An Introduction to Microeconomics
Prof. Vimal Kumar
Department of Economic Sciences
Indian Institute of Technology, Kanpur

Lecture - 61
Perfect Complements

So, the example I just gave had 2 goods they are perfect substitute for each other and what does it mean when I say they are perfect substitute for each other. It simply means that 2 goods are that, that 2 goods are perfect substitute for a consumer of course, we should not forget that we are talking about a particular consumer ok, if which is a consumer the example I gave you tea and cola it might not be perfect substitute for the other consumer.

So, of course, we have to keep in mind that we are talking in context of a particular consumer. So, 2 goods are perfect substitute for a consumer if he is willing to exchange 1 good for the other good in the fixed ratio and also what is important that no matter what how much of unit 1 of good 1 and good 2 he has. So, at all level he is willing to exchange good 1 to good 2 in the same proportion, then only these 2 goods would be perfect substitute.

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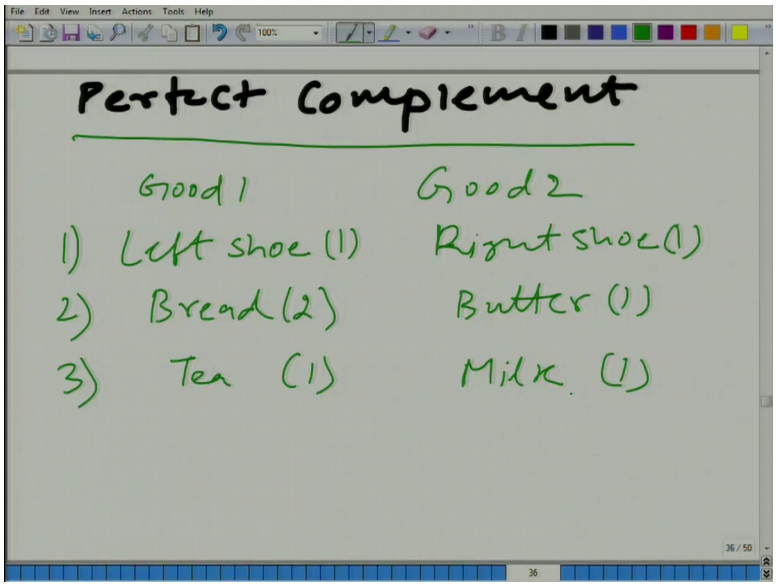

Now, we are going to study another case where goods are perfect complement of each other ok. So, take example of let say that good 1 and good 2, let us take some example

on good 1 we have left shoe and good 2 we have right shoe ok. You cannot use left shoe without right shoe of course, I am talking about a person who has who has both his legs intact ok.

Ah similarly let us take example of bread and butter you can eat bread and butter on its own, but let us say for the example sake that whenever you have 2 slices of bread you will take 1 unit of butter . Similarly, you can say that tea 1 unit of tea requires 1 unit of milk, you consume them in the fixed proportion and if 1 good is absent the second good is not valuable at all for the consumer fine.

So, in this case let say, let us take an example where you have of course here when I talk about shoe these are all the same type of shoe.

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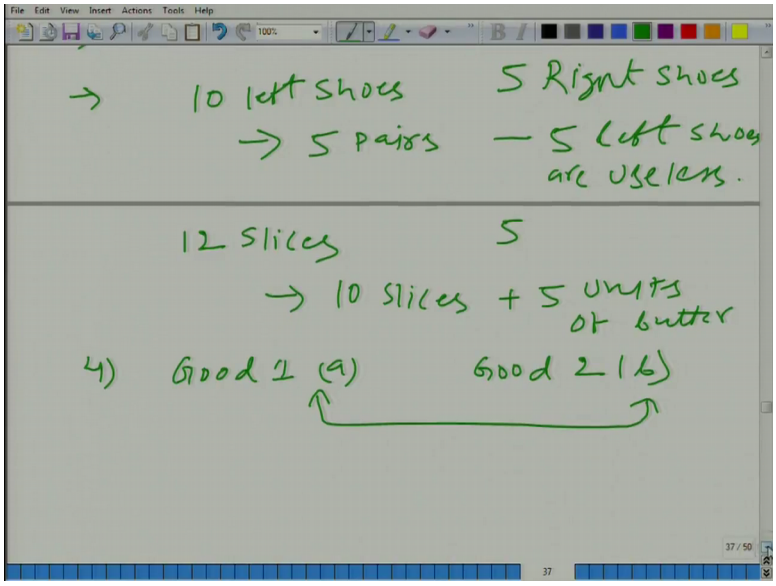

So, we have 10 left shoes and 5 right shoes how many pair of shoes you can use 5 only pairs 5 are 5 left shoes are useless.

Similarly, let us say you have just for example, 12 slices of bread and you have only 5 units of butter, how many slices of bread you can use only 10, 10 slices and plus 5 units of butter that you will use and 2 would be 2 slices would be wasted. Similarly rather than naming them you can think of such examples let say you need good 1 a units of good 1 and b units of good 2 to have 1 perfect combination ok.

Now, if let us say you are living in a world.

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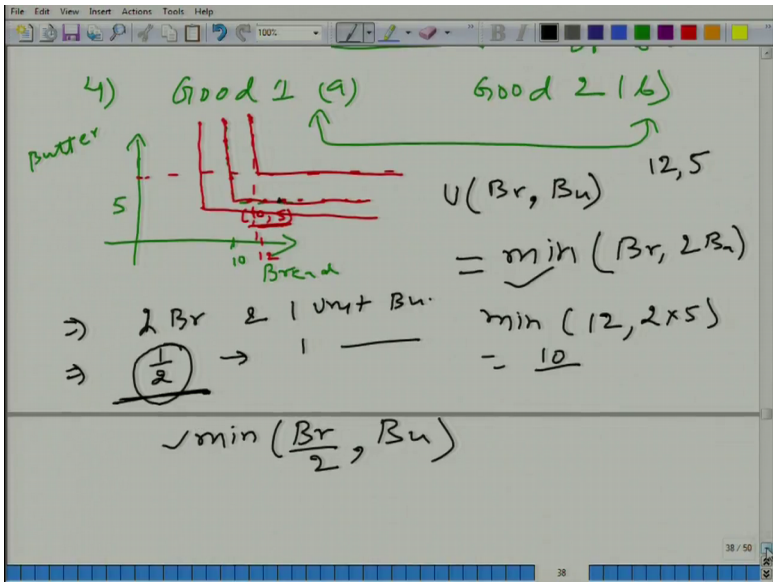

Of course the world for the example sake it is made of only 2 goods and let say in that good, that world both the goods are perfect complement, this these are the examples of perfect complement what do I mean by perfect complement that 1 good is valueless if the other good is not present in the fixed predetermined proportion ok. Not just in any fixed proportion because this ratio is important how would you draw the indifference curve and how would you describe the utility function.

So, let us try to describe, let us try to describe the indifference curve first starting with 10 slices of bread and 5 units of butter and let say here we have bread and here we have butter and here we have 10 and this is let us say for example, this is , this is 5 units of butter fine. Let say your level of satisfaction is this much, given by red point it gives the red point denotes 10 comma 5 bundle fine.

Now, let say that the amount of bread remains the same, but amount of butter goes up now from it is 5 to 6. So, you are moving from here to here, does this person experience any change in the level of satisfaction or in other words change in level of utility no same. It goes up 6, 7, 8 level of utility would remain same as this particular bundle 10 comma 5 bundle, similarly let us say if we have, if we keep the amount of butter fixed and we increase the amount of bread from 10 to 11 or 11 to 12, what would happen amount of bread butter is fixed at 5. So, again the utility will not increase level of satisfaction will not increase. So, all these red points they are at the same utility level, it

means a curve passing through all these points would represent the same indifference would be on the same indifference curve.

So, let us see what happens if we decrease from 10 comma 5, if we decrease the amount of butter to 4 what will happen. Now, if we move amount of its now we are here, what will happen the utility level will decrease. So, this point is no it is not on the same indifference curve. So, let us erase this is not on the same indifference curve and similarly here if we keep the level of butter same and if we decrease the amount of bread again it will not be on the same indifference curve, utility will decrease. So, this part also we should erase.

So, what we will get is basically this will be the indifference curve just quick deviation, little small deviation do you think here this is the preference of this person is convex or it isn't convex. Similarly, let me let me draw a few more indifference curve and they will be like when we move from 10 to let us say here 12 and then here 6 and then again we get another indifference curve and so on. We can get things like that we will get is it convex is it is strictly convex.

Let us look at it lets take this one if we pick any 2 bundle, let say the bundles are this is one bundle this is another bundle and we draw a line, at all these points utility level is higher ok, but how about when we pick this point and these this point and we draw a line utility level is same. So, it means it satisfies convexity, but not strict convexity, is it clear remember earlier I talked about it that the all the axioms rationality axioms, continuity axioms, monotonicity and strict convexity all these are satisfied then we can use our optimisation technique, but here one strict convexity is not satisfied fine ok.

Now, we have drawn we have drawn our indifference curves, how can we give the utility what will be the utility equal to let say Br denotes bread and Bu denotes butter , minimum of Br comma let us check, Br comma to b a means let us take the example here is the point, here is the point 12 comma 5 what do we get minimum of 12 comma 2 multiplied by 5. So, that is equal to 10, is this fine.

So, this one is also what we what we mean to say here is that to increase utility by 1 unit although I am using here in the cardinal sense, but one unit is meaningless I am just talking about the ranking. So, increase utility by 1 unit what do we need we need increase in 1 unit butter, 2 unit bread and 1 unit butter. That is what we need or in other

word one unit of bread will increase half unit of utility if we have one unit of butter, I am saying that if you have one more unit of butter, if if bread is going up by one unit then and if we have one more unit of butter then in ordinal sense let say that utility will increase by half.

So, in other word we can say utility is Br by 2 multiplied by Bu, but here these 2 are different are they, but if you notice.

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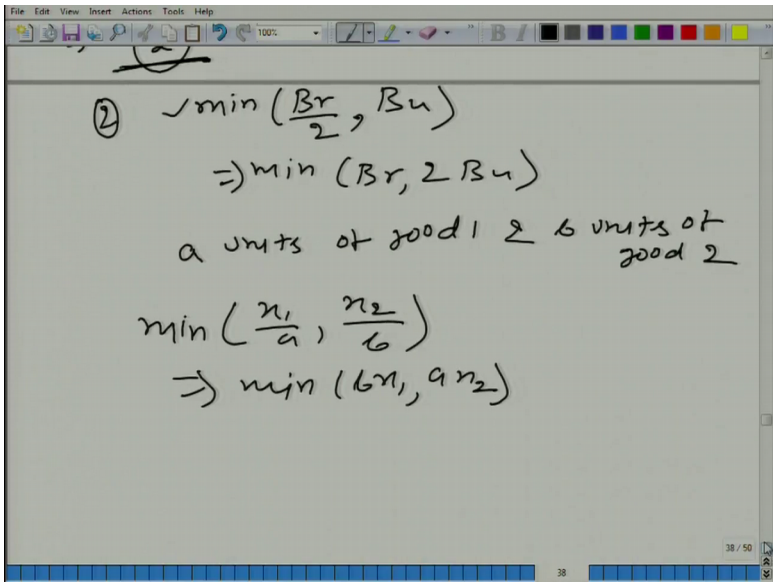

The second one is the monotonic transformation of the first one or the first one is the monotonic transformation of the second one, you multiply the whole thing by 2 what we will get minimum of Br multiplied by 2 bu. So, they represent the same utility level or we can say that if you require, let say to increase in utility by 1 unit you require a units of good 1 and b units of good 2.

So, how many one unit of good will increase the 1 by a. So, utility is going to be represented by minimum of x 1 by a and x 2 by b and if you multiply by whole thing you can also say this is equivalent to minimum of bx 1, ax 2 fine this is the utility representation.

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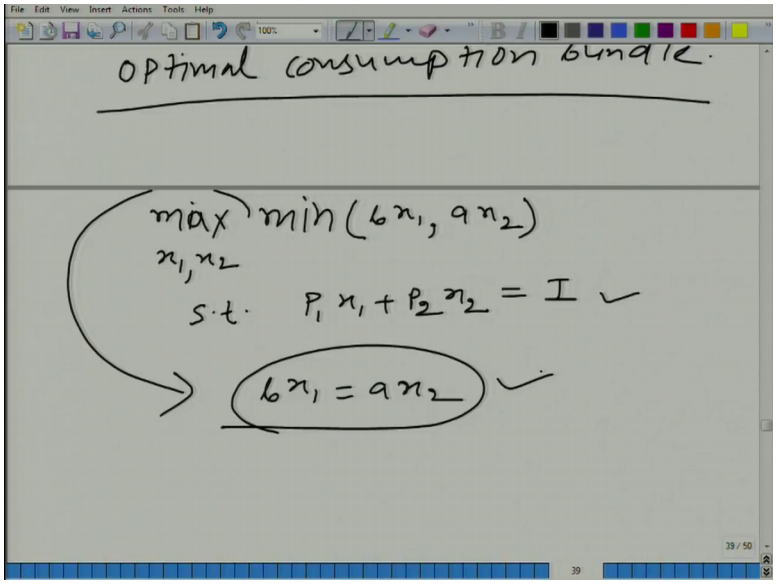

Now, how about the optimal consumption bundle, about optimal consumption bundle always be on the corner point that we have ok, fine. So, if it is always on the corner point what does it mean, how can we solve the problem. Now, the problem is let say maximise minimum of let say this is the problem bx 1 comma ax 2 with respect to x 1 comma x 2 such that p 1 x 1 plus p 2 x 2 is equal to I. Again we do not have to worry about less than or equal to sign because this does is satisfy monotonicity, it does not satisfy monotonicity, it satisfy the another version of monotonicity the version that we have talked about in the class is not satisfied.

What we have said in the class that same amount of all the other goods and at least the person has some more of one good then his utility will be higher than the previous situation scenario that is not true here. So, that version of monotonicity is not satisfied.

Student: Only on the line.

Yes.

Student: Joining corner.

Only on the joining corner this is satisfied, but fortunately here the optimal bundle lies on the on the corner itself, what, how can we solve from here what we need to maximise utility what we need is bx 1 is equal to ax 2, if this is not equal then you are wasting at least 1 of the you are wasting one of these 2 goods because both goods are expensive ok.

So, now you have 2 equations, 2 linear equation and it is very easy to solve. So, let us solve it what will you get x 1.

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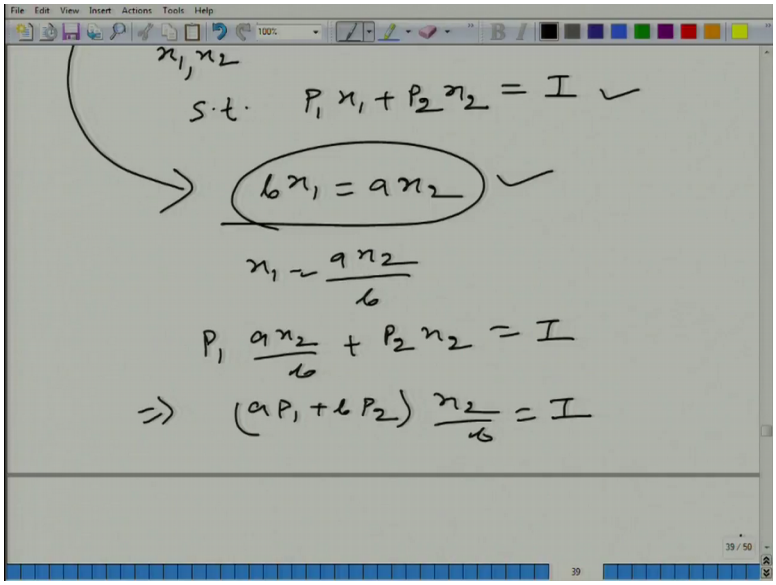

Is equal to ax 2 by b so p 1 ax 2 by b is equal to p to x 2 i. So, basically what we have a p 1 plus bp 2 x 2 by b is equal to i. So, x 2 is.

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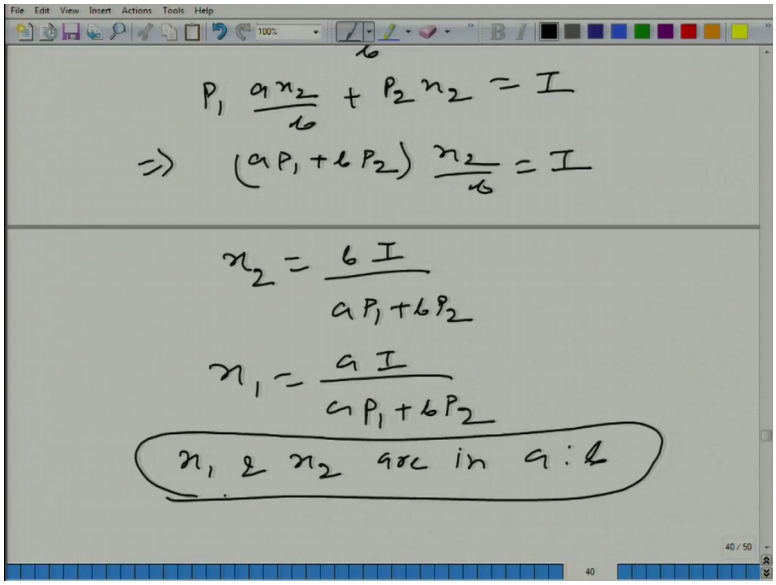

So, x 2 is b I a p 1 plus bp 2 and x 1 is if you solve it you will get a i, a p 1 plus b p 2. So, x 1 and x 2 are in a is to b ratio that is how we started a that the description, it is clear and solution will be on link.