

# IS12 - Introduction to Programming

## Lecture 13: Conditionals

Peter Brusilovsky

<http://www2.sis.pitt.edu/~peterb/0012-051/>

## Course Logistics

- We are at a turning point
- We have got through C basics and programs are getting complicated
  - Are you able to follow?
  - How challenging was the exam?
  - Can you understand and write programs?
- This is the last chance to catch up



## What you have to do?

- Attend lectures and browse it again
- Do your reading assignments
- Explore all examples - run, modify...
- Solve all problems (including exercises)
- Work with KnowledgeTree - quizzes, dissections, Expression Executor
- Try free C tutorials (KnowledgeSea)
- Ask questions in the forums
- Come and talk with us, use office hours



## Outline

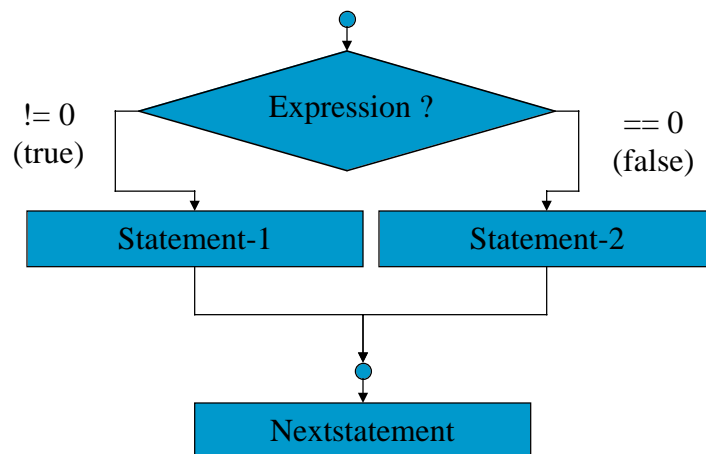
- If and If-else
- The use of if-else
- The use of if
- Simple nested ifs
- If inside a loop
- Conditional operator
- If-else vs. conditional operator

## Conditional Statement if-else

```
if (expression)
    statement-1
else
    statement-2
nextstatement
```

- If expression is not 0 (true) - statement-1
- If expression is 0 (false) - statement-2
- In any case after that - nextstatement

## Flowchart of if-else





## if-else with blocks

```
if (expression) {  
    statement-11  
    ...  
} else {  
    statement-21  
    ...  
}  
nextstatement
```

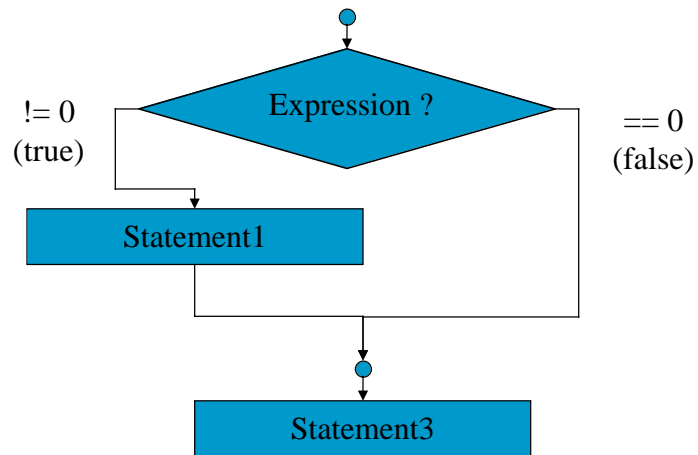


## Conditional Statement `if`

```
if (expression)  
    statement-1  
nextstatement
```

- If expression value isn't 0 (*true*) - statement-1, after that - nextstatement
- If expression value is 0 (*false*) - nextstatement

## Flowchart of if



## if with blocks

```
if (expression) {  
    statement-1  
    ...  
}  
nextstatement
```

## Example: Maximum with if-else

```
#include <stdio.h>

void main() {
    int a, b;

    printf("Enter two integers: ");
    scanf("%d %d", &a, &b);

    printf("Maximum of %d and %d ", a, b);
    if(a < b)
        printf("is %d\n", b);
    else
        printf("is %d\n", a);
}
```

## Example: Maximum with if

```
#include <stdio.h>

void main() {
    int a, b, max;

    printf("Enter two integers: ");
    scanf("%d %d", &a, &b);

    max = a; /* pre-assignment */

    if(a < b)
        max = b; /* re-assignment */

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

## Example: Variable Rate (1)

```
#define THRESHOLD 5000

#include <stdio.h>

void main() {
    float rate1, rate2, interest_rate; /* interest rates %% */
    float capital; /* capital $$ */
    float annual_interest; /* annual interest $$ */

    /* read data */
    printf("Interest rates (%%xx.xx): ");
    scanf("%f %f", &rate1, &rate2);
    printf("Capital ($.cc): ");
    scanf("%f",&capital);
```

## Example: Variable Rate (2)

```
/* calculate the rate */
if (capital < THRESHOLD)
    interest_rate = rate1;
else
    interest_rate = rate2;
printf("The rate for $.2f is %.2f%%\n",
       capital, interest_rate);

/* calculate capital */
annual_interest = capital * interest_rate / 100;
printf("Interest %6.2f; New capital %9.2f\n",
       annual_interest, capital + annual_interest);
}
```

## Example: Nested if - max3

```
#include <stdio.h>
void main() {
    int a, b, c;

    printf("Enter three integers: ");
    scanf("%d %d %d", &a, &b, &c);
    printf("Maximum of %d, %d and %d is ", a, b, c);
    if (a > b)
        if (a > c)
            printf("%d\n", a);
        else
            printf("%d\n", c);
    else
        if (b > c)
            printf("%d\n", b);
        else
            printf("%d\n", c);
}
```

## Example: Running Max

```
#define SENTINEL -1
#include <stdio.h>
void main () {
    int max, nextnumber;

    printf("Number: ");
    scanf("%d", &nextnumber); /* read first number */
    max = nextnumber; /* pre-assignment */

    while (nextnumber != SENTINEL) {
        if (max < nextnumber)
            max = nextnumber;
        printf("Number: ");
        scanf("%d", &nextnumber);
    }
    printf ("Max = %d\n", max);
}
```

← The Running Max pattern  
Interleaved with  
The Sentinel Loop pattern





## Conditional Operator

**Expr1 ? Expr2 : Expr3**

- Conditional operator calculates the value from 3 arguments (expressions)
- First, Expr1 is evaluated
- If it is *true* (not zero), then Expr2 is calculated; it's value is the result
- If it is *false* (zero), then Expr3 is calculated; its value is the result



## Conditional Operator: Examples

- `min = a < b ? a : b`
- `rate = capital < 3000 ? rate1 : rate 2`
- `printf("%c\n", (lower ? 'a' : 'A'));`
- `x = a + (b % 2 ? b - 1 : b)`



## Compare Conditionals

- Conditional statement
  - Controls the order of statement execution

```
if (capital < THRESHOLD)
    interest_rate = rate1;
else
    interest_rate = rate2;
```

- Conditional operator
  - Calculates a value

```
interest_rate = capital < THRESHOLD ? rate1 : rate2;
```



## Before next lecture:

- Do reading assignment
- Perry: Chapter 11; Chapter 13: Hello Conditional
- Run Classroom Examples
- Exercises: variable rate in a loop; calculating minimum of a sequence
- Check yourself by working with KnowledgeTree and its components