# Check if a number is multiple of 9 using bitwise operators

Given a number n, write a function that returns true if n is divisible by 9, else false. The most simple way to check for n's divisibility by 9 is to do n%9.
Another method is to sum the digits of n. If sum of digits is multiple of 9, then n is multiple of 9.
The above methods are not bitwise operators based methods and require use of % and /.
The bitwise operators are generally faster than modulo and division operators. Following is a bitwise operator based method to check divisibility by 9.

```
#include<iostream>
using namespace std;

// Bitwise operator based function to check divisibility by 9
bool isDivBy9(int n)
{
    // Base cases
    if (n == 0 || n == 9)
        return true;
    if (n < 9)
        return false;

    // If n is greater than 9, then recur for [floor(n/9) - n%8]
    return isDivBy9((int)(n>>3) - (int)(n&7));
}

// Driver program to test above function
int main()
{
    // Let us print all multiples of 9 from 0 to 100
    // using above method
    for (int i = 0; i < 100; i++)
       if (isDivBy9(i))
```

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```
        cout << i << " ";
    return 0;
}
```

Output:

```
0 9 18 27 36 45 54 63 72 81 90 99
```

**How does this work?**
*n/9* can be written in terms of *n/8* using the following simple formula.

```
n/9 = n/8 - n/72
```

Since we need to use bitwise operators, we get the value of *floor(n/8)* using *n>>3* and get value of *n%8* using *n&7*. We need to write above expression in terms of *floor(n/8)* and *n%8*.
*n/8* is equal to *"floor(n/8) + (n%8)/8"*. Let us write the above expression in terms of *floor(n/8)* and *n%8*

```
n/9 = floor(n/8) + (n%8)/8 - [floor(n/8) + (n%8)/8]/9
n/9 = floor(n/8) - [floor(n/8) - 9(n%8)/8 + (n%8)/8]/9
n/9 = floor(n/8) - [floor(n/8) - n%8]/9
```

From above equation, *n* is a multiple of *9* only if the expression *floor(n/8) – [floor(n/8) - n%8]/9* is an integer. This expression can only be an integer if the sub-expression *[floor(n/8) - n%8]/9* is an integer. The subexpression can only be an integer if *[floor(n/8) - n%8]* is a multiple of *9*. So the problem reduces to a smaller value which can be written in terms of bitwise operators.

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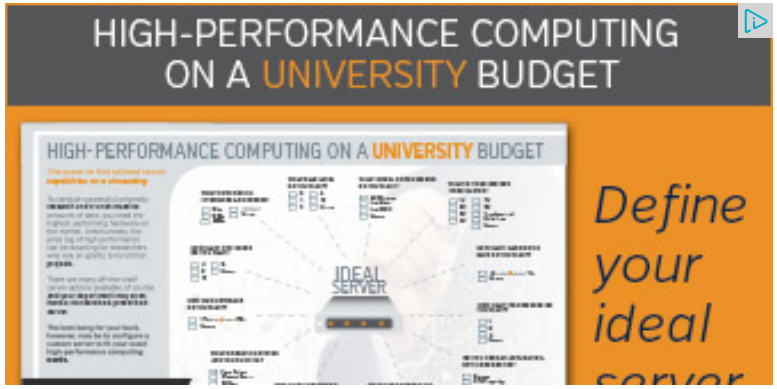




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Hi All,

There is one more solution to it.A number is divisble by 9 if the sum of its digits

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**Lohith Ravi** • a month ago

dude you are using subtration, i would rather subtract 9, until the original numb

```
isDivisbleby9(int n)
{
if(n==0) return true;
else if(n < 9) return false;

return isDivisbleby9(n-9);
}
```

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**Bhagat Vishal** Lohith Ravi • 8 days ago

dude you just used some extra stack . problem talks about bitwise ope to this approach , you need to find the solution using bitwise operators.

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Are we expected to come up with this solution during an interview? Even if I dc apparent.

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You are eventually using minus(-) which is not a bitwise operator.Not a very ef I would use n%9 instead. Pls correct me if I m wrong.

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gud one...!!!!


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