

CS & IT ENGINEERING



'C' Programming

'C' Tokens

Lecture No.- 02



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Recap of Previous Lecture



— What is a 'C' Token?

— The Smallest individual Element of 'C' Program

— 6 Tokens : Identifiers, Keywords, Constants, Strings, Operators, Special Symbols.

— Identifiers : Name (1) Start with letter or _ 2) No space 3) Not a keyword
4) No Symbol Except _ 5) length < 32)

— Keywords : Predefined / Reserved word (32 keywords, Each letter must be in small)

— Constants : (Fixed Value) [Numeric Constants : Integers, Real
Literal Constants : Character, String]



Topics to be Covered



– Operators

- Definition
- Types of Operators
- Unary operators





Operators

An operator, which performs operation, on operands.

Example : $a \leq b$

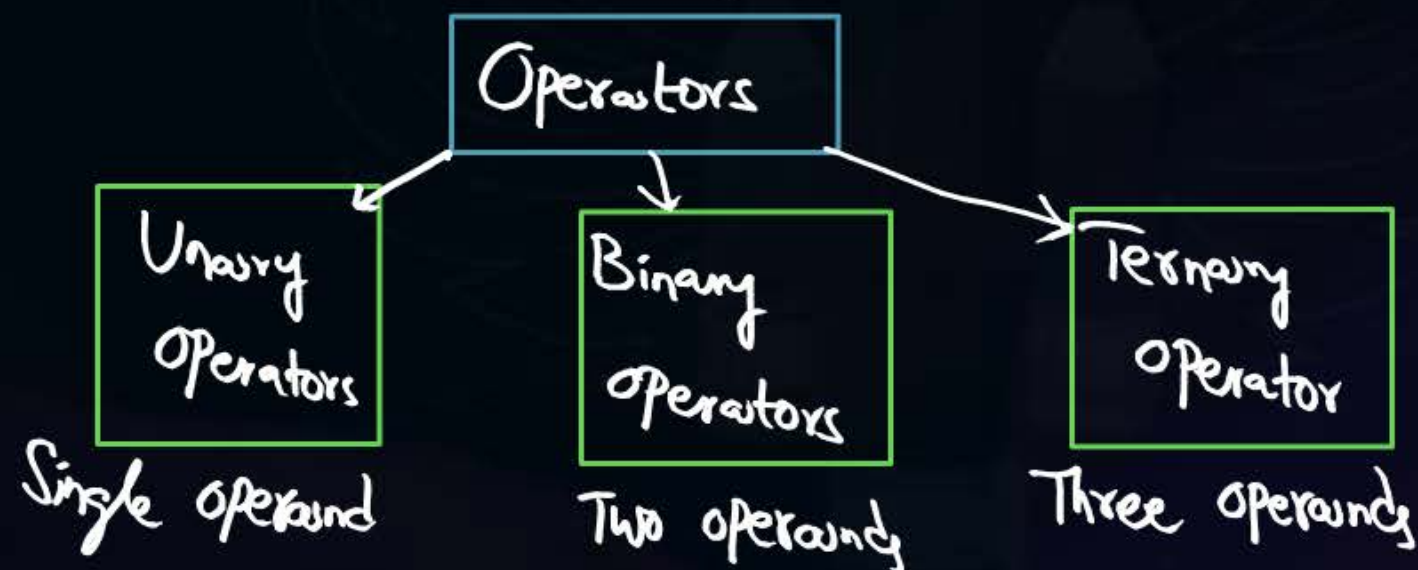
\leq = operator

a b operands

In Equality operation

Types of Operators

Based on Number of operands that are used to perform operation, operators are classified into 3 types.





Unary Operators

Operator	Operation / Meaning
++	Increment
--	Decrement
+	Sign Plus
-	Sign minus
*	Pointer Indirection
&	Address of
!	Logical NOT
~	Bitwise NOT
sizeof	Size of the given data



Topic : 'C' Tokens - 2

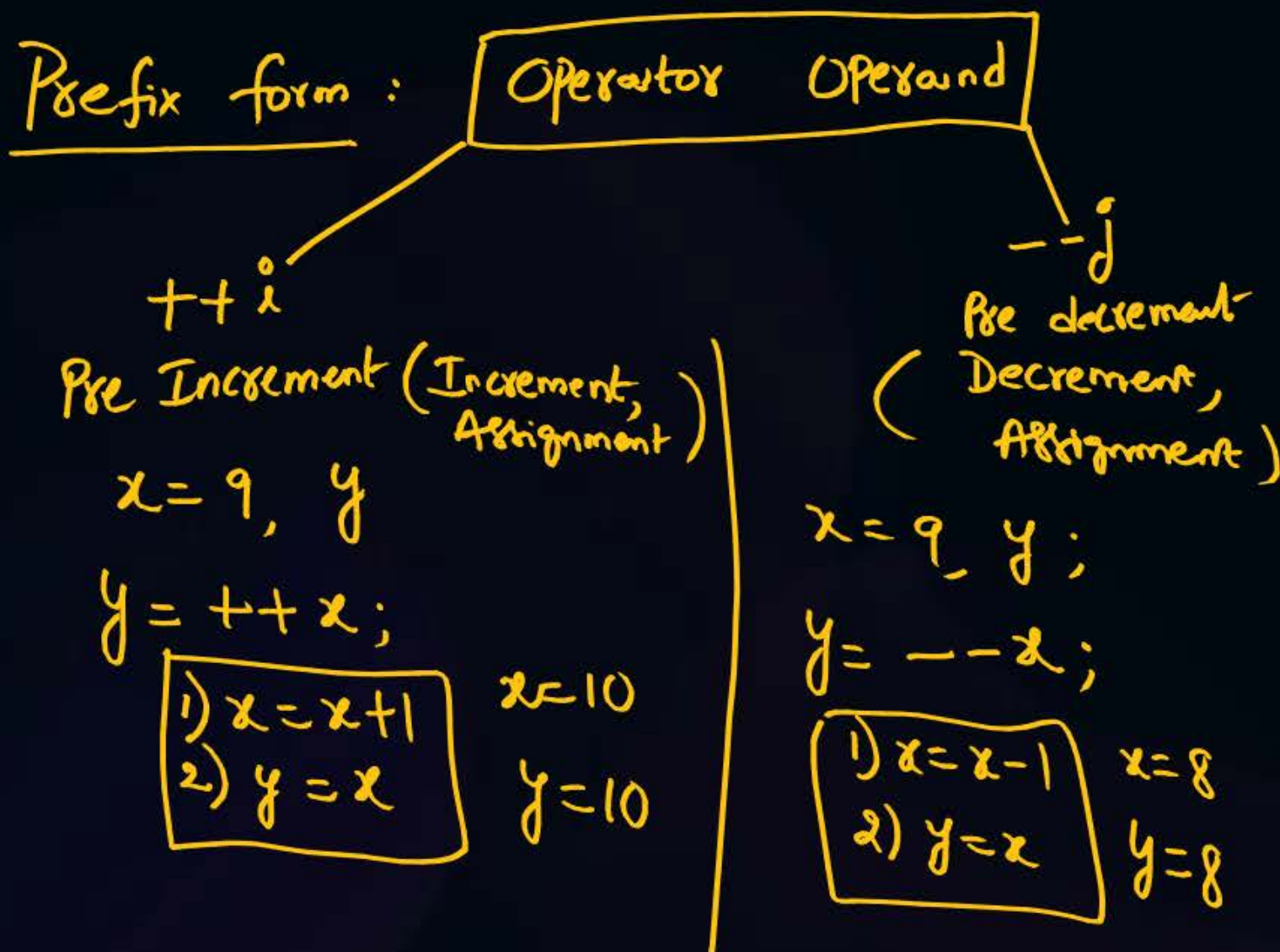


Increment and Decrement Operators :

Increment == Next

Decrement == Previous

— These operators can be implemented in either of 2 ways: Prefix form, Postfix form



$x = 9$
 $x = ++x;$

1) $x = x + 1$
2) $x = x$

$x = 10$

$x = 9;$
 $x = --x;$

1) $x = x - 1$
2) $x = x$

$x = 8$



Topic : 'C' Tokens - 2



Postfix form : Operand Operator

$i++$
Post Increment (Assignment, Increment)

$i = 9, j$

$j = i++;$

1) $j = i$	$j = 9$
2) $i = i + 1$	$i = 10$

$j--$
Post Decrement (Assignment \rightarrow Decrement)

$i = 9, j$

$j = i--$

1) $j = i$	$j = 9$
2) $i = i - 1$	$i = 8$

$x = 9$

$x = x++$

1) $x = x$
2) $x = x + 1$

$x = 10$

$x = 9$

$x = x--$

1) $x = x$
2) $x = x - 1$

$x = 8$



Topic : 'C' Tokens - 2



Examples

$$\begin{array}{c} i \\ \boxed{\cancel{7} 8 7} \end{array}$$

$$\begin{array}{c} j \\ \boxed{\cancel{-8} \cancel{-4} \cancel{-5} \\ -4} \end{array}$$

$$\begin{array}{c} k \\ \boxed{\cancel{9} 8 1} \end{array}$$

$$\begin{array}{c} p \\ \boxed{\cancel{2} 4} \end{array}$$

$$\begin{array}{c} q \\ \boxed{\cancel{12} \cancel{13} 14} \end{array}$$

① int $i=7, j=-5, k=9, p=3, q, r, s;$

$$i = \underline{7}$$

$$j = \underline{-4}$$

$$k = \underline{7}$$

$$p = \underline{4}$$

$$q = \underline{14}$$

$$r = \underline{15}$$

$$s = \underline{-10}$$

$$q = i++ + ++j + k--; \quad q = 7 + (-4) + 9 = 7 - 4 + 9 = 12$$

$$r = j-- + ++q + --i; \quad r = (-4) + 13 + 7 = -4 + 13 + 7 = 16$$

$$s = ++p - --k + ++j - r-- + q++;$$

$$= 4 - 7 + (-4) - 16 + 13$$

$$s = 4 - 7 - 4 - 16 + 13$$

$$= 17 - 27$$

$$s = -10$$

$$\begin{array}{c} r \\ \boxed{\cancel{16} 15} \end{array}$$

$$\begin{array}{c} s \\ \boxed{-10} \end{array}$$



Topic : 'C' Tokens - 2



Ex: (2)

$$a = -4, b = 0, c = -1, d = -2, e = 1$$

$$a = \cancel{-4} \cancel{-5} \cancel{2} \cancel{4} \cancel{2} \cancel{5} \cancel{2} \cancel{6}$$

$$b = c++ + ++e - --a - ++d;$$

$$b = -1 + 2 - (-5) - (-1)$$

$$b = -1 + 2 + 5 + 1 = 7$$

$$b = \cancel{0} \cancel{7} \cancel{8} \cancel{7} \cancel{6} \cancel{7}$$

$$c = d-- - --c + b++ + ++e;$$

$$c = -1 - (-1) + 7 + 3$$

$$c = -1 + 1 + 7 + 3$$

$$c = \cancel{-1} \cancel{0} \cancel{-1} \cancel{10} \cancel{4} \cancel{10} \cancel{11}$$

$$a = --b - --d + c++ + ++e;$$

$$a = 7 - (-3) + 10 + 4$$

$$= 7 + 3 + 10 + 4$$

$$d = \cancel{-2} \cancel{-1} \cancel{-2} \cancel{-3} \cancel{4} \cancel{3} \cancel{3}$$

$$d = a++ + ++c + e-- - --b;$$

$$d = 24 + 12 + 4 - 6$$

$$= 34$$

$$e = \cancel{-1} \cancel{2} \cancel{3} \cancel{4} \cancel{5} \cancel{5}$$

$$e = d-- - --c + b++ + ++a;$$

$$e = 34 - 11 + 6 + 26$$

$$= 66 - 11 = 55$$

$$a = \underline{26} \quad b = \underline{7} \quad c = \underline{11} \quad d = \underline{33} \quad e = \underline{55}$$



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NOTE: The Sequence (or) Order of Evaluation (or) The behaviour of Increment and Decrement Operators is Highly Unpredictable, due to flexibility to change rules of Compilers.





2 mins Summary



- Operators

- Types
- Unary operators
- Pre Inc, Pre Dec
- Post Inc, Post Dec



THANK - YOU