Bitwise operator

Sunday, 3 September 2023 1:31 PM

bitwise → bit level

- → AND → &
- → OR → |
- → NOT → ~
- → XOR → ^

→ bitwise And

a	b	a & b
0	0	0
0	1	0
1	0	0
1	1	1

→ bitwise OR

a	b	a | b
0	0	0
0	1	1
1	0	1
1	1	1

→ bitwise XOR (imp: used to solve complex questions)

a	b	a ^ b
0	0	0
0	1	1
1	0	1
1	1	0

Ex → 2, 3, 4, 5, 2, 4, 3,
Find unique element?
⇒ apply XOR in every element
2 ^ 3 ^ 4 ^ 5 ^ 2 ^ 4 ^ 3
⇒ (0010) ^ (0011) ^ (0100) ^ (0101) ^ (0010) ^ (0100) ^ (0101)
⇒ 0101
⇒ 5

Q.)
```
main() {
    int num = 1;
    cout << ~num << endl;   // ~ (Tilda)
    cout << (~num) << endl;
    cout << ~(num) << endl;
}
```

⇒ ~1
⇒ 1 = 00000.....0001
⇒ ~1 = 11111.....1110

it is a negative no. So it's magni. is 2's compliment
1's compli. = 0000.....1
2's = 0000.....10

LSB = 1 -ve no.

~1 = 1000.....10
⇒ ~1 = -2

Output
>> -2
>> -2
>> -2

H.W
What if bool num = 1
Why the output is still -2

Q.)
```
main() {
    int a = 5;
    int b = -5;
    cout << 5 ^ -5 ;
}
```

Output
>> -2

5
⇒ 0000.....0101
-5
⇒ 1's = 1111.....1010
2's = 1111.....1011

5 ^ -5
⇒ 5: 0000.....0101
-5: 1111.....1011
1111.....1110

LSB: -ve
to magnitude 2's compliment hoga

1's: 0000.....0001
2's: 0000.....0010
⇒ 2

⇒ 5 ^ -5 = -2

H.W
(~a) vs ~(a)
see if this give different answer

Left Shift Operator

`<<1`

0 0 0 0 . . . . 0 1 1 1] → 7

`<<1`

0 0 0 0 . . . . 1 1 1 0] → 14

$2^3 = 8$
$2^2 = 4$
$2^1 = 2$
14

`<<1`

0 0 0 0 . . . 1 1 1 0 0] → 28

$2^4 \rightarrow 16$
$2^3 \rightarrow 8$
$2^2 \rightarrow 4$
28

Right Shift operator

" >> "

int n = 5

n>>1 → divide 2^1
⇒ $n/2 = 2$

n>>2 → divide 2^2
⇒ $n/2^2 = 1$

If a num is right shifted n times then the ans is " $\frac{num}{2^n}$ " → Not every time

⇒ -5

1 1 1 1 1 . . . . 0 1 0

>>1

0 1 1 1 1 . . . . 1 0 1

now this became a +ve num

⇒ If the num is -ve and signed int then compiler can handle it correctly and will give right answer.

but if the num is unsigned int then it will give a big +ve num.

⇒ int n = 10;
n << -1 ; if we do right shift by -ve num then,
it does not give error, it just gives warning and will give garbage value

(Imp)
* Pre/Post Inc/Dec. operator

pre increment → ++a
(post " → a++

pre-decrement → --a
post-decrement → a--

++a: increment then use
a++: use then increment
--a: decrement then use
a--: use then decrement

Ex → 1. main() {
int a = 5;
cout << (++a);
}

>> 6

2. main() {
int a = 5;
cout << (a++);
}

>> 5

3. main() {
int a = 10
cout << (--a) * 10;
cout << a;
}

>> 90
>> 9

4. main() {
int a = 10;
cout << (a--) * 10;
cout << a;
}

>> 100
>> 9

5. main() {
int a = 21;

cout << ++a << endl;
cout << a++ << endl;
cout << a;
}

>> 22
>> 22
>> 23

6. main() {
int a = 10;
cout << (++a) * 10 << endl;
cout << (a++) * 10 << endl;
cout << a;
}

>> 110
>> 110
>> 12

7. main() {
int a = 10;
cout << (++a) * (a++);
}

>> 121 / 132

8. main() {
int a = 10
cout << (a++) * (++a);
}

>> 120 or any other answer

Q. 7 and Q.8 are H.W question why the answers are varying

→ practice more questions

* Break & Continue

→ break

```
for (int i=0; i<=5; i++)
  {
     if(i==2)
        break;
cout<<i<<endl;
  }
```

out of loop

```
>> 0
>> 1
```

→ Continue (current iteration skip)

```
for (int i=0; i<=5; i++)
  {
     if(i==2)
        continue;
     cout<<i<<endl;
  }
```

```
>> 0
>> 1
>> 3
>> 4
>> 5
```

Continue current iteration ko skip karke ata on

* Global and Local Variable

```
int a=25;
main(){
   a=5;
   cout<<a;
}
```

H.W 05/09/23

>> Error global variable cannot be reinitialised

>> Scope of global variable is in the whole program

```
main()
{ int a=5;

  for(int i=0;i<=5;i++){
        cout<<a;
  }
  cout<<i;
```

=) It will give error since i is local to the for loop and cannot be accessed out side it, means scope of i is inside for loop.

```
main(){
   int a=202;
   if(true){
      int a=303;
      cout<<a;
   }
}
```

>> 303

So compiler will look for value of a which is near the print statement that's why it is giving 303.

using goto statement is a bad practice

Q) 1*2+5/10-2

→ we solve it acc. to BODMAS

→ but computer solves it by operator precedence

→ don't need to remember precedence table just use brackets like ((1*2)+(5/10)-2)