

# IS12 - Introduction to Programming

## Lecture 15: Complex Conditions

Peter Brusilovsky

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

### if-else: 2 choices

```
if (Expression-1)
    Statement-1
else
    Statement-2
Nextstatement
```



## else-if with 3 choices

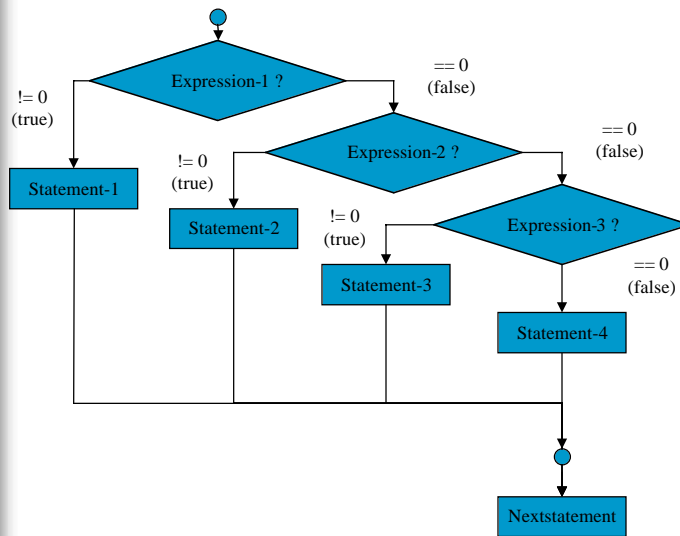
```
if (Expression-1)
    Statement-1
else if (Expression-2)
    Statement-2
else
    Statement-3
Nextstatement
```



## else-if with 4 choices

```
if (Expression-1)
    Statement-1
else if (Expression-2)
    Statement-2
else if (Expression-3)
    Statement-3
else Statement-4
Nextstatement
```

## Flowchart of else-if



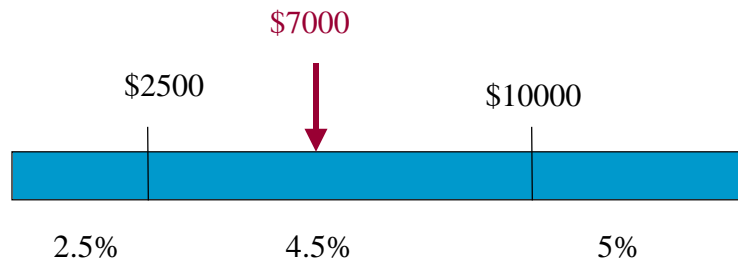
## Example: QPA

```
#define MINQPA 2.75
#define MINISQPA 3.00
#include <stdio.h>

void main() {
    float qpa1, qpa2;
    /* read data */
    printf("Your general QPA?: "); scanf("%f", &qpa1);
    printf("Your IS QPA?: "); scanf("%f", &qpa2);

    /* make decision */
    if (qpa1 < MINQPA)
        printf("Your general QPA is too low for BSIS\n");
    else if (qpa2 < MINISQPA)
        printf("Your Information Science QPA is too low for BSIS\n");
    else /* here qpa1 >= MINQPA and qpa2 >= MINISQPA */
        printf("You are admitted to BSIS program!\n");
}
```

## Example: Variable Rate 2



## Example: Variable Rate 2 (1)

```
#define FIRST_THRESHOLD 2500
#define SECOND_THRESHOLD 10000
#include <stdio.h>

void main() {
    float rate1, rate2, rate3, interest_rate; /* interest rates
in percents */
    float capital; /* capital in dollars */
    float annual_interest; /* annual interest in dollars */

    /* read data */
    printf("Interest rates (%%xx.xx): ");
    scanf("%f %f %f", &rate1, &rate2, &rate3);
    printf("Capital ($$.cc): ");
    scanf("%f",&capital);
```

## Example: Variable Rate 2 (2)

```
/* calculate the rate */
if (capital < FIRST_THRESHOLD)
    interest_rate = rate1;
else if (capital < SECOND_THRESHOLD)
    interest_rate = rate2;
else
    interest_rate = rate3;
printf("The rate for $%.2f is %f\n", capital,
       interest_rate);

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

## Complex Conditions: AND

- AND operation `ex1 && ex2`
    - evaluated to 1 (true) if *each* of ex1 and ex2 are not equal to 0 (each is true in C terms)
    - otherwise evaluated to 0
- ```
c = 4;
c > 3 && c < 5 ⇒ 1
c < 3 && (c % 2 == 0) ⇒ 0
c > 3 && c < 9 && (c % 3 == 0) ⇒ 0
c > 3 && c < 9 && (c % 2 == 0) ⇒ 1
```

## Complex Conditions: OR

### ■ OR operation `ex1 || ex2`

- evaluated to 1 (true) if *at least one* of `ex1` and `ex2` are not equal to 0 (at least one is true is C terms)
- otherwise evaluated to 0

```
c = 4;
```

```
c > 3 || c < 5 ⇒ 1
```

```
c < 3 || (c % 2 == 0) ⇒ 1
```

```
c < 3 || c > 9 || (c % 3 == 0) ⇒ 0
```

```
c < 3 || c > 9 || (c % 2 == 0) ⇒ 1
```

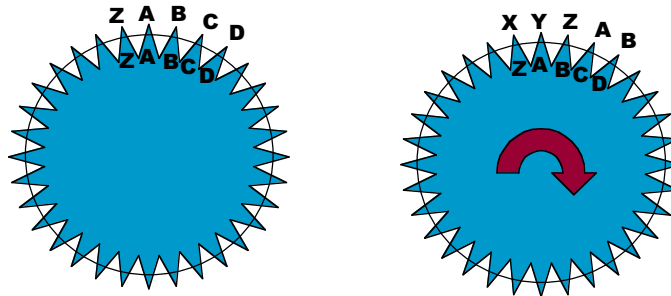
## Example: QPA again

```
#define MINQPA 2.75
#define MINISQPA 3.00
#include <stdio.h>

void main() {
    float qpa1, qpa2;
    /* read data */
    printf("Your general QPA?: "); scanf("%f", &qpa1);
    printf("Your IS QPA?: "); scanf("%f", &qpa2);

    /* make decision */
    if (qpa1 < MINQPA || qpa2 < MINISQPA)
        printf("Your QPA is too low for BSIS\n");
    else /* here qpa1 >= MINQPA and qpa2 >= MINISQPA */
        printf("You are admitted to BSIS program!\n");
}
```

## Encryption Engine



## Calculating an Encrypted Char

- Calculate “number of a character” in its category:  
$$\text{charnum} = \text{ch} - \text{'a'}; /* a \Rightarrow 0, b \Rightarrow 1 \dots z \Rightarrow 25 */$$
- Calculate new “shifted” number of character  
$$(\text{charnum} + \text{SHIFT}) \% \text{NLCHARS} /* should be 0 to 25 */$$
- Calculate the character corresponding to this new number (I.e., 0 is 'a', 1 is 'b', ... 25 is 'z')  
$$\text{encrypted} = \text{'a'} + (\text{charnum} + \text{SHIFT}) \% \text{NLCHARS}$$

## Example: Encryption Engine

```
#include <stdio.h>
#define SHIFT 1
#define NLCHARS ('z'-'a'+1) /* 26 */
#define NUCHARS ('Z'-'A'+1) /* 26 */

void main () {
    int ch, charnum;
    while((ch = getchar()) != EOF)
        if (ch >= 'a' && ch <= 'z') {
            charnum = ch - 'a'; /* a => 0, b => 1... z => 25 */
            putchar('a' + (charnum + SHIFT) % NLCHARS);
        } else if (ch >= 'A' && ch <= 'Z') {
            charnum = ch - 'A'; /* A => 0, B => 1... Z => 25 */
            putchar('A' + (charnum + SHIFT) % NUCHARS);
        } else
            putchar(ch);
}
```

## Before next lecture:

- Do reading assignment
- Perry: Chapter 12
- Run Classroom Examples
- Check yourself by working with KnowledgeTree and WADEIn system
- Exercise: Count number of letters a, b and c in a text (similar to new line counting, but uses simple else-if)
- Assignment: Hailstone numbers