

05

April

15th Wk • 095-270

09/04/24  
Tuesday

S	T	W	T	F	S	S	M	T	W	T	F	S
11	12	13	14	15	16	17	18	19	20	21	22	23
25	26	27	28	29	30	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15	16	17	18	19	20

operators & Binary Number SystemArithmetic operators

✓ Binary operators → perform with 2 operands.  
 +, -, \*, /, %

✓ Unary operators → perform with single operand.

++ , --  
 ↘ a = a - 1.  
 a = a + 1

1 Pre-increment : ++a → (i) change value, (ii) use value

2 Post-increment : a++ → (i) use value, (ii) change value

3 E.g. 1

E.g. 2

4 int a = 10;  
 int b = 0;

int a = 10;  
 int b = 0;

b = 10  
 a = 11  
 ↙ 5  
 ↙ b = a++ ;  
 ↙ b = ++a ;  
 ↙ b = 11  
 ↙ S.O.Pln(b);  
 ↙ S.O.Pln(b);  
 ↙ a = 11.  
 ↙ S.O.Pln(a);  
 ↙ S.O.Pln(a);

Pre-decrement :- --a

4 E.g. 1  
 Post-decrement :- a--

E.g. 1

b = a--;  
 b = 10, a = 9

E.g. 2

b = --a;  
 b = 9, a = 9.

2022

MAY
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22

23 24 25 26 27 28 29 30 31

M T W T F S S M T W T F S S

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06

Wednesday

## Relational operators

8       $=$      $\rightarrow$  equal to . checks 'a' equal to 'b' or not.

9       $!=$      $\rightarrow$  not equal to

10      $>$      $\rightarrow$  greater than

11      $<$      $\rightarrow$  less than

12      $\geq$      $\rightarrow$  greater than or equal to

1       $\leq$      $\rightarrow$  less than or equal to

All these checks  
corresponding check operations  
and returns true or  
false.

## Logical operators

3       $\&$  (logical AND)

4       $\|$  (logical OR)

5       $!$  (logical NOT)

## Binary Number System

Decimal number System  $\rightarrow$  Base: 10. (0 - 9)

Binary number System  $\rightarrow$  (Base 2) (0 - 1).

8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30											

M	T	W	T	F	S	S	M	T	W	T	F	S
---	---	---	---	---	---	---	---	---	---	---	---	---

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Thursday

~~E.g. 1~~ 4 to Binary

$$\begin{array}{r}
 \cancel{4} \\
 2 \overline{)4} \quad 0 \\
 2 \overline{)2} \quad 0 \\
 \quad \quad 1
 \end{array}
 \quad (100)_2$$

$\therefore (4)_{10} \rightarrow (100)_2$

~~E.g. 2~~ 100 to decimal

$$\begin{array}{r}
 \cancel{100} \\
 2^2 \quad 2^1 \quad 2^0 \\
 1 \quad 0 \quad 0
 \end{array}
 \rightarrow (0 \times 2^0) + (0 \times 2^1) + (1 \times 2^2)$$

$$= 0 + 0 + 4 = 4.$$

$(100)_2 \rightarrow (4)_{10}$

~~E.g. 3~~ 5 to binary

$$\begin{array}{r}
 2 \overline{)5} \\
 2 \overline{)2} \quad 1 \\
 \quad \quad 1 \quad 0
 \end{array}
 \quad (101)_2$$

~~E.g. 4~~ 101 to decimal

$$\begin{array}{r}
 2^2 \quad 2^1 \quad 2^0 \\
 1 \quad 0 \quad 1
 \end{array}
 = (1 \times 2^0) + (0 \times 2^1) + (1 \times 2^2)$$

$$= 1 + 0 + 4 = (5)_{10}.$$

2022

MAY	1	2	3	4	5	6	7	8				
9	10	11	12	13	14	15	16	17				
23	24	25	26	27	28	29	30	31				
M	T	W	T	F	S	S	M	T	W	T	F	S

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Friday

other number systemOctal  
(base 8)Hexadecimal  
(base 16)// Bitwise operators

&amp; (Binary AND) → checks every bit of 2 operands, and returns '1' if both bits are true, else '0'

| (Binary OR)

^ (Binary XOR)

~ (Binary one's complement)

&lt;&lt; (Binary left shift)

&gt;&gt; (Binary Right shift)

✓ very important for Bit Manipulation.

✓ very important for dynamic programming.

E.g.  $a = 0101$ ,  $b = 0110$ .

$$a = 0101$$

$$b = 0110$$

$$\begin{array}{r} a \\ b \\ \hline \end{array}$$

$$0100$$

Time - 1

False - 0

binary &amp;

$$a \& b = 0100$$

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Saturday

2022

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S	T	F	S	1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	1	2	3	4	5	6	7
M	T	W	T	F	S	S	M	T	W	T	F	S	S

E.g.  $a = 0101$

$$b = 0110$$

$$\begin{array}{r} a \\ \times b \\ \hline 0111 \end{array}$$

binary | (OR)

$$c = a | b = 0111.$$

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E.g.

$$a = 0101$$

$$b = 0110$$

$$\begin{array}{r} a \wedge b \\ \hline 0011 \end{array}$$

similar values → false

diff. value → true

binary ^ (XOR)

12

$$a \wedge b = ab' + a'b.$$

1 If  $a=0, b=0, a \wedge b = 0.$ 2 If  $a=1, b=0, a \wedge b = 1.$ 3 If  $a=0, b=1, a \wedge b = 1.$ 4 If  $a=1, b=1, a \wedge b = 0.$ 

5

E.g.

$$a = 0101, \sim a = 1010.$$

$$b = 0110, \sim b = 1001.$$

binary complement

E.g. Binary left shift

 $a = 0101, a \ll 1$  (it means 1 pos. shift left)

$$\begin{array}{r} 0 1 0 1 \\ \times 1 \\ \hline 1 0 1 0 \end{array}$$

$\downarrow a \ll 1$

 $\therefore a \ll 1 = 1010$

2022

MAY	1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26
27	28	29	30	31				

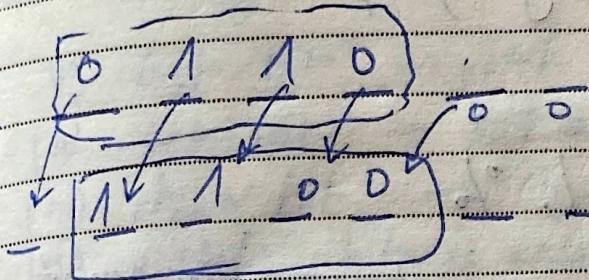
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Sunday

$$b_2 = 0110, \quad b \ll 1 = \underline{\underline{1100}}$$

Binary right shift

$$0101 \gg 1 = \underline{\underline{0010}}$$

$$0110 \gg 1 = \underline{\underline{0011}}$$

Assignment operators

$$=, + =, - =, \alpha =, / =.$$

These operators assign the value in the right side of the operator to the left side.

$$\text{If, } a = 10, \quad b = 5,$$

then,  $a = b$  means  $a = 5$ .

then,  ~~$a * = b$~~  means,  $a = a * b$ ,  $a = 50$

$a += b$  means,  $a = a + b$ ,  $a = 15$

$a -= b$  means,  $a = a - b$ ,  $a = 5$

$a /= b$  means,  $a = a / b$ ,  $a = 2$

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Monday

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		1	2	3	4	5	6	7	8	9	10
		11	12	13	14	15	16	17	18	19	20
2022	APRIL	21	22	23	24	25	26	27	28	29	30
		M	T	W	T	F	S	S	M	T	W

## Summary of operators

### 1) Arithmetic operators

9 Binary : +, -, \*, /, %

Unary : ++, --

10 Pre-Increment : ++a, Post-increment: a = a++  
Pre-decrement: --a, Post-decrement: a = a--

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### 2) Relational operators

12 ==, !=, >, <, >=, <=

### 3) Logical operators

1 &, ||, !

### 4) Bitwise operators

3 &, |, ^, <<, >>, ~

### 5) Assignment operators

5 =, +=, -=, \*=, /=.

## Summary of Number System

6 Binary  $\rightarrow ( )_2$

Decimal  $\rightarrow ( )_{10}$

Octal  $\rightarrow ( )_8$

Hexadecimal  $\rightarrow ( )_{16}$