



Pass by Value and Pass by Reference

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A closer look to functions

$$f(x) = x^2$$

```
// C, C++, C#, Java....
```

```
int square(int num)
{
    return num * num;
}
```

```
# Python
```

```
def square(num):
    return num**2
```



An innocent looking DELINQUENT function

```
void main(void)
{
    int a = 10;
    int b = 20;
    swap(a, b);

    printf("a is %d and b is %d", a, b);
}
```

```
void swap(int a, int b)
{
    int temp = a;
    a = b;
    b = temp;
}
```

Can you guess, what is wrong here?

Boring definitions

Pass by Value

The caller and the callee have two independent variables with the same value.

Pass by Reference

The caller and the callee use the same variable.

A Visual Example with Coffee Cups

pass by reference

cup = 

fillCup()


pass by value

cup = 

fillCup()

```
● ● ●  
  
// Pass by reference  
void fillCup(int *cup)  
{  
    *cup++;  
}  
  
void main (void)  
{  
    int cup = 0;  
    fillCup(&cup);  
}
```

```
● ● ●  
  
// Pass by value  
void fillCup(int cup)  
{  
    cup++;  
}  
  
void main (void)  
{  
    int cup = 0;  
    fillCup(cup);  
}
```



Fixing our `swap()` function

(Watch me code on the board)



**TRUST
ME
I'M
AN
ENGINEER**



```
1 #include <stdio.h>
2
3 void swap(int *a, int *b)
4 {
5     int temp = *a;
6     *a = *b;
7     *b = temp;
8 }
9
10 int main(void)
11 {
12     int a = 10;
13     int b = 20;
14     swap(&a, &b);
15
16     printf("a is %d and b is %d", a, b);
17
18     return 0;
19 }
```

a is 20 and b is 10

Process returned 0 (0x0) execution time : 0.105 s
Press any key to continue.

Thank you!

Got any questions?

Meanwhile swapping in python



`a,b = b,a`

*Just an easter egg.

& no, Python developers are not paying us for putting it here

Picture Credits

1. Slide 3, Man in prison: <https://www.pinterest.com/pin/687784174321520109/>
2. Slide 5, The animation: <https://www.mathwarehouse.com/programming/passing-by-value-vs-by-reference-visual-explanation.php>