Introduction to Programming in C
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Lecture - 23

This one more concept that we have to understand, before we really understand how c evaluates expressions, that is the concept of precedence.

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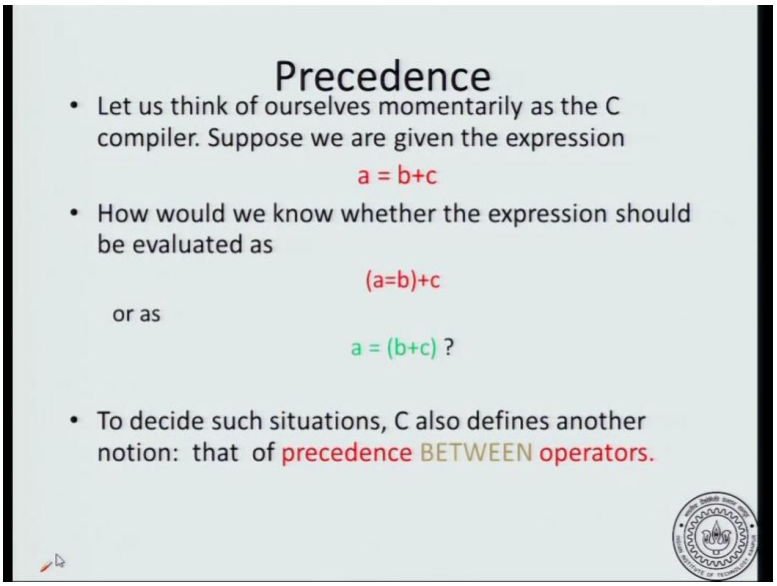

So, what do we mean by a precedence? Let us pick a expression which involves multiple operators. Like for example, in this expression you have two operations, the assignment operation and the addition operation. Now, how do we know, how to evaluate this expressions. So, what are the two ways in which the above expression can be interpreted, the first way is you could say a equal to b and then say plus c or you can say a equal to b plus c.

To decide which of the above possibilities to really do, c also defines what is known as a precedence between operators. So, we have already seen in the notion of associativity which is what happens, when the many occurrences of the same operator occur in an expression. Precedence on the other hand is to mediate between two different or multiple different operations in the same expression.

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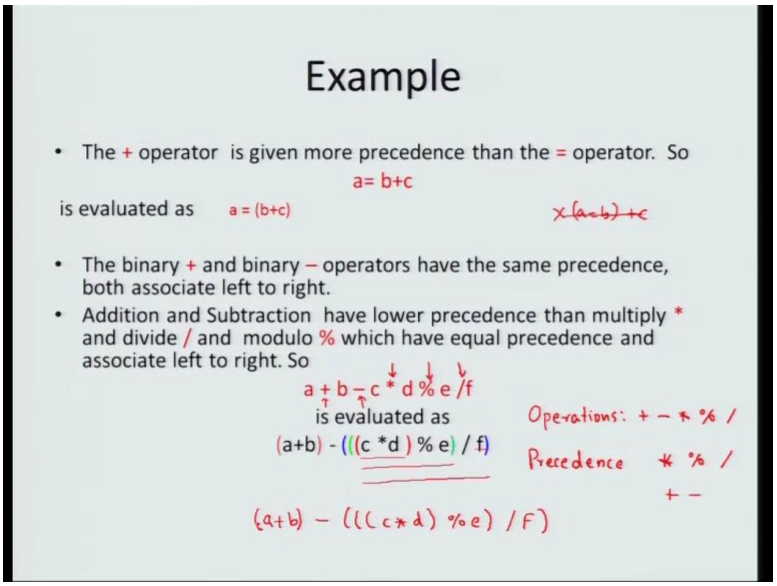

So, let us see what is an example of using precedence. So, in c the plus operation is given more precedence than the equal to operation. So, I really want to interpret this expression as a equal to b plus c. So, this is how I want to interpret their operation and not as a equal to b plus c. So, I want to avoid this and I want to do it in this way. So, one way I can ensure that is by saying that, please do b plus c first, then take that result and assign it to it.

So, one way of doing that is to say, whenever equal to and plus appear together give more importance to plus, do that first. So, proceed means going first. So, plus has a greater precedence over assignment plus and minus have the same precedence and both have the same associativity we have seen this, addition and subtraction have the same precedence,, but multiplication and division have a higher precedence.

So, if I want to evaluate a complicated expression, let us say that a plus b minus c star d modulo e divided by f. So, suppose I have a fairly complicated expression, what I can do is, what are the operations here? So, the operations are plus, minus, star, modulo and division. Now, according to the precedence I know that star, modulo and division have equal precedence about plus and minus.

So, I know that these operations have to be done before plus and minus. So, they have a lower precedence. So, these have to be done first,, but among them how do you know which to do first, for that we use the left to right associativity of these operations. So, as for as with in the same precedence is concerns, let us just simplify this situation in a little

bit and think of them as the same operation, their different operations of the same precedence.

But, I will just ((Refer Time: 04:26)) the thing a little bit to say that, let say that they are the same operation, all of them have left or right associativity. Therefore, I will according to the associativity rule I will do c star d first, then that modulo e and then that divided by f, because that is what the left to right associativity it says. So, by precedence we will know that these three operations have to be done first, among them how do you do this, star occurs first when you scan from left to right. So, c star d has to be done first and then the modulo operation and then the divided by operation.

So, and once you done there then you come to plus and minus. So, currently once we have finished with this, you will have some situation like this, c star d modulo e divided by f and then on the remaining side you have a plus b minus this. And now you have to decide, which may you will do the plus and minus, again we know that they have the same precedence.

So, let us found a little bit and think of them as the same operator, both of them have the left or right associativity. So, I do a plus b first and then the minus. So, with in the same precedence level, you will decide which operation to do first purely based on the left to right associativity.

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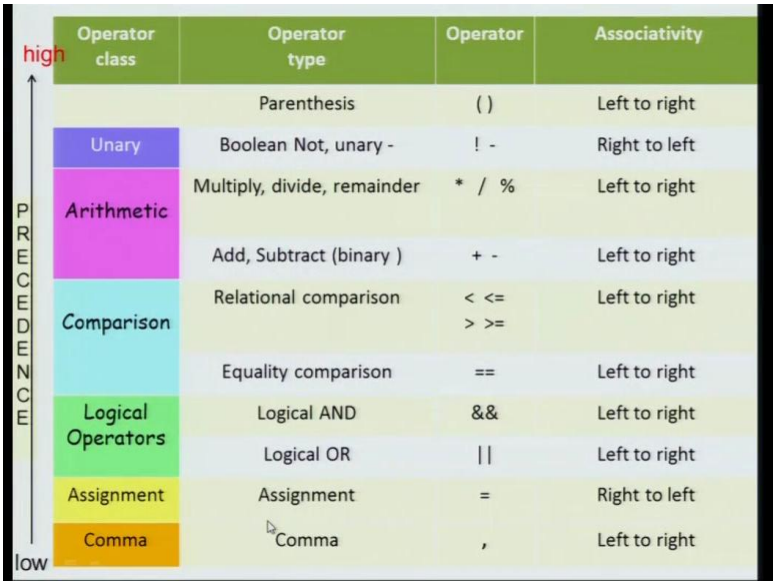

Operator class	Operator type	Operator	Associativity
	Parenthesis	( )	Left to right
Unary	Boolean Not, unary -	! -	Right to left
Arithmetic	Multiply, divide, remainder	* / %	Left to right
	Add, Subtract (binary)	+ -	Left to right
Comparison	Relational comparison	< <= > >=	Left to right
	Equality comparison	==	Left to right
Logical Operators	Logical AND	&&	Left to right
	Logical OR	||	Left to right
Assignment	Assignment	=	Right to left
Comma	Comma	,	Left to right

So, let us take a look at the precedence of associativity table. Again I want to emphasie is not to memorise, it is just that if you are given this table, you should be able to understand how an expression is going to be evaluated? So, parenthesis is above all because once a parenthesis an expression, then you really saying this is the order that I want. So, it over writes any other precedence or associativity rule.

Then, you have the unary operations which have the second higher precedence, then the arithmetic operations, then the comparison operation, logical operators, assignment and so, on. The comma is an operation we will see later. So, with in the arithmetic operations multiply, divide and modulo operator have higher precedence over plus and minus. Plus and minus have higher precedence over relational operations, like less than, less than or equal to and so, on. So, we will see a few examples of how to use this table to understand what will happen with an expression?

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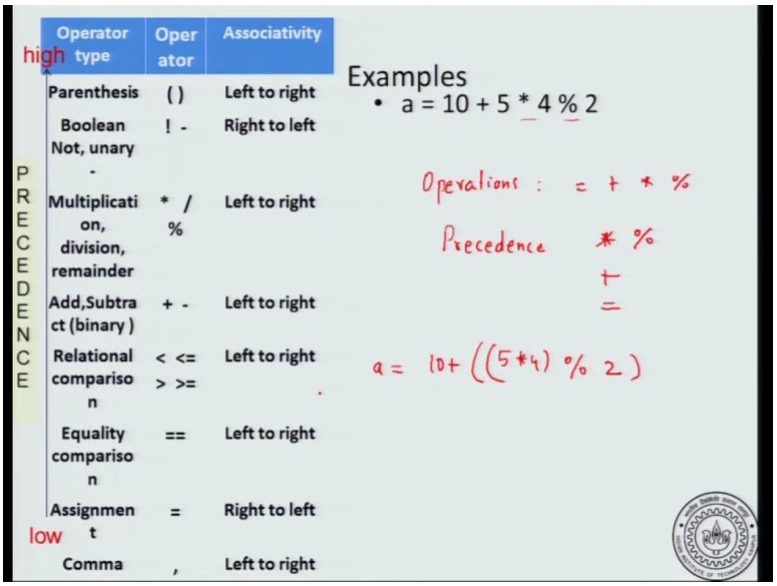

So, let us take 10 plus 5 star 4 modulo 2 and assign to a, let us examine what will happen here. So, what I will do is I will make a list of operations. So, they are equal to, plus, star, modulo and then precedence I know that multiplication and modulo have very high precedence. Then, the next level is plus and then assignment has the least precedence.

Now, both of these occurring in this expression star and modulo, how do we decide which goes first, both of them have left to right associativity. So, whatever happens first in the looking from left to right, we will do that first. So, among all these operations we know that 5 star 4 will happen first, then this will be followed by modulo 2 and then this will be followed by 10 plus. And finally, the last which is that you do all these operations get the value and assign it way. So, this is the way in which the above expression will be evaluated. So, the above expression corresponds to giving the parentheses in the wave that we have done.

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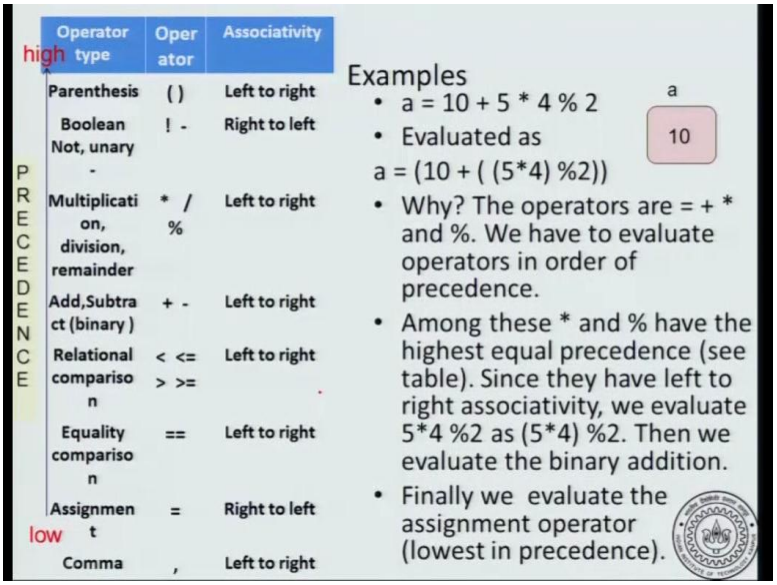

So, once you do that a will get the value 10.