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`

```plaintext

Example: QPA

```define` MIN QPA 2.75
`define` MIN ISQPA 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 < MIN QPA)
        printf("Your general QPA is too low for BSIS\n");
    else if (qpa2 < MIN ISQPA)
        printf("Your Information Science QPA is too low for BSIS\n");
    else /* here qpa1 >= MIN QPA and qpa2 >= MIN ISQPA */
        printf("You are admitted to BSIS program!\n");
}
#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 $%.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 is C terms)
  - otherwise evaluated to 0
  - `c = 4;`
    - `c > 3 && c < 5` \(\not\Rightarrow\) 1
    - `c < 3 && (c % 2 == 0)` \(\not\Rightarrow\) 0
    - `c > 3 && c < 9 && (c % 3 == 0)` \(\not\Rightarrow\) 0
    - `c > 3 && c < 9 && (c % 2 == 0)` \(\Rightarrow\) 1
Complex Conditions: OR

- OR operation  \( \text{ex1} || \text{ex2} \)
  - 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
#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:
  \[ \text{charnum} = \text{ch} - \text{`a'}; /* a => 0, b => 1... z => 25 */ \]

- Calculate new “shifted” number of character
  \[ (\text{charnum} + \text{SHIFT}) \mod \text{NLCHARS} /* should be 0 to 25 */ \]

- Calculate the character corresponding to this new number (i.e., 0 is 'a', 1 is 'b', ... 25 is 'z')
  \[ \text{encrypted} = \text{`a'} + (\text{charnum} + \text{SHIFT}) \mod \text{NLCHARS} \]
Example: Encryption Engine

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

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