How to swap two numbers without using a temporary variable?

Given two variables, x and y, swap two variables without using a third variable.

Method 1 (Using Arithmetic Operators)
The idea is to get sum in one of the two given numbers. The numbers can then be swapped using the sum and subtraction from sum.

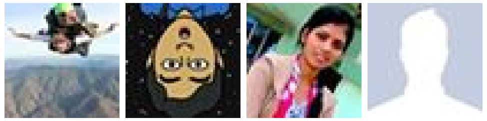
```
#include <stdio.h>
int main()
{
  int x = 10, y = 5;

  // Code to swap 'x' and 'y'
  x = x + y;  // x now becomes 15
  y = x - y;  // y becomes 10
  x = x - y;  // x becomes 5

  printf("After Swapping: x = %d, y = %d", x, y);

  return 0;
}
```

Output:

```
After Swapping: x = 5, y = 10
```

Multiplication and division can also be used for swapping.

```
#include <stdio.h>
int main()
{
```



Interview Experiences
Advanced Data Structures
Dynamic Programming
Greedy Algorithms
Backtracking
Pattern Searching
Divide & Conquer
Mathematical Algorithms
Recursion

```
  int x = 10, y = 5;

  // Code to swap 'x' and 'y'
  x = x * y;  // x now becomes 50
  y = x / y;  // y becomes 10
  x = x / y;  // x becomes 5

  printf("After Swapping: x = %d, y = %d", x, y);

  return 0;
}
```

Output:

```
After Swapping: x = 5, y = 10
```

Method 2 (Using Bitwise XOR)
The bitwise XOR operator can be used to swap two variables. The XOR of two numbers x and y returns a number which has all the bits as 1 wherever bits of x and y differ. For example XOR of 10 (In Binary 1010) and 5 (In Binary 0101) is 1111 and XOR of 7 (0111) and 5 (0101) is (0010).

```
#include <stdio.h>
int main()
{
  int x = 10, y = 5;

  // Code to swap 'x' (1010) and 'y' (0101)
  x = x ^ y;  // x now becomes 15 (1111)
  y = x ^ y;  // y becomes 10 (1010)
  x = x ^ y;  // x becomes 5 (0101)

  printf("After Swapping: x = %d, y = %d", x, y);

  return 0;
}
```

Output:

```
After Swapping: x = 5, y = 10
```

Problems with above methods
1) The multiplication and division based approach doesn’ work if one of the numbers is 0 as the product becomes 0 irrespective of the other number.

Geometric Algorithms

Popular Posts

- All permutations of a given string
- Memory Layout of C Programs
- Understanding “extern” keyword in C
- Median of two sorted arrays
- Tree traversal without recursion and without stack!
- Structure Member Alignment, Padding and Data Packing
- Intersection point of two Linked Lists
- Lowest Common Ancestor in a BST.
- Check if a binary tree is BST or not
- Sorted Linked List to Balanced BST

2) Both Arithmetic solutions may cause arithmetic overflow. If x and y are too large, addition and multiplication may go out of integer range.

3) When we use pointers to variable and make a function swap, all of the above methods fail when both pointers point to the same variable. Let’s take a look what will happen in this case if both are pointing to the same variable.

```
// Bitwise XOR based method
x = x ^ x; // x becomes 0
x = x ^ x; // x remains 0
x = x ^ x; // x remains 0
```

```
// Arithmetic based method
x = x + x; // x becomes 2x
x = x – x; // x becomes x
x = x – x; // x becomes 0
```

Let us see the following program.

```
#include <stdio.h>
void swap(int *xp, int *yp)
{
    *xp = *xp ^ *yp;
    *yp = *xp ^ *yp;
    *xp = *xp ^ *yp;
}

int main()
{
  int x = 10;
  swap(&x, &x);
  printf("After swap(&x, &x): x = %d", x);
  return 0;
}
```

Output:

```
After swap(&x, &x): x = 0
```

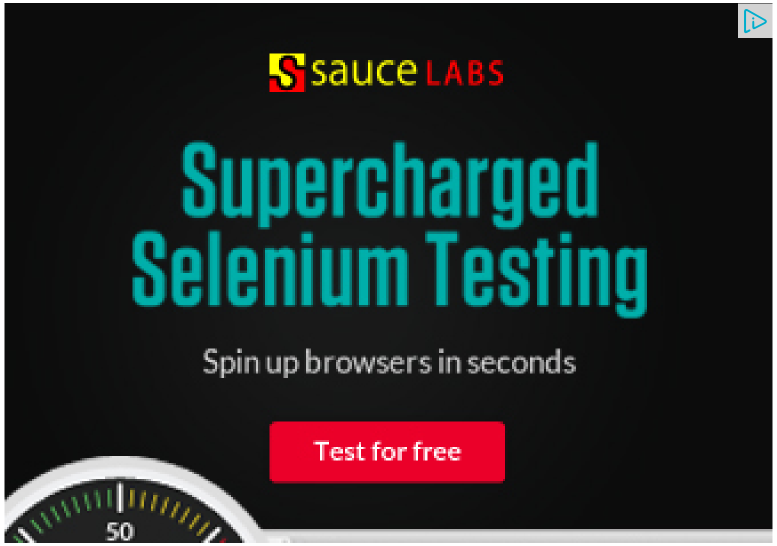
Swapping a variable with itself may needed in many standard algorithms. For example see this implementation of QuickSort where we may swap a variable with itself. The above problem can be avoided by putting a condition before the swapping.

```
#include <stdio.h>
void swap(int *xp, int *yp)
{
    if (xp == yp) // Check if the two addresses are same
      return;
    *xp = *xp + *yp;
    *yp = *xp - *yp;
    *xp = *xp - *yp;
}
int main()
{
  int x = 10;
  swap(&x, &x);
  printf("After swap(&x, &x): x = %d", x);
  return 0;
}
```

Output:

```
After swap(&x, &x): x = 10
```

Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above



705

Subscribe

Recent Comments

Abhi You live US or India?

Google (Mountain View) interview · 31 minutes ago

Aman Hi, Why arent we checking for conditions...

Write a C program to Delete a Tree. · 1 hour ago

kzs please provide solution for the problem...

Backtracking | Set 2 (Rat in a Maze) · 1 hour ago

Sanjay Agarwal bool tree::Root_to_leaf_path_given_sum(tree...

Root to leaf path sum equal to a given number · 1 hour ago

GOPI GOPINATH @admin Highlight this sentence "We can easily...

Count trailing zeroes in factorial of a number · 1 hour ago

newCoder3006 If the array contains negative numbers also. We...

Find subarray with given sum · 2 hours ago

Related Tpoics:

- Check if a number is multiple of 9 using bitwise operators
- Divide and Conquer | Set 4 (Karatsuba algorithm for fast multiplication)
- Find position of the only set bit
- Swap all odd and even bits
- Add two bit strings
- Write your own strcmp that ignores cases
- Binary representation of a given number
- Find the element that appears once

19 Tweet 5 1

Writing code in comment? Please use **ideone.com** and share the link here.

21 Comments **GeeksforGeeks**

Sort by Newest ▾

Join the discussion…

Chita Ranjan Satapathy · a month ago

One line code can make the swap. How ever there are possibilities like value

Anyway I am just writing the method.

a = 5;
b = 10;

a = (a*b)/(b=a);

Now a = 10 and b=5.

kri · 2 months ago

// Arithmetic based method

x = x + x; // x becomes 2x

x = x – x; // x becomes x

x = x – x; // x becomes 0

the result of the second assignment should be zero, not x

4 ⌃ | ⌄ • Reply • Share ›

Blancos · 2 months ago

always use temp variable when swapping. no need for tricks which lead to une

⌃ | ⌄ • Reply • Share ›

coder027 · 3 months ago

good discussion..thanks geeksforgeeks

⌃ | ⌄ • Reply • Share ›

We The Computer Guys · 3 months ago

C code along with an explanation :
http://www.youtube.com/watch?v...

⌃ | ⌄ • Reply • Share ›

Guest · 3 months ago

```
int a = 0;
int b = 20;
cout<<"\nA : "<<a<<" ,="" b="" :="" "<<b;="" a="a" ^="" b;="" b="a" ^="" b;="" a=
"<<a<<"="" ,="" b="" :="" "<<b;="" output:="" a="" :="" 0="" ,="" b="" :="" 20=""
```

⌃ | ⌄ • Reply • Share ›

Aniket Thakur • 3 months ago

Swapping two numbers ---> http://opensourceforgeeks.blog... and
Swapping two Strings ---> http://opensourceforgeeks.blog...
without using temporary variables. Java Code with example.

⌃ | ⌄ • Reply • Share ›

xxmajia • 3 months ago

Thanks for sharing.
But I Agree with @Qianqian

If we look at the problem at the CPU instructions perspective, use tmp will be l
run a benchmark agains all those 4 method (including the 4th by using temp v
beats all above 3 method. And the reason is how CPU move the variable into r
need to use.

So this 3 can be used in an interview for "show off", but just make sure, we do

⌃ | ⌄ • Reply • Share ›

Gaurav Jain • 3 months ago

a^=b^=a^=b;

⌃ | ⌄ • Reply • Share ›

DIDI • 3 months ago

Python:
a, b = b, a

2 ⌃ | ⌄ • Reply • Share ›

Qianqian • 3 months ago

But, what's the advantage of this method compared to the temporary variable
In my opinion, IF will introduce a jump in the CPU streamline which is not gooc

⌃ | ⌄ • Reply • Share ›

Harsha · 3 months ago

a=a+b-(b=a).

^ | ⌄ · Reply · Share ›

Guest ➦ Harsha · 3 months ago

I think,this behavior is dependent on compiler. If compiler performs b=a
output will be a=a,b=a. In other case,we get the value swapped,when b

^ | ⌄ · Reply · Share ›

Amit Jain · 3 months ago

Instead of

if (xp == yp) // Check if the two addresses are same
return;
It could have been better::
if (*xp == *yp) // Check if the two values are same
return;
because no need to swap if two values are same

3 ^ | ⌄ · Reply · Share ›

Kartik ➦ Amit Jain · 3 months ago

Amit, thanks for sharing your thoughts. This may not work if xp and yp
correct me if i am wrong.

^ | ⌄ · Reply · Share ›

Siva Krishna ➦ Kartik · 3 months ago

"This may not work if xp and yp are pointers to structures" can

^ | ⌄ · Reply · Share ›

Kartik ➦ Siva Krishna · 3 months ago

A situation where we have two "struct ABC" type variabl prototype of swap would be swap(struct ABC *a, struct

We cannot compare two struct variables using ==. For

3 ^ | ⌄ • Reply • Share ›

vishal ➦ Kartik • 2 months ago

For structures , we can use memcmp
memcmp(&str1, %str2, sizeof(str1)
);

1 ^ | ⌄ • Reply • Share ›

Amit Jain ➦ Kartik • 3 months ago

What I feel is that if we want to swap 2 structures then v
multiplication or xor directly. At end, we must swap eacl
checking values will be better. Please correct me if I mis

^ | ⌄ • Reply • Share ›

pavan ➦ Amit Jain • 3 months ago

it can be done in 5 ways see in ...

www.programmerschat.blogspot.c...

^ | ⌄ • Reply • Share ›

Kailash • 3 months ago

good, you rock

^ | ⌄ • Reply • Share ›

✉ Subscribe   Ⓓ Add Disqus to your site