in these shops, which means our real problem is to set a constraint which limits our decisions (number of products) so that we will not overload the per day work which can be done by pigmenting and assembly team.

This problem tests our mathematical skills. Do you remember “Work—Time” problems? Let’s look at small example which might help you in understanding the concept. Suppose one painter can paint the entire house in seven hours, and the second painter takes nine hours to paint a similarly-sized house. How long would it take the two painters together to paint the house? If the first painter can do the entire job in seven hours and the second painter can do it in nine hours, then the first guy can do (1/7) of the job per hour, and the second guy can do (1/9) per hour. The question then becomes, how much then can they do per hour if they work together? Just do the summation (1/7) +(1/9). Let us assume that “t” is the total time taken by two painters to complete the task, then the above summation is nothing but equal to (1/t).

(1/t) = (1/7) +(1/9) ---- This equation will help us in finding the time taken by two people to complete the job by working together. The important thing to understand about the above example is that the key was in converting how long each person took to complete the task into a rate. You can use this concept while writing the per day limitations of painting and assembling.