Now, we solve this problem, multiple choice problem. What is the optimal objective function value for this problem? To compute optimal objective function value, we do have two ways. One is to multiply the final values by the coefficients of the objective function. Final values by the coefficients of the objective function. That is explicit way, and a way that all of us will. So I multiply 0, 27.5, and 0 by 500, 300, and 400. This is 0. It doesn’t have an impact. This is 0. It has no impact. So the only thing that is non 0 is 27.5. So I multiply by 300, therefore, the answer is $8,250.

What is the allowable range objective function coefficient activity 3? We are talking about activities not resources, therefore, we should look at the top part of the table, and we are talking about activity 3, allowable range for activity 3. Activity 3 is here. Its objective function coefficient is 400. It can go up by infinity, therefore, on increased direction, it can go to infinity. On decreased direction, we can reduce it by 250 and still we are within the range. So 400 minus 250 is 150. Therefore, the range is from 150 to infinity. 150 to infinity. What is the allowable range for the right-hand side of resource A? We are talking about resource right-hand side of the resource, therefore, we should go to the bottom part of the table, bottom part of the sensitivity analysis report. Resource A is here. The right-hand side is 60. We can increase it by 50 units, therefore, the highest value is 110, but we can also decrease it by infinity. So it can go to negative infinity. But usually these resources do not become negative. So when we say negative infinity, we mean it can go to 0. But if negative infinity is one of the choices, from negative infinity to 110, that is also correct, but usually we write from 0 to there. So the answer is B.

If the coefficient for activity 2 – we are talking about activity, top part of the table, activity 2. The coefficient in the objective function is changed to 400. So I go back to the table, to the top part of the table, and look for coefficient of activity 2. Activity 2 is 300. The coefficient is 300. Now it says if it is changed to 400, 400 is 100 units more than 300. But we know that in increased direction we can increase this coefficient by 500 units and still remain within the range, within the range in which the production plan remains the same. Therefore, increasing that coefficient by 100 units is still within the range, and therefore the production plan remains the same. We still produce 27.5 units of that product. Please note that 27.5 does not create a problem. You cannot criticize this problem by saying who can produce 27.5 units. Don’t forget if today you produce 27.5, today you have produced 27, tomorrow you will produce 27.5 plus the half of the previous day would become 28. Therefore, in 2 days you still produce integer number of products. Therefore, don’t be worried that the number of units that you produce is not integer. After several days, it will become integer. For example, if it was 27.1, after 10 days we will have integer number of products. .1 Extra each day after 10 days, 10 times .1 is 1. Anyways, let’s look at our problem here. Profit increased by 100, we are producing 27.5, therefore, our objective function value will increase by 2,750. Therefore, the answer is B. If the coefficient of activity 1 in the objective function is changed to 50 -- activity 1 coefficient in the objective function is changed to 50, coefficient is 500. It is changed to 50. That is minus 450. We should reduce it by 450 units. But allowable range is 425 units, therefore, that is out of the range, and we cannot say too much. We should solve the problem from the beginning and find a new optimal solution.

If the coefficient of activity 1 or the objective function changes to $50 then the objective function value, we don’t know exactly what will happen to the objective function value, therefore, can only be discovered by solving the problem from the beginning. If the coefficient of activity 2 in the objective function is changed to 100, activity 2 is 300. It is changed to 100. Therefore, that is negative 200. We will reduce it by 200 units. And 200 units is within the range, because it can be reduced by 300 and still remain in the range. Therefore, the production plan will remain the same. This production plan will remain the same, and therefore this number instead of being multiplied by 300, it is multiplied by 100. 200 degrees, therefore, I multiply 200 by 27.5, and that would be 5,500 units degrees. Now let’s go and see which one of the answers is correct.

The production plan remains the same because it is within the range. The objective function value will reduce by 5,500. The original solution remains optimal. The objective function value decreases. A is correct. Let’s just make sure the others are not correct. The problem must be resolved – no. We know A is correct. The shadow prices will remain the same, no. When the coefficient of objective function changes, if it is within the range, the optimal solution remains the same. The production plan, the product mix, the optimal solution remain the same. These three names are used interchangeably, optimal solution, product mix, production plan. Remains the same, but because profit it is are increased or decreased, shadow prices will change. So shadow price will not remain the same. The original solution and the objective function value will remain the same. No, the original solution remains the same, but the objective function value will decrease. None of them. A is correct.

If the right-hand side of resource B is changed to 80 -- right-hand side of resource B is changed to 80, resource B, right-hand side, is changed to 80. That is negative 30. 30 units decrease is within the range because we can have 46 units decrease and still remain in the range. It is within the range when we are talking about – let us talk about the table when we are in the range. The shadow prices will remain the same. Therefore, as long as resource 2 is constant, that shadow price is multiplied by 80 instead of 110, and therefore, 75 times 32,250 – shadow prices will remain the same. The objective function value will reduce by 2,250. The objective function value will decrease by 200, 250. If the right-hand side of resource C is changed to 140, what will happen to the objective function? Resource C, right-hand side, 80. If it is changed to 140, that is plus 60. Plus 60 is out of range, therefore, we should solve this problem from the beginning to see what happens to the objective function value. So the answer is E.

If the right-hand side of resource C is changed to 130, let’s see what will happen. Right-hand side of resource C is changed to 130. Right-hand side of resource C80 is changed to 130 + 50. + 50 is within the range, allowable increases 57.5, therefore shadow prices will remain the same. But shadow price of this resource is 0. 0 multiplied by 50 is 0. Shadow price remains the same, but there is no change in the objective function value. The original solution that remains optimal, the objective function value will increase? No. It will not increase. The objective function value will increase? No. It will not increase. The problem must be resolved – the shadow prices remain the same. The objective function value will decrease, no. The shadow prices remain the same. The shadow prices will remain the same. That is correct. If the coefficient of activity 2 and activity 3 move or are decreased by 100 unit it is, then what will happen to the objective function value? Activity 2 and activity 3. So I write A2 and A3. Both are decreased. 100 and 100. So I should compute ratios ratio 1, ratio 2. And I always put a positive sign between them, no matter go if it is decreased or increased. But now I should go to allowable decrease, 300 and to 50. So I write here 300, and I write here 250, and that is equal to 0.33 plus 0.4, which is less than or equal to 1. Therefore, the final values, the production plan, the optimal solution; remains the same, this is decreased. This is decreased. Both are decreased by 100 units. Negative 100, and negative 100. Negative 100 times 27.5 is equal to negative 2. 750 negative 100 times 0 is 0, therefore, the objective function value will decrease by 2750. The objective function value will decrease by 2750. If the right-hand side of resource C is increased by 40, and right-hand side of resource B is decreased by 20, again, remember when we talk about decrease or increase in value of more than one parameter, those parameters should be of the same nature either objective function coefficients or right-hand side. Here we are talking about right-hand side. Therefore, if it is less than or equal to 1, things remain the same, and things when we talk about right-hand side are shadow prices. Resource B decrease. 20. Resource C increase, 40. Ratio, ratio, positive sign, B decrease, 46, 46, C increase 57.5. This is close to .5. This is close to .67, so I think this is greater than 1, definitely greater than 1. We cannot say anything. We should solve the problem from beginning, because it is greater than one. It is not less than or equal to one. The optimal solution remains the same, no. The objective function value increased by 1500? No. The shadow prices remain the same? No. Only can be discovered after resolving the problem? D.

Finally we go to this question. Resource A is increased by 25, and resource B is decreased by 20. Resource A increased by 25. Resource B decreased by 20. Ratio, ratio positive sign, an increase, 25 allowable increase. 50, B. Decreased. 46, this is .5, this is less than .5. If you do the computation, you see this is less than or equal to 1, therefore, things remain the same. What are the things that remain the same? Shadow prices. Resource A, 25, multiplied by the shadow price, which is 0. That was increase. Resource B, 20 degrees. 20, negative, multiplied by 75, 1500 degrees. The objective function value will increase. The objective function value will decrease by 1500. That is the correct answer. D is correct.