

IS12 - Introduction to Programming

Lecture 15: Complex Conditions

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if-else: 2 choices

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



else-if with 3 choices

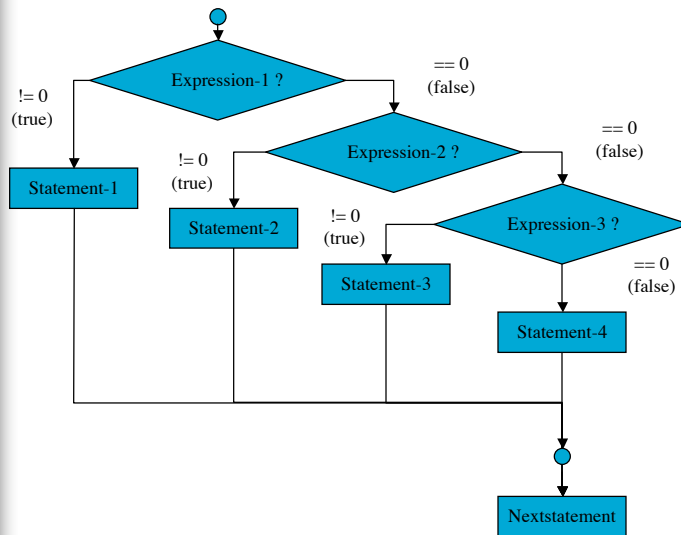
```
if (Expression-1)
    Statement-1
else if (Expression-2)
    Statement-2
else
    Statement-3
Nextstatement
```



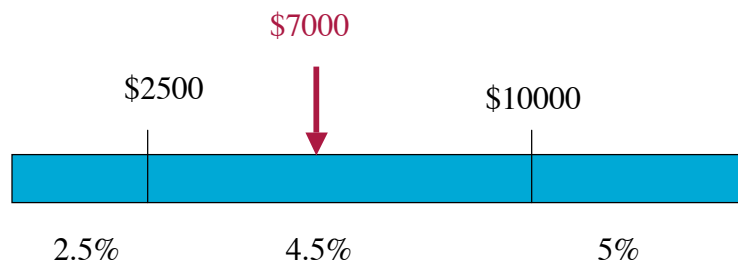
else-if with 4 choices

```
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



Complex Conditions. 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);
}
```

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");
}
```

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 ⇒ true ⇒ 1
c < 3 && (c % 2 == 0) ⇒ false ⇒ 0
c > 3 && c < 9 && (c % 3 == 0) ⇒ false ⇒ 0
c > 3 && c < 9 && (c % 2 == 0) ⇒ true ⇒ 1
```

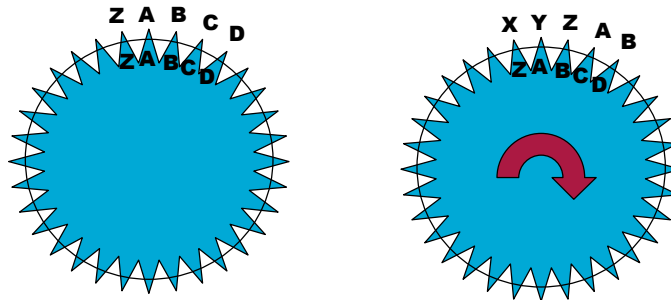
## Complex Conditions: OR

- 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 ⇒ true ⇒ 1  
c < 3 || (c % 2 == 0) ⇒ true ⇒ 1  
c < 3 || c > 9 || (c % 3 == 0) ⇒ false ⇒ 0  
c < 3 || c > 9 || (c % 2 == 0) ⇒ true ⇒ 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... 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 QuizQuide 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 7