

Algorithm Analysis

Example 1

```
for(int i = 0; i<n; i++){  
    m = m + 2;  
}
```

Loop happens n times

Constant Operation

The leading
constant is
ignored!

$$f(n) = c \times n$$

constant

loop

$$f(n) = O(n)$$

Algorithm Analysis Part 1

Example 3 – Nested Loops

```
for(int i = 0; i<n; i++){  
    for(int j = 0; j<n; j++){  
        k=k+1;  
    }  
}
```

Outside loop has inside
loop happen n times!

Inside Loop goes to n

Constant time operation

$$f(n) = c \times n \times n$$

Constant

Inner Loop

Outer Loop

$$f(n) = c \times n^2$$

$$f(n) = O(n^2)$$

Example 4 – Consecutive Statements

```
1 for(int i = 0; i<n; i++){  
    m = m + 5;  
2 }  
for(int i = 0; i<n; i++){  
    for(int j = 0; j<n; j++){  
        k=k+1;  
    }  
}
```

Single Loop Operation

Nested Loops

$$f(n) = c \times n + c \times n \times n$$

1 **2**

$$f(n) = c \times n + c \times n^2$$

$$f(n) = O(n^2)$$

Algorithm Analysis Part 1

Example 5 – If-Then-Else

```
if( x + 1 < 5 ){  
    return -1;  
} else {  
    for(int i = 0; i<n; i++){  
        for(int j = 0; j<n; j++){  
            k=k+1;  
        }  
    }  
    return k;  
}
```

Constant

Constant

Outer Loop

Inner Loop

Constant

$$f(n) = c_0 + c_1 + n \times n \times c_2$$

$$f(n) = c_0 + c_1 + \underline{c_2 \times n^2}$$

$$f(n) = O(n^2)$$