Marketing Analytics
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Lecture No 23
Pricing (contd.)

Hello everybody, welcome to Marketing Analytics course. This is Doctor Swagato Chatterjee from VGSOM, IIT Kharagpur who is taking this course. And we are in week 5 and we are discussing about pricing. So, in this whole week we will be discussing about pricing in great details. And in this particular class we will discuss about power block pricing. So, power block pricing is the pricing that generally the power companies, the electricity companies generally try to use.

So, even there are also so you will see that the demand of electricity will be dependent on the price. As price goes up the demand comes down. But the electricity companies has to decide that there are various time periods, from at which the prices will be different and probably there are various kinds of users for whom prices will be different. The charges for domestic users and the charges for probably the industrial users should be different.

So, all of this things comes into this picture. And we try to, and then there are certain cost which are fixed. For example, let us say, if you, I am pretty sure you know that let us say you have went out from your home for a very long time, let us say probably 2 months, 3 months, you still have to pay a little bit of money for the electricity probably for the meter that is there or some basic base price you have to pay.

So, there are those, that is also one type of pricing where you have to pay some amount of price which is base. And after that for every additional usage of electricity you will actually pay more. So, all of these things comes under the power block pricing and we will discuss about that particular strategies, various strategies that one can adopt to take care of power block strategy in details.

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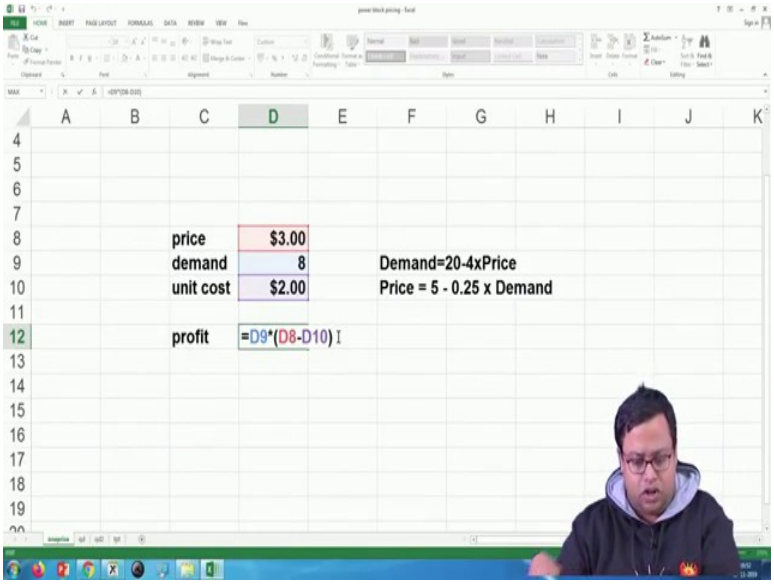

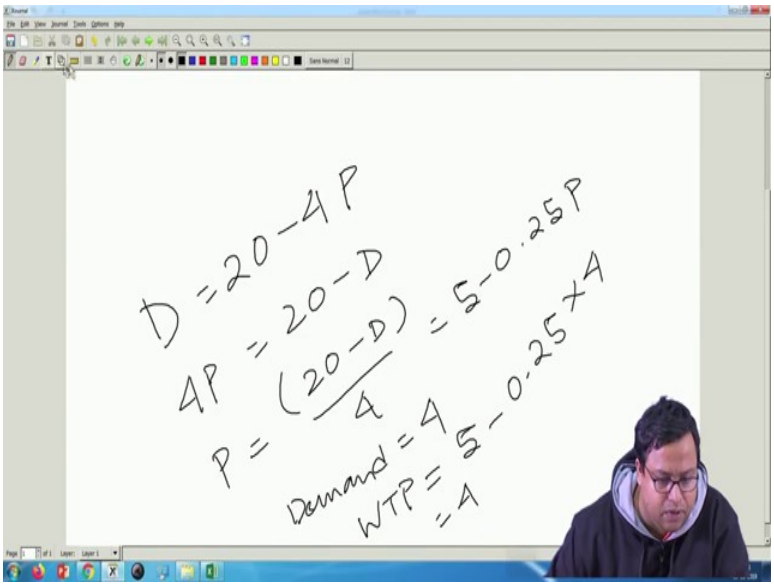

So, in this particular class, we will talk about basically four ways and this is the very basic one the starting one which we will start with. So, let us say, I have from the past data I find out that demand is a function of price and the formula that is written is Demand (D)=20-4×P.

So, if D=20-4P, then basically I can write 4P=20-D; and I can also write P=(20-D)/4=5-0.25P. And that is what is probably written here, that I can also write price is a zip function of demand instead of demand as a function of price.

So, both ways I can write that and why that, what does the second line mean? Actually does it, does the price is affected by the demand is actually sometimes affected. As demand goes up if the supply is constant, then the price will also go up. So, you will know that that the equilibrium will come and both demand and price can actually impact each other.

Another thing what the cyclical relationship other than the cyclical relationship another thing what we want to say by saying this the last line is probably this price can also be used as willingness to pay of the customers, of the last customer. So, if the demand is x, so let us say according to this formula the demand is let us say by any chance the demand is let us say 4.

Then the last customer, who has the lowest willingness to pay, the willingness to pay for the last customer will ,WTP=5-0.25×4=4. So, that is where also this particular equation, this particular equation comes in handy, and we will use this equation to solve certain problems which is related to willingness to pay as well.

So, now before I go ahead and do all those stuff, the first thing that I want to focus on is what happens when there is a normal pricing. There is nothing extra, excess, excessive thing that is there, so normal pricing. So, I have written price, demand, cost and profit. Price let us say, let us say I set the price as 3 rupees.

So, if the price is 3 rupees, what will be the demand? 3 dollars in this case, what will be the demand? Demand=20-4×P. So, that is the formula that has been written there, (20-4×D8). Why D8? Because D8 is where the price is written. The 3 dollar is written there.

So, (20-4×3)comes up to be (20-12)that means 8, 8 is my demand. And I am assuming that the unit cost is 2 dollars. So, let us say this is the situation that has been given that the demand function is given 2 dollar unit cost is given what is the maximum profit that you can make out of it?

You can make profit as, carefully see D9, D9 is what? D9 is the demand part (D9×D8-D10). What is D8? D8 is the price and - unit cost.

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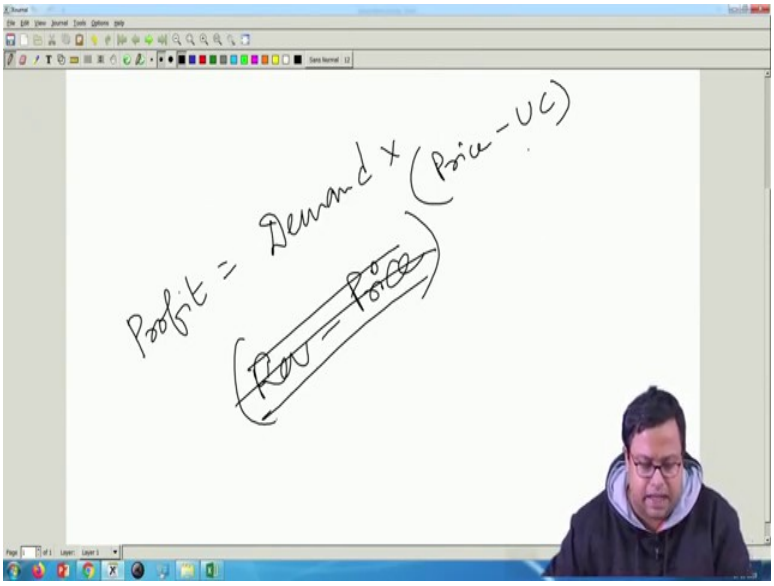

So, this formula comes up to be like this, that your profit is, your Profit=Demand×(Price-Unit Cost). That comes up to be your profit. Now, I have to do something to maximize this profit. So, I can write it in a in a formal way also.

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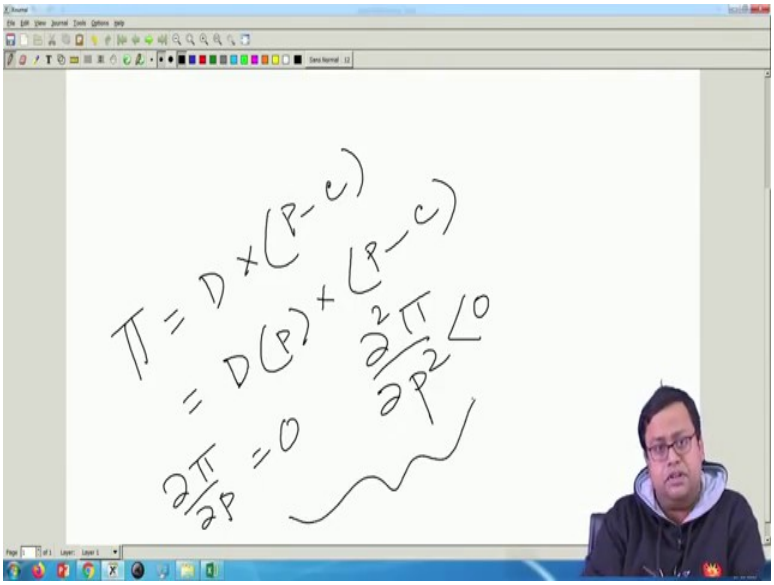

So, I can write it like this that that okay, so my profit (π)=D×(P-C), where C is the unit cost and D is also a function of P.(D(P)). So, basically (P-C), so this I can find out for which P this becomes 0 ($\delta\pi/\delta P^2=0$) and this becomes negative($\delta^2 \pi/\delta P^2<0$), I can solve that. So, in the, in our

previous class we have seen that this can be solved using solver in your excel file. So, I will also use solver in my Excel to solve this thing.

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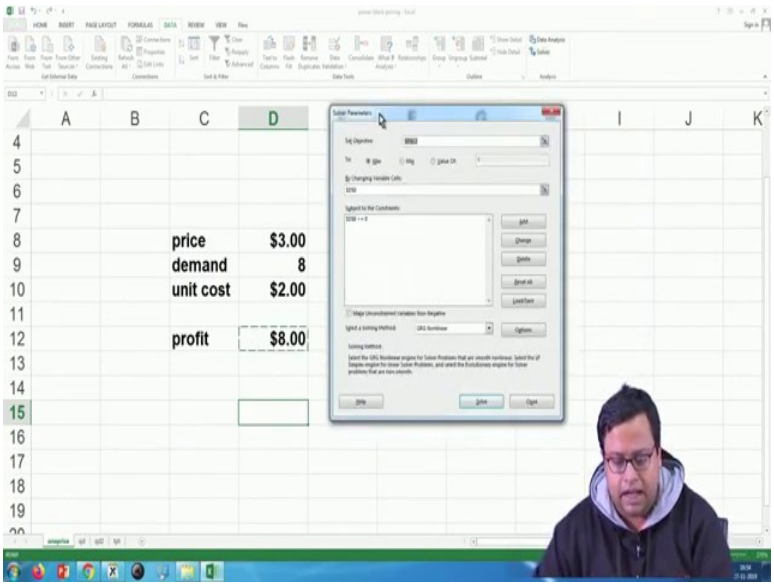

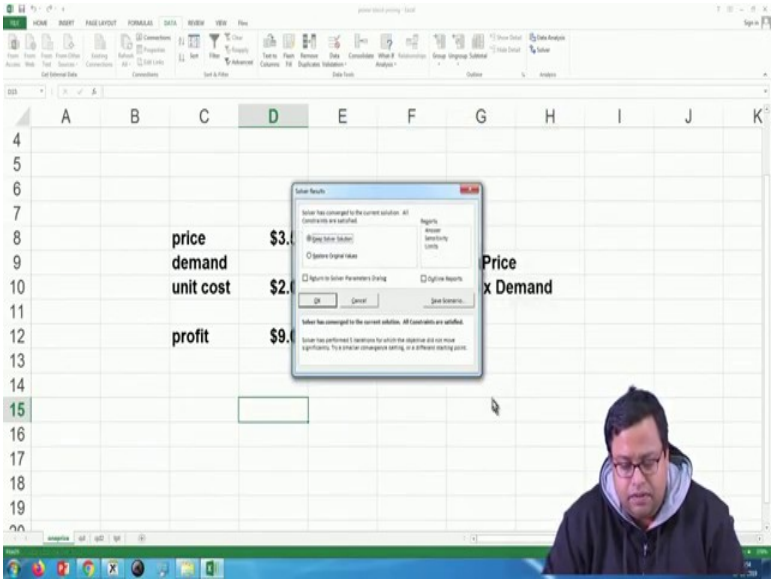

So, I will go to this and I will go to data and there there is a solver button in and previous video I have shown you if the this particular button is not there what to do to get this button. So, I will click on this one. And when I click on this one, so it is asking me that which one I will want to optimize.

So, I will want to optimize D12 by changing so maximize the D12 by changing what? By changing my price. So, by changing D8 and D8>0, and this you can probably delete and make the unconstrained variables non negative, that is enough.

So, if you just select that and GRG nonlinear because this is nonlinear function, try to solve it you will get a solution. And the solution is saying that 3.5 dollars is the optimal price in this particular case. And the profit in this particular case you are getting is 9 dollars because there will be 6 people who will be buying it. Your unit cost is 2 dollars. So, 3.5-2=1.5 dollar and then for 1.5 dollar× 6 is your demand, 1.5 is your unit margin actually. So, 1.5×6comes up to be 9 dollars(1.5×6=9).

So, that is something that you generate when you are doing a profit maximization and you can set up only one single price. But in real life situation, as I told that you can actually set up multiple levels of pricing. So, you can say that in our in some of the places where I stayed it was 0 to 100 units some price, 100 to 150 units some other price, 150 to 200 units some other unit price.

And that actually is dependent on how much is the willingness to pay of those people who actually consume up to that level. So, they keep on a tap on, so keep on actually doing surveys or somethings. And they say that, this demand curve that you have put is not always a linear curve, it can be a book in linear. But even if it is linear, even if they are a one single slide that defines a demand curve still we can have prices at different levels and that is something that we will talk about right now.

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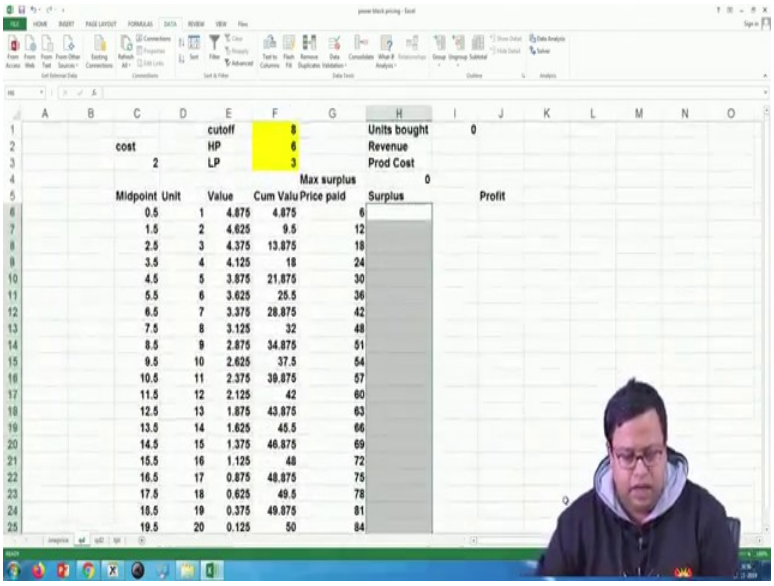
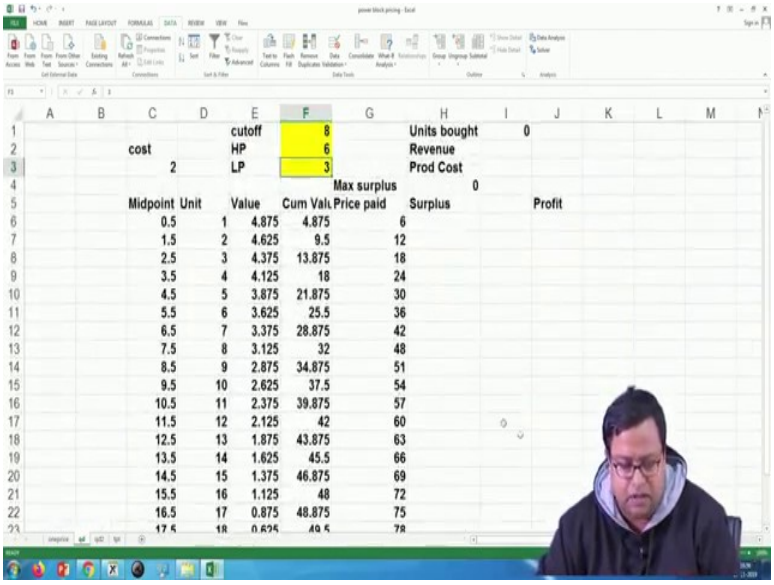


				cutoff	8		Units bought	0							
		cost		HP	6		Revenue								
		2		LP	3		Prod Cost								
						Max surplus	0								
		Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit						
		0.5	1	4.875	4.875	6									
		1.5	2	4.625	9.5	12									
		2.5	3	4.375	13.875	18									
		3.5	4	4.125	18	24									
		4.5	5	3.875	21.875	30									
		5.5	6	3.625	25.5	36									
		6.5	7	3.375	28.875	42									
		7.5	8	3.125	32	48									
		8.5	9	2.875	34.875	51									
		9.5	10	2.625	37.5	54									
		10.5	11	2.375	39.875	57									
		11.5	12	2.125	42	60									
		12.5	13	1.875	43.875	63									
		13.5	14	1.625	45.5	66									
		14.5	15	1.375	46.875	69									
		15.5	16	1.125	48	72									
		16.5	17	0.875	48.875	75									
		17.5	18	0.625	49.5	78									
		18.5	19	0.375	49.875	81									
		19.5	20	0.125	50	84									



				cutoff	8		Units bought	0							
		cost		HP	6		Revenue								
		2		LP	3		Prod Cost								
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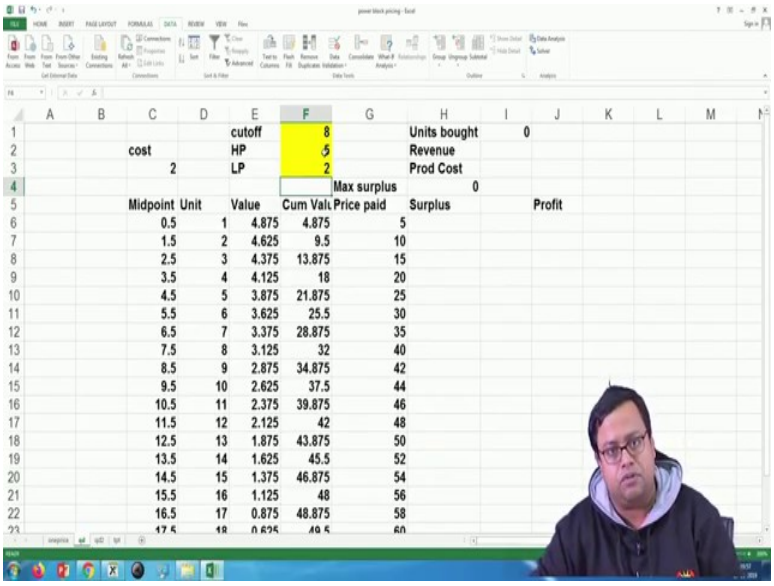
		14.5	15	1.375	46.875	69									
		15.5	16	1.125	48	72									
		16.5	17	0.875	48.875	75									
		17.5	18	0.625	49.5	78									



	A	B	C	D	E	F	G	H	I	J	K	L	M
1					cutoff	8		Units bought	0				
2			cost		HP	5		Revenue					
3			2		LP	2		Prod Cost					
4							Max surplus	0					
5			Midpoint	Unit	Value	Cum Val	Price paid	Surplus		Profit			
6			0.5	1	4.875	4.875	5						
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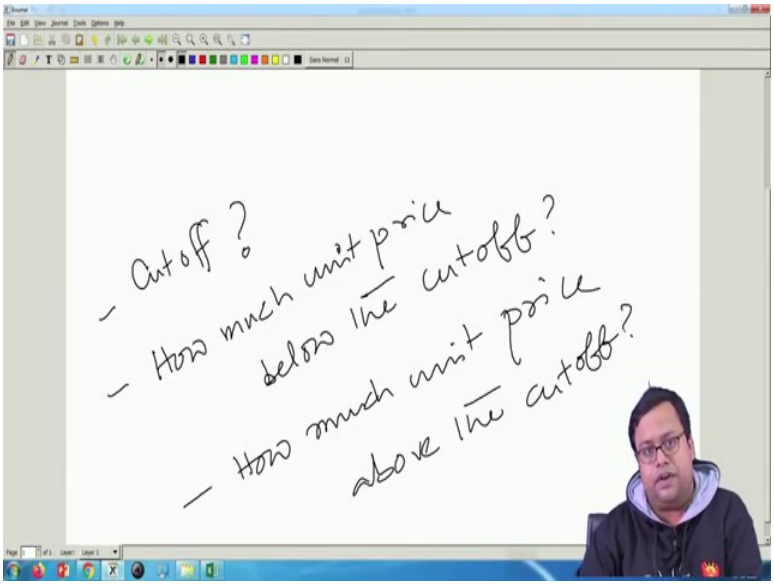
14			8.5	9	2.875	34.875	42						
15			9.5	10	2.625	37.5	44						
16			10.5	11	2.375	39.875	46						
17			11.5	12	2.125	42	48						
18			12.5	13	1.875	43.875	50						
19			13.5	14	1.625	45.5	52						
20			14.5	15	1.375	46.875	54						
21			15.5	16	1.125	48	56						
22			16.5	17	0.875	48.875	58						



So, in this particular thing we have suggested that there are two types of price. So, let us say the high price and the low price, defined as HP and LP in this particular graph. HP and LP and the cutoff is something. So, the people who are below this cutoff has to pay, so up to this cutoff the charges is 3 dollars and after this cutoff the charges is, let us say 6 dollars. Or I will write 5 or 2, let us say 5 or 2 dollars.

Now, what is the situation that I have to find out? So, this is something that I have to find out. So, this is something that I have to decide, my decision variables are 3 points. My decision variables are basically three numbers. The first number is what will be the cutoff? Then the second decision is how much price, how much unit price below the cutoff and how much unit

price above the cutoff. So, this is basically the decision variable that we are trying to find out. So, you have to decide a cut off value up to a level and now I am talking about two price ranges, there can be multiple price ranges.

There can be low price, medium price and high price with the same demand curve you can try to find out that when the, when the usage is between 0 to 5 dollars one pricing, 5 to 10 dollars another pricing and 10 to 15 dollars another pricing. So, I will try to do that, in this particular session itself I will try to do that. So, let us say, right now I have been told that I can only have two particular cut off, one particular cutoff. And there will be two prices, high price and low price.

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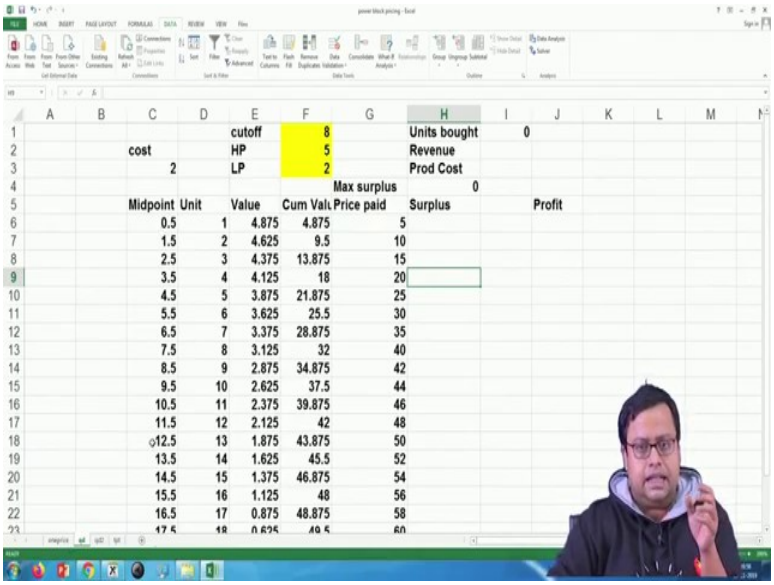

	A	B	C	D	E	F	G	H	I	J	K	L	M
1					cutoff	8		Units bought	0				
2			cost		HP	5		Revenue					
3			2		LP	2		Prod Cost					
4							Max surplus	0					
5			Midpoint	Unit	Value	Cum Val	Price paid	Surplus		Profit			
6			0.5	1	4.875	4.875	5						
7			1.5	2	4.625	9.5	10						
8			2.5	3	4.375	13.875	15						
9			3.5	4	4.125	18	20						
10			4.5	5	3.875	21.875	25						
11			5.5	6	3.625	25.5	30						
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13			7.5	8	3.125	32	40						
14			8.5	9	2.875	34.875	42						
15			9.5	10	2.625	37.5	44						
16			10.5	11	2.375	39.875	46						
17			11.5	12	2.125	42	48						
18			12.5	13	1.875	43.875	50						
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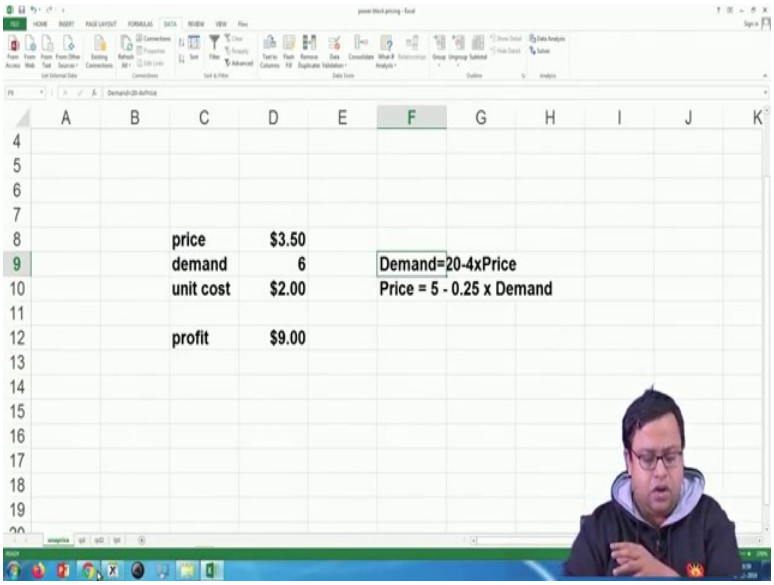
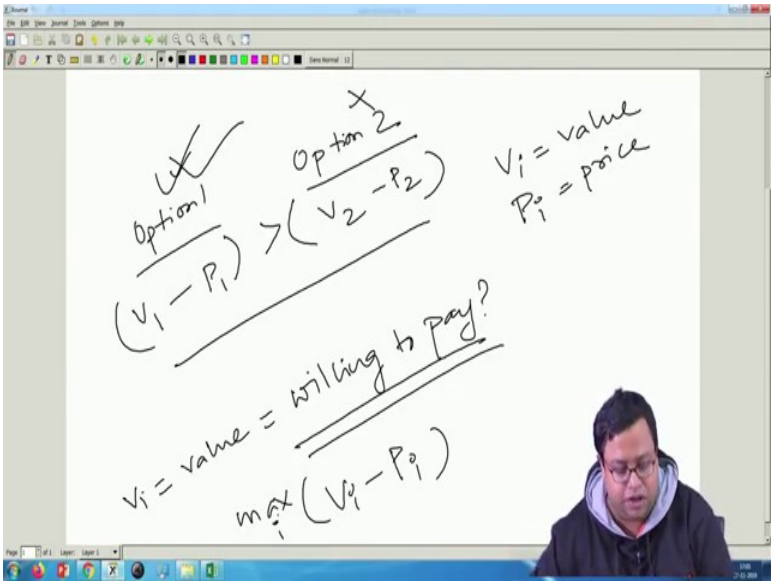
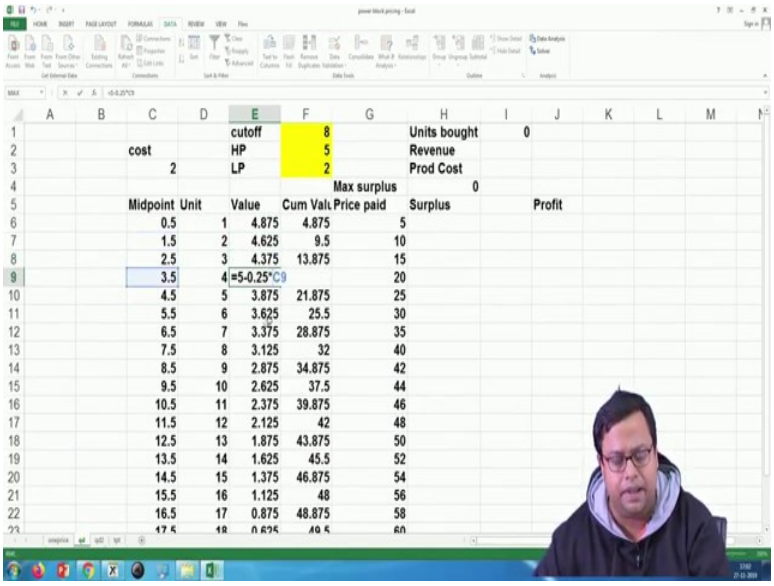
21			15.5	16	1.125	48	56						
22			16.5	17	0.875	48.875	58						
23			17.5	18	0.625	49.5	60						


price $3.50
demand 6
unit cost $2.00
profit $9.00
Demand=20-4xPrice
Price = 5 - 0.25 x Demand


Option 1
Option 2
$(V_1 - P_1) > (V_2 - P_2)$
V_i = value
P_i = price
V_i = value = willing to pay?
$\max_i (V_i - P_i)$



Now, remember that these thing that this particular, it is a electricity and electricity is measured in units. So, 1 unit, two unit and so on. So, these are the units that has been consumed, the demand. So, one demand, two demand and etc. And because we are trying to do trying to do, trying to actually focus on the on a continuous variable in here in this particular equation, my Demand=20-4P.

The assumption is that the demand is a continuous variable. So, because the assumption is that the demand is a continuous variable, we have changed this unit, 1 unit consumption, 2 units consumption to a continuous variable. So, 1 is basically 0 and 1's mean which is 0.5, 2 is 1 and 2's mean which is 1.5 and so on. And I have till 20 I have taken.

So till 20 units, you can actually half in the real life situation it will be up to 100 units or something like that. Or if the measurement of unit different then then the things will be different. But let us say we are doing it for up to 20 units. We think that most of the people will actually purchase below 20 units.

One other remember another thing is that, so if I if the price is 0, if the price is 0, the maximum possible demand is 20. You cannot, according to this particular equation the demand cannot be higher than 20 in the practical situation. Because otherwise the price has to be negative. That means somebody uses and you are paying him money, which is not possible. So, when the price is zero, demand is 20. So, that is why you have taken up to 20.

Now, what is the value thing? The value is the willingness to pay. So, this is something that we, remember in the bundling case we did this thing. So, that whenever your price, your willingness to pay is higher than your price. So, let us say you have two options, you have two options and option one and option two, and you will choose option one over option two only when $P2((V_1-P_1)>(V_2-P_2))$. You will only then you will choose this option 1.

Where Vi's are value and Pi's are price. Now, Vi if I change it to this value, if I change it to the monitory tab, we can also say this is the willingness to pay. How much money we are willing to pay. That is the that is also proxy of value and you will choose this one over this one only when this happens.

So, this is something it is the basic thing and if you have three options or multiple options which ever has Vi - Pi, maximum if you have multiple options you will maximize based on

Max (i (Vi-Pi)). So, that is the same thing that we are going to do here. So, if you check carefully this is the value what does it comes from?

The formula is (5-0.25×C6). And what is the C6? C6 is the midpoint demand. So, a continuous variable which is representing the demand of electricity (5-0.25×C6)gives me the value. What is value? Value is nothing but the willingness to pay. The formula for the corresponding thing is this. This is what we are using there as well. So, (5-0.25×C6). And then I am dragging that up. So, I am getting the same thing for or all of them.

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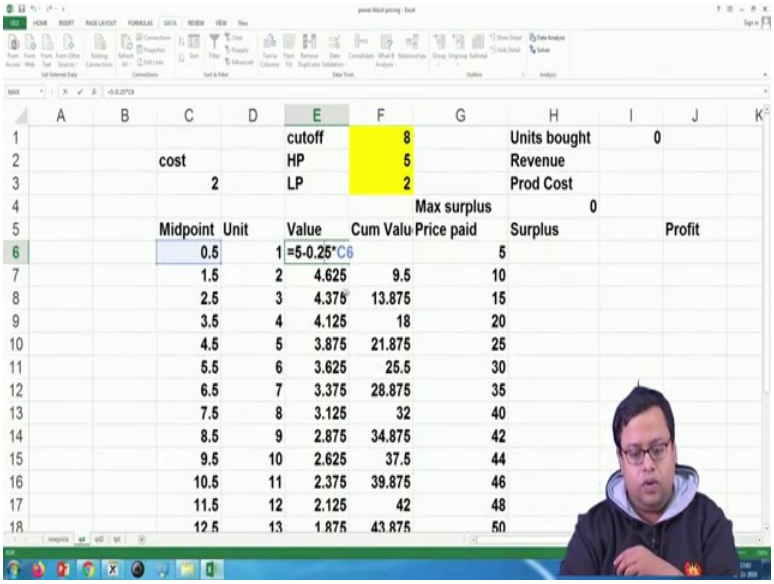

	A	B	C	D	E	F	G	H	I	J	K
1					cutoff	8		Units bought	0		
2			cost		HP	5		Revenue			
3			2		LP	2		Prod Cost			
4							Max surplus		0		
5			Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit	
6			0.5	1	=5-0.25*C6		5				
7			1.5	2	4.625	9.5	10				
8			2.5	3	4.375	13.875	15				
9			3.5	4	4.125	18	20				
10			4.5	5	3.875	21.875	25				
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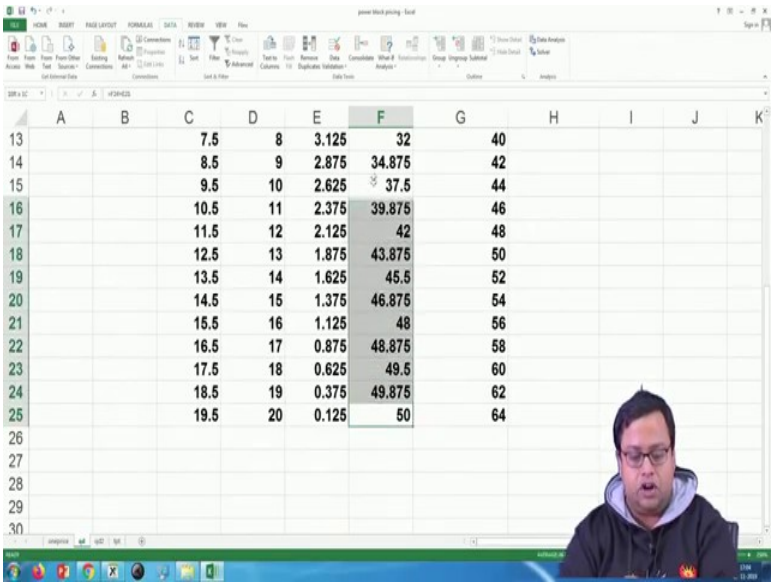

	A	B	C	D	E	F	G	H	I	J	K
13			7.5	8	3.125	32	40				
14			8.5	9	2.875	34.875	42				
15			9.5	10	2.625	37.5	44				
16			10.5	11	2.375	39.875	46				
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23			17.5	18	0.625	49.5	60				
24			18.5	19	0.375	49.875	62				
25			19.5	20	0.125	50	64				
26											
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Now, what is the cumulative value? So, if somebody consumes carefully we will see that is somebody, when I consume only 1 unit, this is the money that I am willing to pay. When I am I am actually consuming 2 units, for the last unit for the second unit the second person, so let us say if there are 2 (persons), each person is actually consuming 1 unit let us assume.

Then the first person is willing to pay 4.875, the second person is willing to pay 4.625. In another words, if the same person is willing to pay, actually using both the units, then for the first unit he is willing to pay 4.875, for second unit he is willing to pay 4.625. For the third unit so it will

slowly come down. How much I am willing to pay for one extra it is like, let us say you have been offered let us say 1 sweet. So, I am a Bengali, so I will say one rasgulla.

So, you have been offered one rasgulla I will probably pay 10 rupees for that one rasgulla. You give me another rasgulla I will probably want to pay a little bit less. Now, I have already have the sweet taste on my mouth. So, I will pay another 7 rupees. But if you keep on giving me rasgullas for the fifth, seventh, ninth one I am already stuffed so I am not willing to pay the unit price for the extra rasgulla will not be much higher. Not be like the first one where I paid 10 rupees per rasgulla.

So, similarly, here the unit cost is coming down. The unit price that you are willing to pay for one extra unit of consumption is coming down. So, then how much you are willing to pay for two units? That is nothing but this is the first unit and this is the second unit. The summation of this two comes up to be 9.5. So, 9.5 is the cumulative value up to second unit.

Similarly 13.85 is 9.5 plus 4.375, that is the cumulative one. So, which is nothing but this cell, 9.5 cell plus 4.375 cell. These two cells together that is the cumulative price you are willing to pay when you are, when you are consuming up to 3 units. And you go on doing that till this thing. So, this is your basically the willingness to pay based on the demand function that is given.

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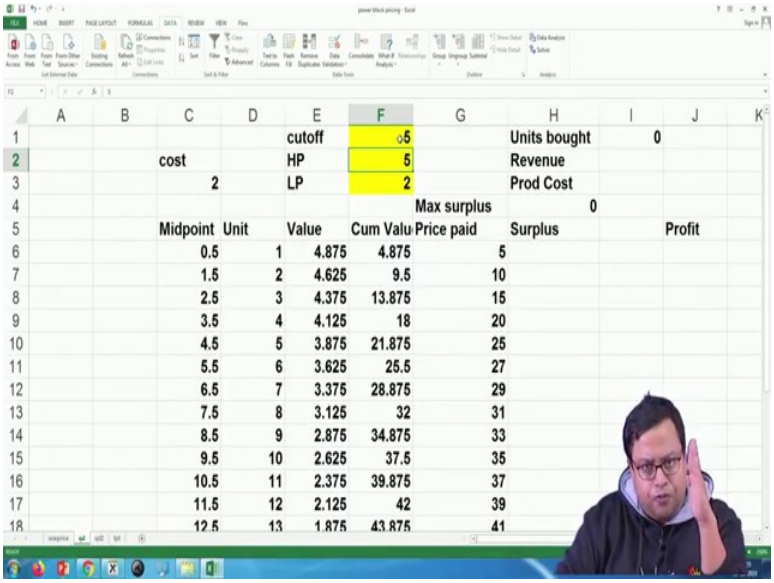
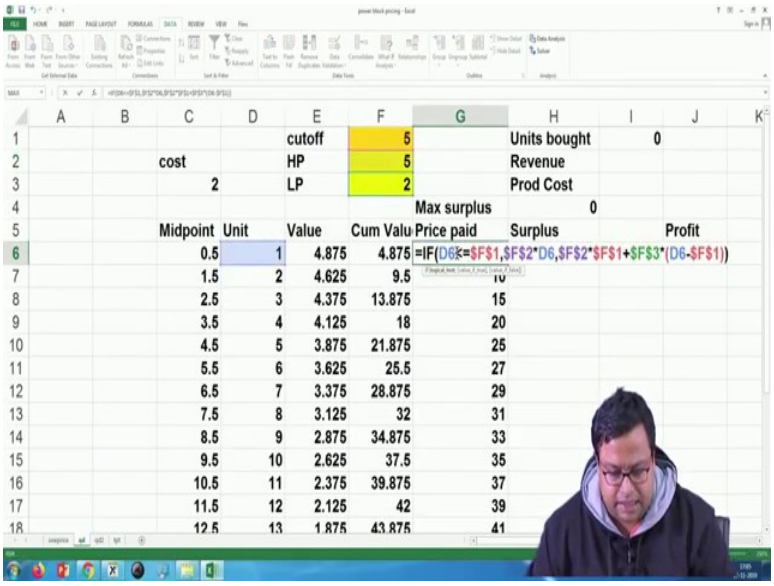


	A	B	C	D	E	F	G	H	I	J	K
1					cutoff	5		Units bought	0		
2			cost		HP	5		Revenue			
3			2		LP	2		Prod Cost			
4							Max surplus	0			
5			Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit	
6			0.5	1	4.875	4.875	5				
7			1.5	2	4.625	9.5	10				
8			2.5	3	4.375	13.875	15				
9			3.5	4	4.125	18	20				
10			4.5	5	3.875	21.875	25				
11			5.5	6	3.625	25.5	27				
12			6.5	7	3.375	28.875	29				
13			7.5	8	3.125	32	31				
14			8.5	9	2.875	34.875	33				
15			9.5	10	2.625	37.5	35				
16			10.5	11	2.375	39.875	37				
17			11.5	12	2.125	42	39				
18			12.5	13	1.875	43.875	41				



Now, how much is the price? I told let see the cutoff is let us say 5, let us assume that the cutoff is 5. So, if the cutoff is 5 then up to 5 units you will pay 2 dollars per unit. So, 5×2=10 dollars up to fifth unit. And then after that you will pay 5 dollars per unit. So, that is what is written here.

So, when D6, carefully see when D6, that means the unit consumed is less than F1, F1 means the cutoff value, when the consumption is than the cutoff value, how much you, how much you pay? You pay actually F2. F2 is the high price. So, for here it is the other way, for if we are doing it in the other way for lower consumption you will pay more, for higher consumption you will pay less.

Obviously, so for lower consumption F2 which is not the case for many many the domestic consumption. In domestic consumption as you go up the charges, the unit price also go up. And that is because there are supply chain issues there, that how the transmission happens and etc are different there.

But in common situations always, in all common situations let us say in the industrial situation etc. The consumption goes up the unit prices come down. So, initially your unit prices will be high up to the cutoff. So, I did it wrong actually initially. So, F2, F2 is the high price × D6. D6 is how much? D6 is the consumption.

So, this much is the money that you will pay till your D6 is less than F1. That means till your consumption is less than the cutoff. Now, when it is higher than the cutoff, then what to pay? So,

let us say it is higher than the cutoff, then up to the cutoff you will pay the high price that is why F2 ×F1, F2 is the high price ×F1. (F1×F2)

So, if you have consumed 7 units, then 5 × 5 high price, 5 is your cutoff into 5 is your high price. So, 5 × 5 + the rest 2 units which is above the cutoff for that you will pay 2 rupees. So, F3 which is the 2 rupees or 2 dollars, × D6 - F1 which is the extra that is above the cutoff. So, this is something that I have written. Carefully you see once more. When D6 is smaller than F1 till my consumption is less than my cutoff value I will pay high price for each consumption. So, high price is basically F2.

So, that is why D6× F2 ×D6 is my overall payment. But if by chance it is higher than the cutoff value, then what will I pay? If it is higher than the cutoff value, then up to the cutoff value I will be the higher price. But anything extra I will pay the low price. So, up to the cutoff, that means up to F1 I will pay F2 that is why F2×F1+for the rest of the things, rest of the things mean what? D6 - F1, for the rest of the things I will pay F3. So, this is something that I have written. And I have actually did it for it.

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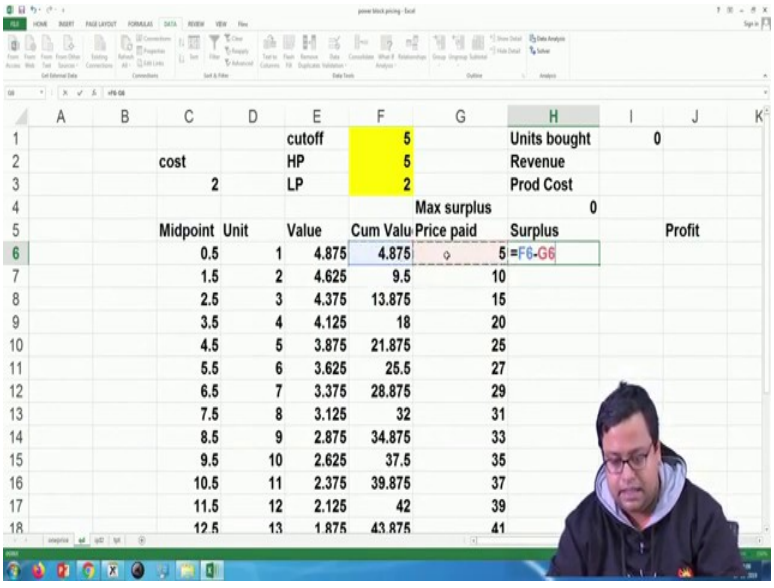
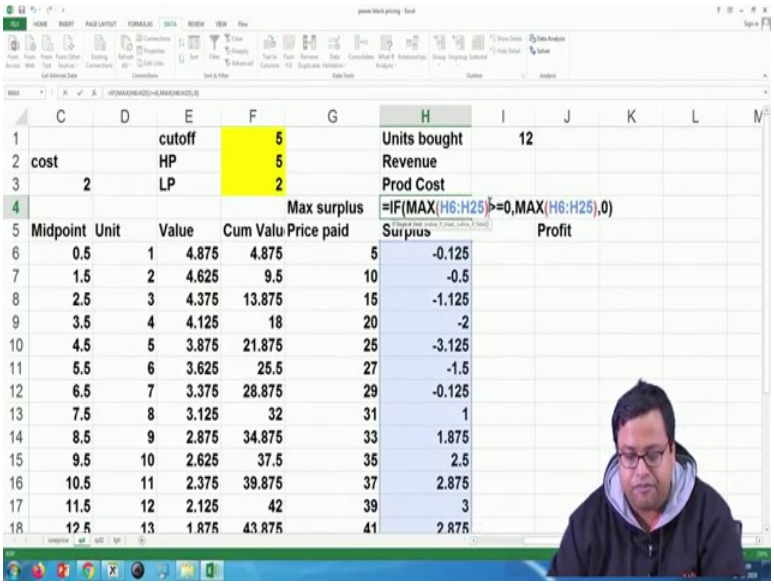
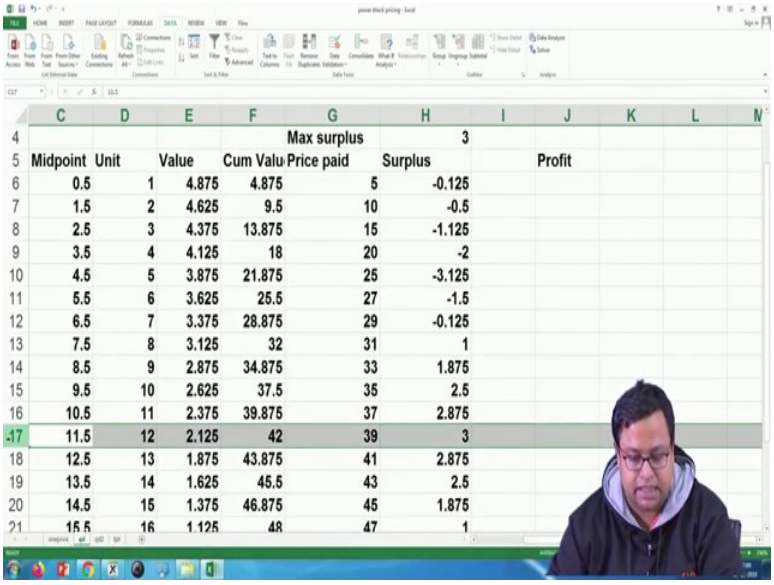


	A	B	C	D	E	F	G	H	I	J	K
1					cutoff	5		Units bought	0		
2			cost		HP	5		Revenue			
3			2		LP	2		Prod Cost			
4							Max surplus	0			
5			Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit	
6			0.5	1	4.875	4.875	5	=F6-G6			
7			1.5	2	4.625	9.5	10				
8			2.5	3	4.375	13.875	15				
9			3.5	4	4.125	18	20				
10			4.5	5	3.875	21.875	25				
11			5.5	6	3.625	25.5	27				
12			6.5	7	3.375	28.875	29				
13			7.5	8	3.125	32	31				
14			8.5	9	2.875	34.875	33				
15			9.5	10	2.625	37.5	35				
16			10.5	11	2.375	39.875	37				
17			11.5	12	2.125	42	39				
18			12.5	13	1.875	43.875	41				





Now, what is the surplus? My surplus is basically the V - P, Vi - Pi. So, this - this, this is my surplus. So, I have to make sure that I have to check that whether the surplus is positive at some point. Yes, so surplus are positive in some point. So, there are some choices which the customers can make.

So, I will put it here, there are some choices where the customers can be there. And they can make certain choices here. So, now you will see carefully that there are some choices where it is positive and I have to find out, out of this which one is maximum. So, if you check the formula, it is saying that if maximum of H6 to H25 is greater than 0, then put the maximum. By chance if everything is negative put 0. That is something that has been. So, the maximum surplus is 3 and

how much is the value for corresponding to 3? 12 units. So, you will see this one. How did I get? I did a match.

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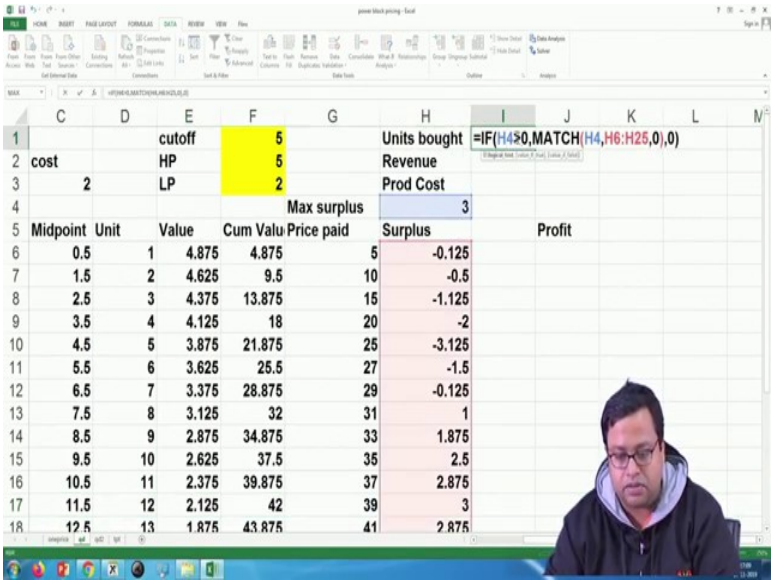
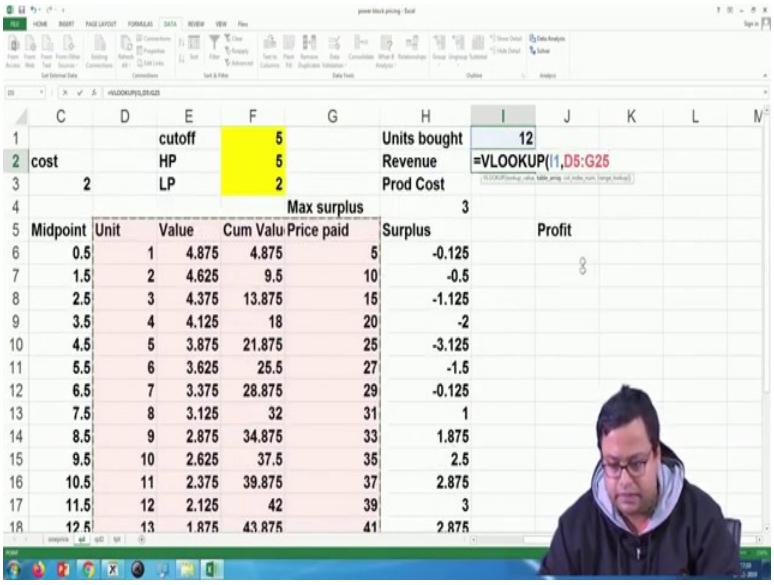
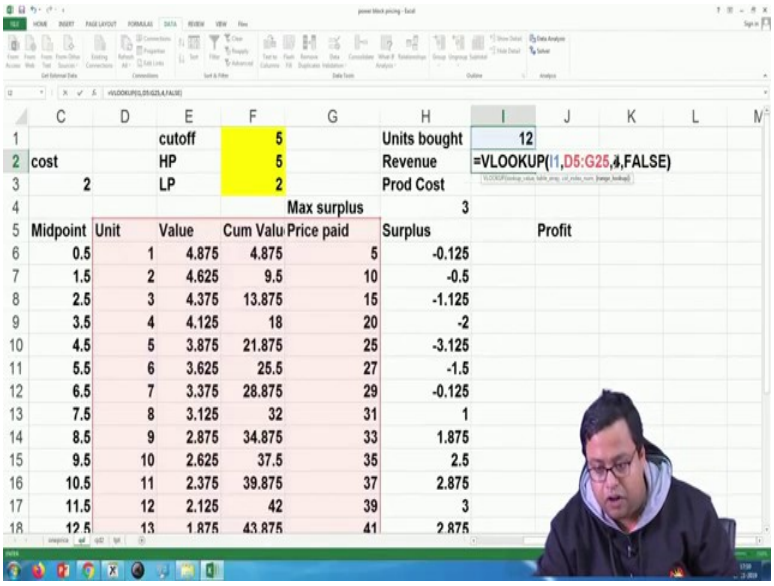


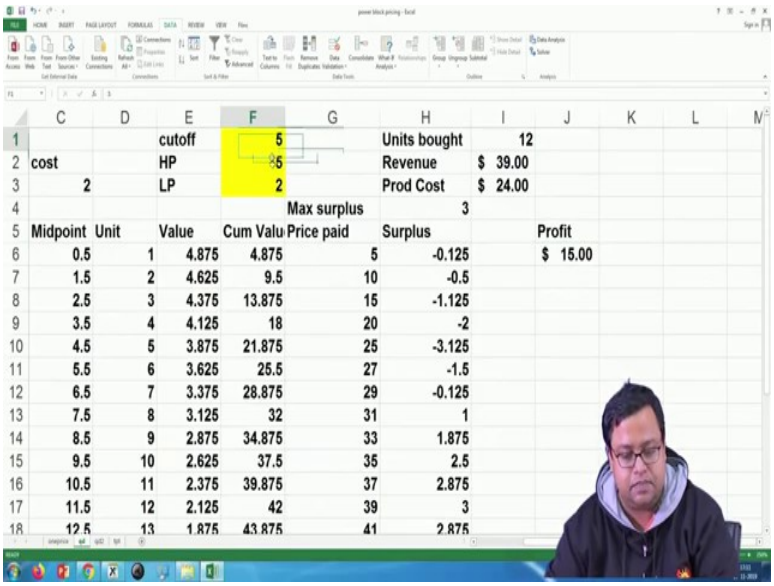




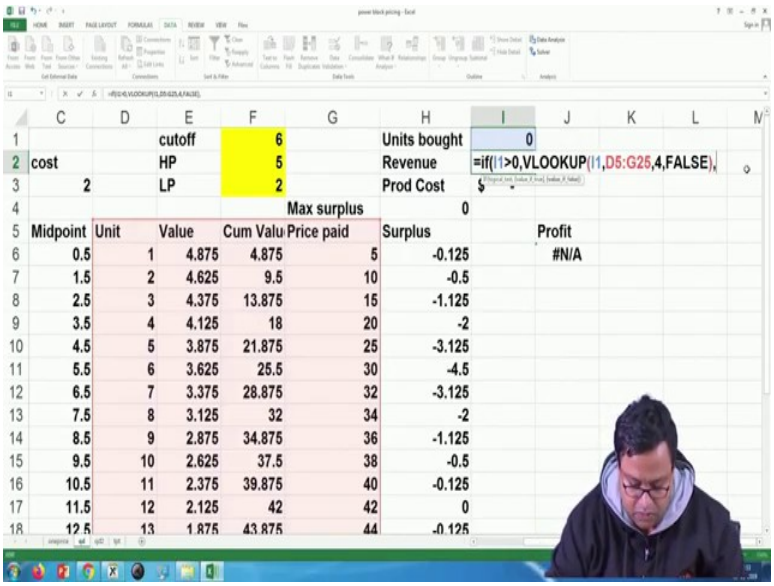
So, if H4>0 by chance this particular maximum surplus is >0, match H4 in this particular in that particular column, otherwise give me 0. So, when this maximum surplus is 0 the units bought is also 0. When maximum surplus is positive match at what unit it is being purchased? So, 12 units is being purchased.

What is the revenue for this 12 units? That is basically you can say VLOOKUP, VLOOKUP this value × this cell and fourth column and match type is equal to false, that means exact match. So, how much, how much money I am paying? I am searching i1, which is 12 × this red or pink I would say pink box in the first column of the pink box, corresponding to 12 I am paying 39 dollars. So, that 39 dollars is coming here.

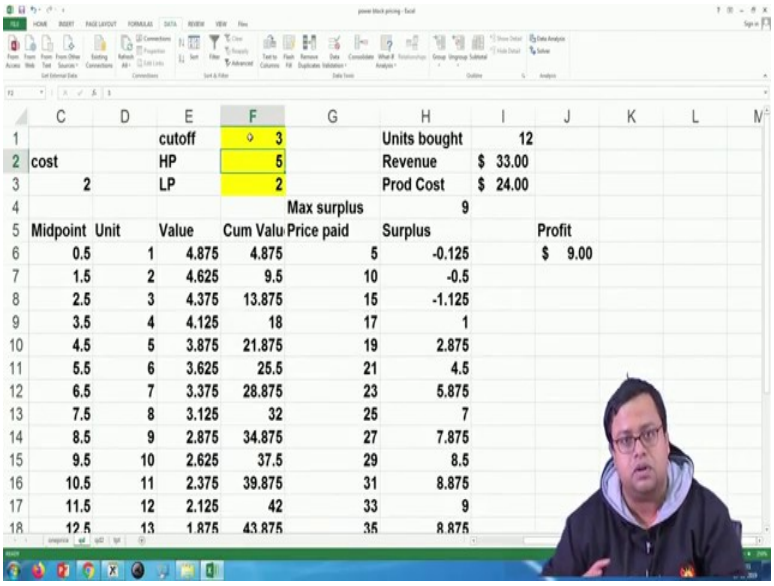
(Refer Slide Time: 23:36)



	C	D	E	F	G	H	I	J	K	L	M
1			cutoff	5		Units bought	12				
2	cost		HP	5		Revenue	$ 39.00				
3	2		LP	2		Prod Cost	$ 24.00				
4					Max surplus	3					
5	Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit			
6	0.5	1	4.875	4.875	5	-0.125		$ 15.00			
7	1.5	2	4.625	9.5	10	-0.5					
8	2.5	3	4.375	13.875	15	-1.125					
9	3.5	4	4.125	18	20	-2					
10	4.5	5	3.875	21.875	25	-3.125					
11	5.5	6	3.625	25.5	27	-1.5					
12	6.5	7	3.375	28.875	29	-0.125					
13	7.5	8	3.125	32	31	1					
14	8.5	9	2.875	34.875	33	1.875					
15	9.5	10	2.625	37.5	35	2.5					
16	10.5	11	2.375	39.875	37	2.875					
17	11.5	12	2.125	42	39	3					
18	12.5	13	1.875	43.875	41	2.875					



	C	D	E	F	G	H	I	J	K	L	M
1			cutoff	6		Units bought	0				
2	cost		HP	5		Revenue	=if(I1>0,VLOOKUP(I1,D5:G25,4,FALSE),				
3	2		LP	2		Prod Cost	$ -				
4					Max surplus	0					
5	Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit			
6	0.5	1	4.875	4.875	5	-0.125		#N/A			
7	1.5	2	4.625	9.5	10	-0.5					
8	2.5	3	4.375	13.875	15	-1.125					
9	3.5	4	4.125	18	20	-2					
10	4.5	5	3.875	21.875	25	-3.125					
11	5.5	6	3.625	25.5	30	-4.5					
12	6.5	7	3.375	28.875	32	-3.125					
13	7.5	8	3.125	32	34	-2					
14	8.5	9	2.875	34.875	36	-1.125					
15	9.5	10	2.625	37.5	38	-0.5					
16	10.5	11	2.375	39.875	40	-0.125					
17	11.5	12	2.125	42	42	0					
18	12.5	13	1.875	43.875	44	-0.125					



	C	D	E	F	G	H	I	J
1			cutoff	3		Units bought	12	
2	cost		HP	5		Revenue	$ 33.00	
3	2		LP	2		Prod Cost	$ 24.00	
4					Max surplus	9		
5	Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit
6	0.5	1	4.875	4.875	5	-0.125		$ 9.00
7	1.5	2	4.625	9.5	10	-0.5		
8	2.5	3	4.375	13.875	15	-1.125		
9	3.5	4	4.125	18	17	1		
10	4.5	5	3.875	21.875	19	2.875		
11	5.5	6	3.625	25.5	21	4.5		
12	6.5	7	3.375	28.875	23	5.875		
13	7.5	8	3.125	32	25	7		
14	8.5	9	2.875	34.875	27	7.875		
15	9.5	10	2.625	37.5	29	8.5		
16	10.5	11	2.375	39.875	31	8.875		
17	11.5	12	2.125	42	33	9		
18	12.5	13	1.875	43.875	35	8.875		

What is the product cost? The product cost is unit bought into to the cost which is 2 dollars. So, how much is the profit? My profit is basically this - the production cost. This is my profit. Now, I have to find out so now see, this is my output, net output is 15 dollars and this is my now if I change my cutoff to 6, this value changes. So, this value becomes 0 NA actually I have to write it carefully.

So, if this > 0 then only all of these things happen. Otherwise it is 0, and then the production cost is also 0, then the profit is also 0. By chance if the cutoff is 4, then I get some value. If the cutoff is 3, I get some values. So, I can change it, so I can change my these three cells, and that will change my profit. So, this is something that I have to do.

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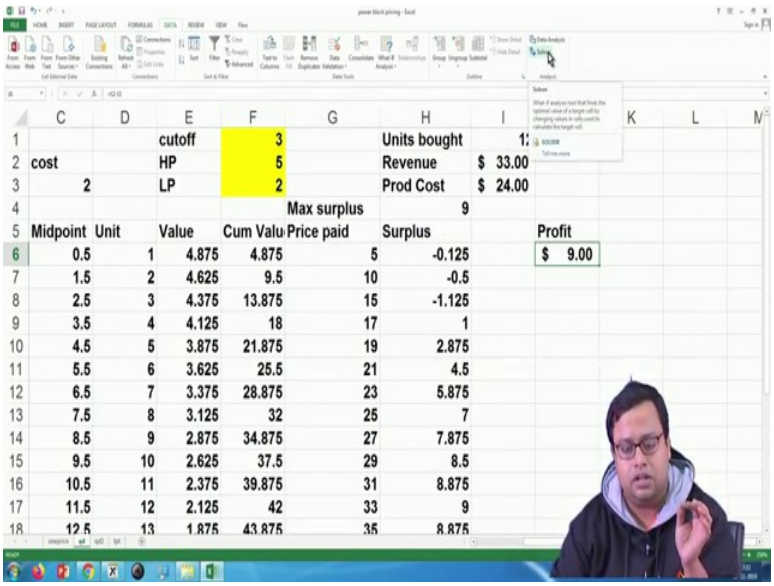
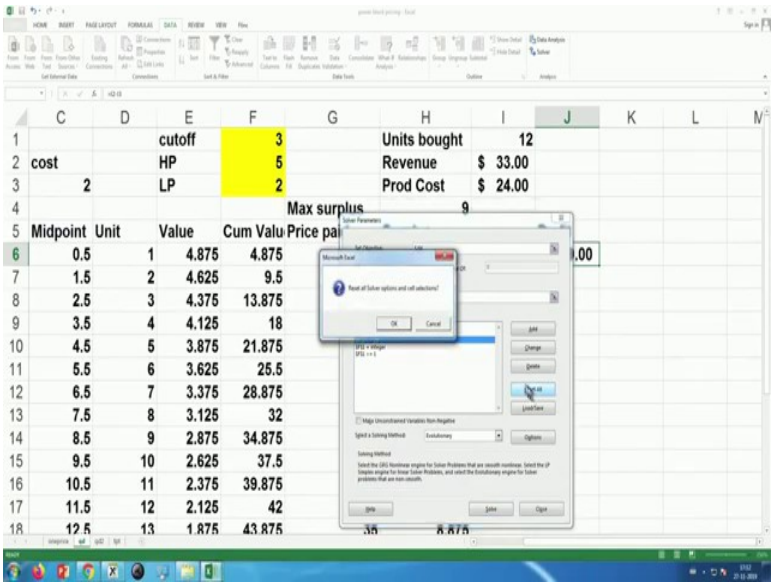
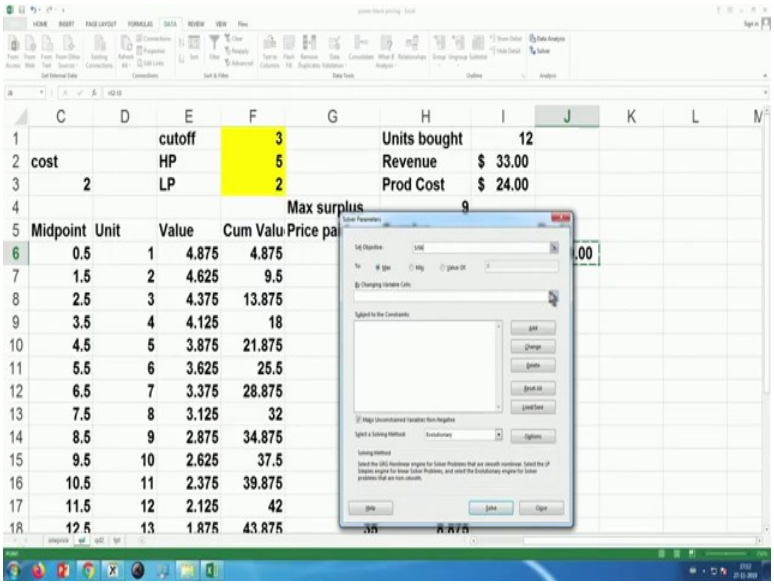
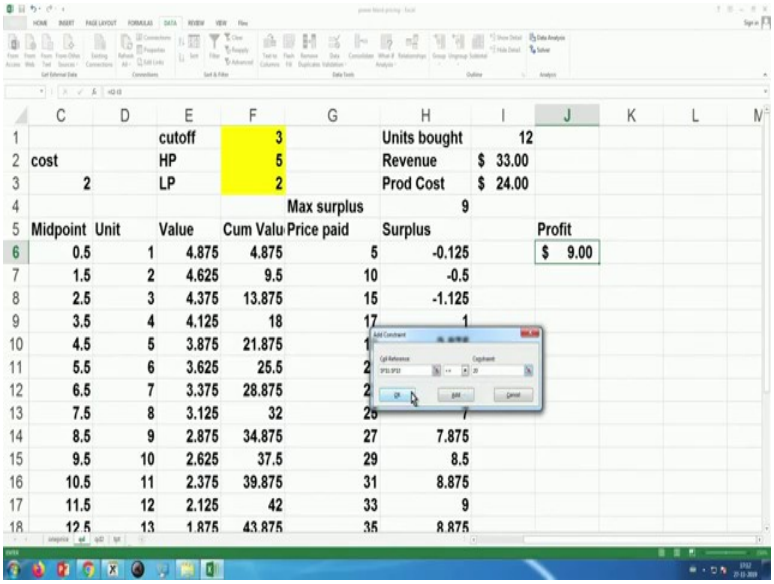






	C	D	E	F	G	H	I	J	K	L	M
1			cutoff	3		Units bought	12				
2	cost		HP	5		Revenue	$ 33.00				
3	2		LP	2		Prod Cost	$ 24.00				
4					Max surplus	9					
5	Midpoint	Unit	Value	Cum Valu	Price pa						
6	0.5	1	4.875	4.875							
7	1.5	2	4.625	9.5							
8	2.5	3	4.375	13.875							
9	3.5	4	4.125	18							
10	4.5	5	3.875	21.875							
11	5.5	6	3.625	25.5							
12	6.5	7	3.375	28.875							
13	7.5	8	3.125	32							
14	8.5	9	2.875	34.875							
15	9.5	10	2.625	37.5							
16	10.5	11	2.375	39.875							
17	11.5	12	2.125	42							
18	12.5	13	1.875	43.875							



	C	D	E	F	G	H	I	J	K	L	M
1			cutoff	3		Units bought	12				
2	cost		HP	5		Revenue	$ 33.00				
3	2		LP	2		Prod Cost	$ 24.00				
4					Max surplus	9					
5	Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit			
6	0.5	1	4.875	4.875	5	-0.125		$ 9.00			
7	1.5	2	4.625	9.5	10	-0.5					
8	2.5	3	4.375	13.875	15	-1.125					
9	3.5	4	4.125	18	17	1					
10	4.5	5	3.875	21.875	1						
11	5.5	6	3.625	25.5	2						
12	6.5	7	3.375	28.875	2						
13	7.5	8	3.125	32	25	7					
14	8.5	9	2.875	34.875	27	7.875					
15	9.5	10	2.625	37.5	29	8.5					
16	10.5	11	2.375	39.875	31	8.875					
17	11.5	12	2.125	42	33	9					
18	12.5	13	1.875	43.875	35	8.875					

Now, what will I do? I will run a solver. So, in the running a solver there are certain constraints that has been given carefully check. So, I have saved my objective function this one and I am maximizing this one by changing these three cells. Now, F1 to F3, so F1 what is the minimum value of F1? The minimum value of F1 is. So, how did I put this, we have done this before or not.

So, first of all just 1 minute, so I will reset everything. So, ok I am maximizing this one by changing the three values, such that these three values has to be lower than 20, let us say I say the price is lower than 20. So, this all these three values are lower than 20.

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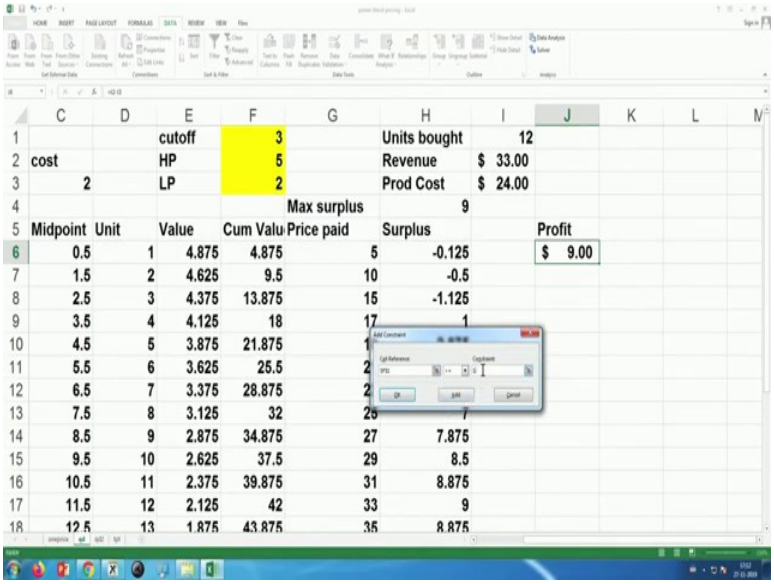

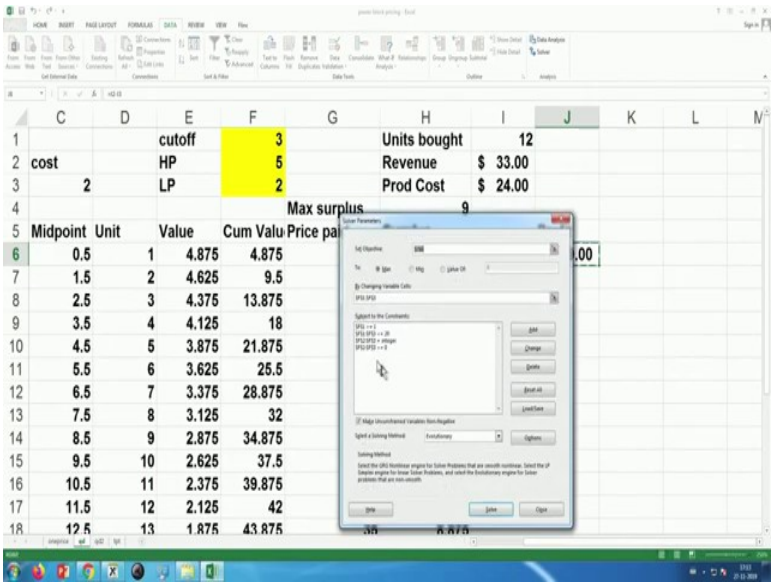

And what else, this value is basically >1 add and these two values are basically > I mean to say 0 add. And let us say I take these two value as integer add any else. So, F1 to F3 has to be between 1, 0 to 20 and this has to be integer and that is ok I think. And the high price has to be higher than the lower price that is also important. So, I will put that, so another thing is that this high price has to be greater than equal to the low price.

So, if I just check this and if I try if I now try to run this one evolutionary is the method that I have chosen because here in the in this thing evolutionary is the method that I have chosen

because there are lots of I would say lots of integer programming involved here, there are also ifs, wherever you say if this is happening or that is happening that is there in your calculation you should use evolutionary.

So, I am running solve, and it is running evolutionary method takes some time in running this thing and it will try to solve and try to find out the best possible solutions based on the optimization functions of integer programming. So, we are not going to the details of integer programming and etc. But it will do a little bit of that to find out that which particular option is based and we have chosen HP and LP to be an integer, so that is also something that will be taken care of.

It is currently running, it might run for a minute or so it will give the result. At any point of time if you want to stop it so you can, below you can see that objective sale is 18 dollars and it is not moving much. But it is still trying, in a real life situation in a bigger problem you will see that that might move after 1 minute or 2 minute and etc, but any point of time if I want to stop you can press an escape. And it will give you the solution that it has find out up to that point. Up to that moment has found find out whatever it will give you that.

So, I can still continue if you do not want to stop you can continue. Or there are limits that you can set you, when you actually run, run this kind of optimization function. There is a limit that can solve. So, solver cannot improve the solution anymore so I am saying ok and it is saying that this would be the price, the dollar they got is 18 dollar.

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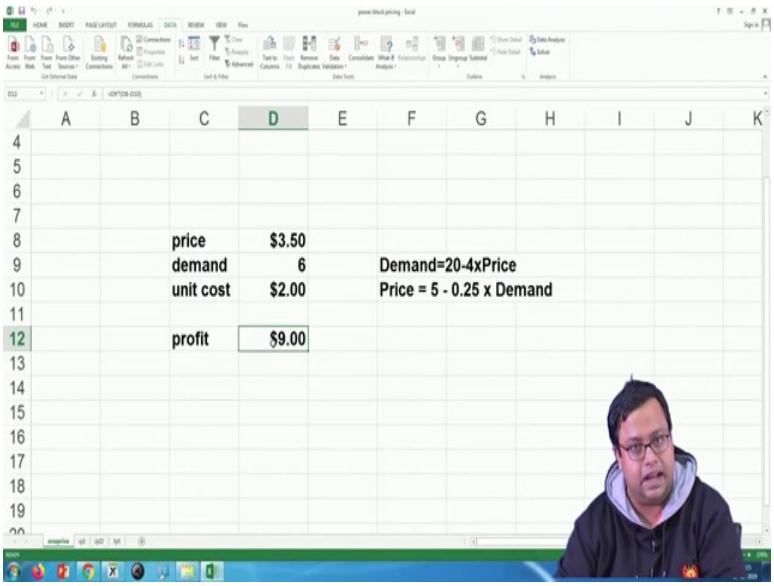

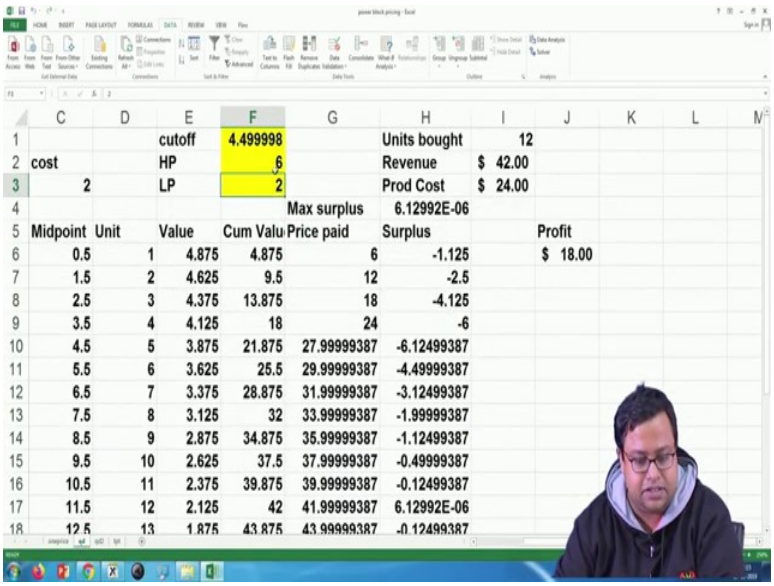

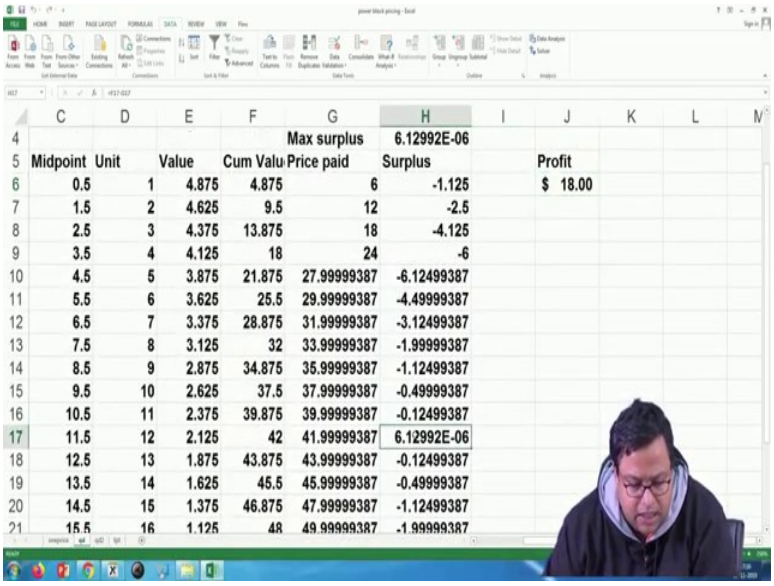

	C	D	E	F	G	H	I	J	K	L	M
4					Max surplus	6.12992E-06					
5	Midpoint	Unit	Value	Cum Valu	Price paid	Surplus		Profit			
6	0.5	1	4.875	4.875	6	-1.125		$ 18.00			
7	1.5	2	4.625	9.5	12	-2.5					
8	2.5	3	4.375	13.875	18	-4.125					
9	3.5	4	4.125	18	24	-6					
10	4.5	5	3.875	21.875	27.99999387	-6.12499387					
11	5.5	6	3.625	25.5	29.99999387	-4.49999387					
12	6.5	7	3.375	28.875	31.99999387	-3.12499387					
13	7.5	8	3.125	32	33.99999387	-1.99999387					
14	8.5	9	2.875	34.875	35.99999387	-1.12499387					
15	9.5	10	2.625	37.5	37.99999387	-0.49999387					
16	10.5	11	2.375	39.875	39.99999387	-0.12499387					
17	11.5	12	2.125	42	41.99999387	6.12992E-06					
18	12.5	13	1.875	43.875	43.99999387	-0.12499387					
19	13.5	14	1.625	45.5	45.99999387	-0.49999387					
20	14.5	15	1.375	46.875	47.99999387	-1.12499387					
21	15.5	16	1.125	48	49.99999387	-1.99999387					

So, now I want to just show you this one. That is when you are doing price, maximize you have profit maximization with one single price you are getting 9 dollar, when you are doing it with two possible prices, you are actually charging less for certain point peoples. So, 3.5 dollars is the price here. And here 6 dollars is the initial price and 2 dollar is the later price. So, you are for high users you are charging low. And you are getting more money. So, that is something that becomes important here which we have to focus on.

So, another thing that I would look here is this is almost very close to 0. So that that might be something which we have to take care of. So, ideally I would run this once more, let us say 5, 6 and 2 or let us say 3, 6 and 2. This is what I will start.

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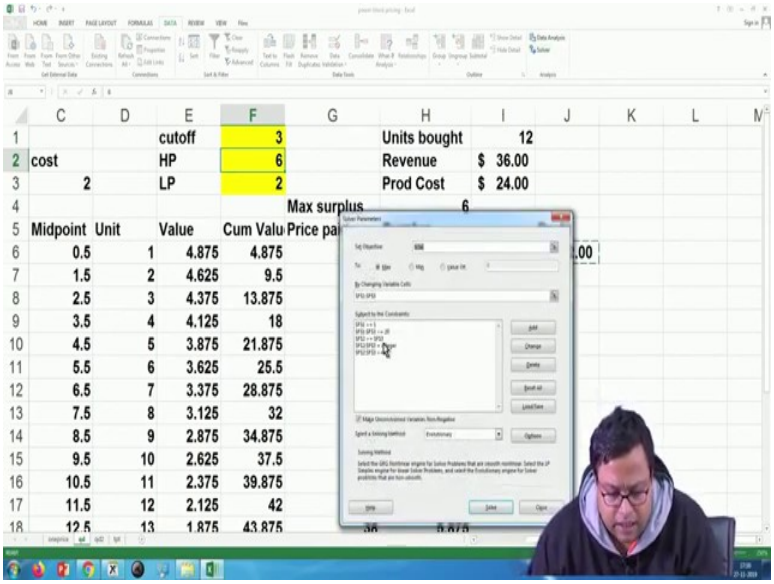

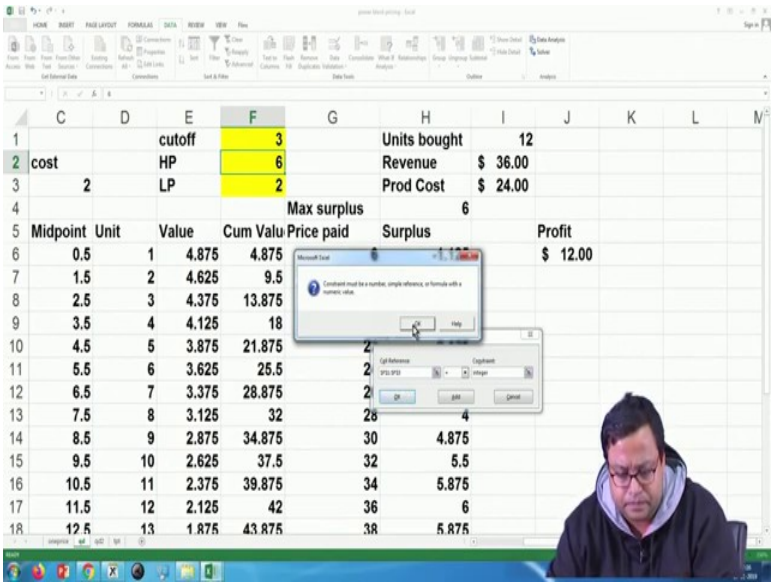

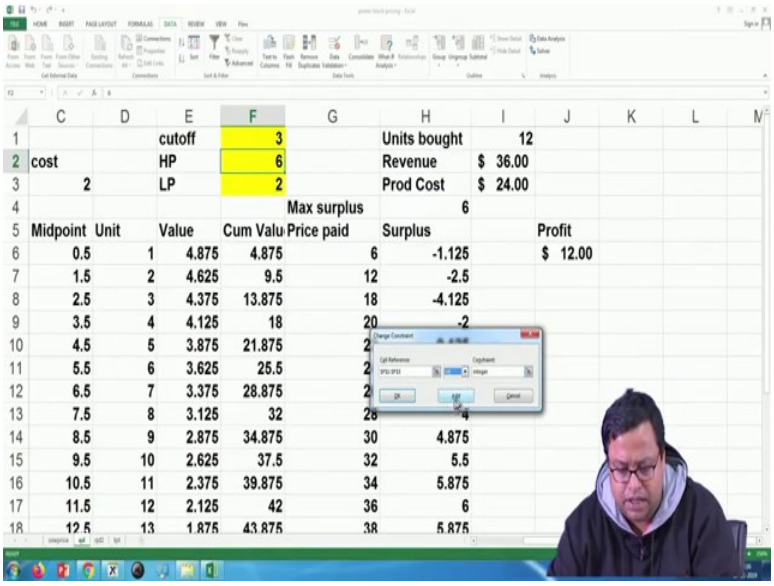

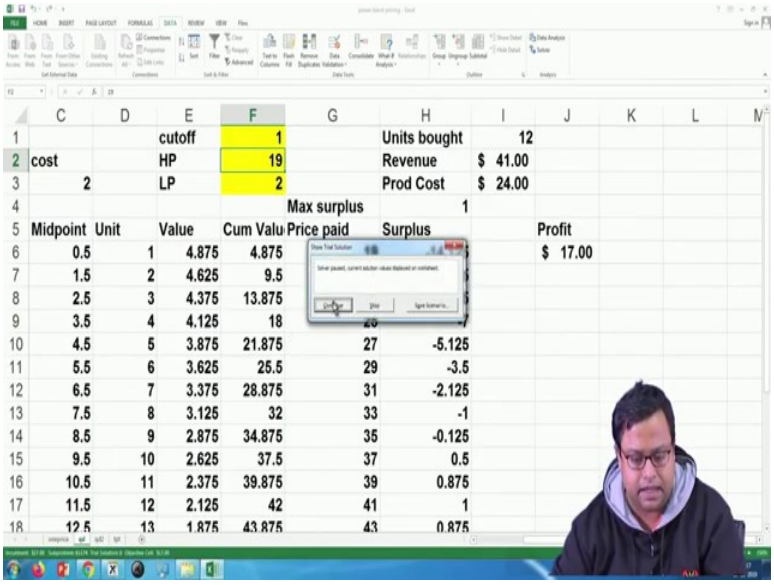

And in the solver thing, I will not say F2, F3 as integers I will change this and say all of these three things are integer. Then things gets little bit good because putting a cutoff 4.9999 it is practically not possible. So, this has to be a integer, so ok. So, F1 to F2 a integer and now I try to solve it.

So, it is solving is quickly solving once more see 17 dollar is why it got dot fix. And I can actually stop it right now. So, I can put and escape you will try out later point of time, it is saying 1, 19, 2. And I think I can continue a little bit you can get a better solutions out of it.1, 19, 2 is not such a good option. You can actually get better solutions if you go on running.

So, again escape let us say. So, ok, 1, 19 and 2 is a solution that I currently have got so you put a 19 dollar and 2 dollars. And you can find out some other options if you change the if the demand curve are different.

So, that is something that I am trying to say. When the prices, we have two prices high price and low price. And you can charge high price when the charges are when the consumption is low, and you can charge low price when the consumption is high. So, it keep on going and see what it actually converges at the end. I think it will converge in whatever value it is showing right now. And we will continue on this particular discussion in our next slide, next video. So, thank you, thank you for being with me in this particular video, I will meet you in the next video. Thank you.