

# Tutorial 2

- Side effects
- Reading input
- Global variables & mutation
- Stacks & Command Based Testing

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## Side effects

(there are 3 types of side effects in functions **for now**)

- print output
- read input
- mutate a *global* variable

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```
// MANY SIDE EFFECTS
```

```
int y = 2;
```

```
int main(void) {
    int x = read_int();
    printf("%d", printf("%d", y));
    if ((x = y - 1)) {
        printf("%d", x = x + 2);
    }
    if (x) {
        y *= y;
        printf("%d", y);
    }
    printf("\n");
}
```

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## Side Effects: printing vs. returning

```
int pure_functional(int n) {
    return n * n;
}

// effects: displays a message
void just_a_side_effect(int n) {
    printf("n squared is %d\n", n * n);
    return;                      // (optional)
}

// effects: displays a message
int has_both_side_effect_and_return_value(int n) {
    printf("n squared is %d\n", n * n);
    return n * n;
}
```

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## Read Input: Exercise

Implement the following function using recursion:

```
// print_reverse(): reads in input from the user until
//     READ_INT_FAIL then prints the numerical
//     inputs in reverse order.
// Effects:
// * reads input
// * prints an output message
```

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## Global variables & mutation

- Global variables are defined *outside* of functions (at the “top level”).
- A function that mutates a global variable **does** have a side effect.
- Even if a function does not have a side effect, its behaviour may depend on other mutable global variables.

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# Stacks

There are a few basic operations that are common when using stacks:

- Push: adds an item to the top of the stack.
- Pop: removes an item from the top of the stack and returns the removed value.
- Top: returns the value on the top of the stack.
- Empty: determines if the stack is empty.

## Command Based Testing

Command based testing clients are commonly used in CS 136.

Tips:

- Enter commands when prompted for input.
- Enter a proper number of parameters.
- Consult the assignment file for help with documentation.
- Use the "help" command, if available.