

C / C++ / Java

Structured Programming

Selection - if statement

Debugging a program

Dan McElroy
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Structured Programming

- Programs are organized into modules, also known as blocks of code. Each block has only one entry point and one exit point.
- Within each block, code is organized using the three constructs and no GO TO statements.
 - * Sequence
 - * Selection (if, if/else, case)
 - * Repetition (LOOPS: while, do...while, for)

Structured Programming

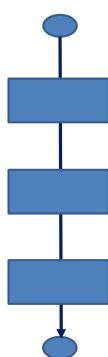
BEFORE – Spaghetti Code with
lots of GO TO statements



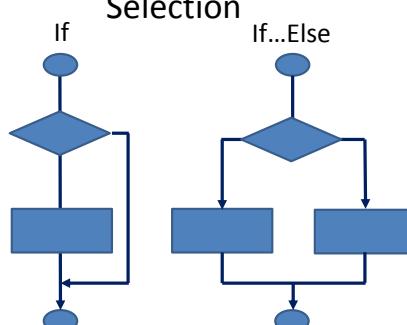
AFTER – Object Oriented Programming
builds on and includes Structured Programming

Spaghetti image credits:
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Sequence

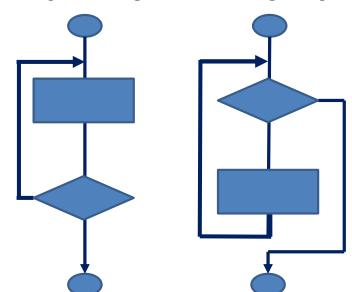


Selection



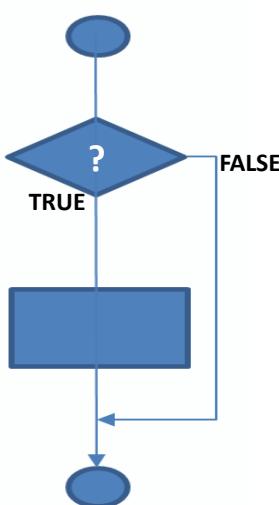
If...Else

Repetition
Do...While
While...Do

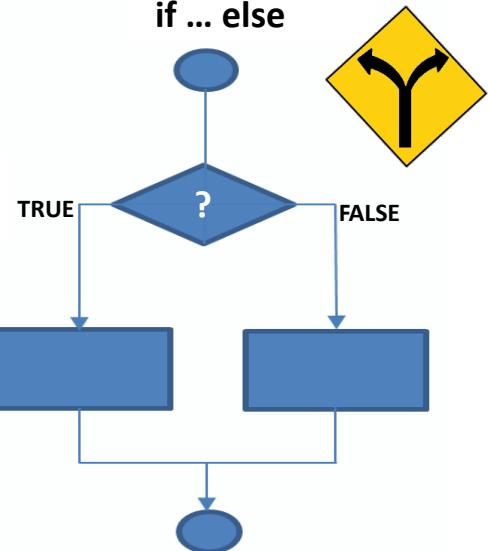


The if / else Statements

if



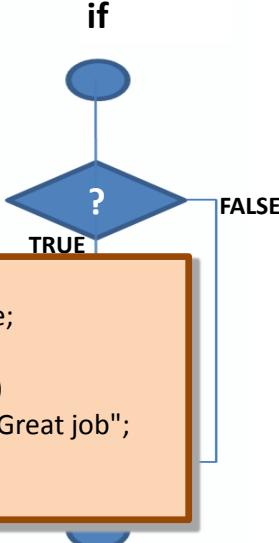
if ... else



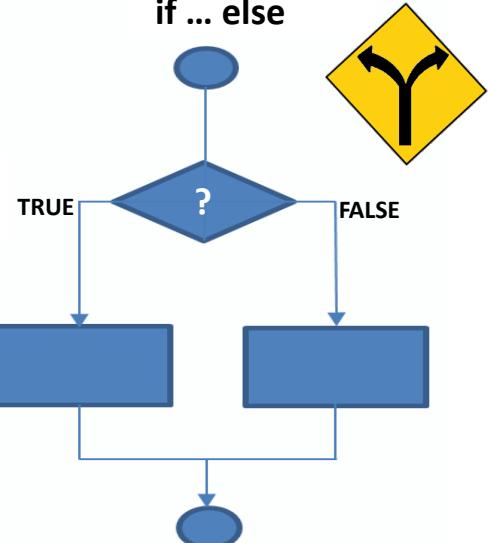
The if / else Statements

if

```
int score = 95;  
String message;  
  
if (score >= 90)  
    message = "Great job";
```

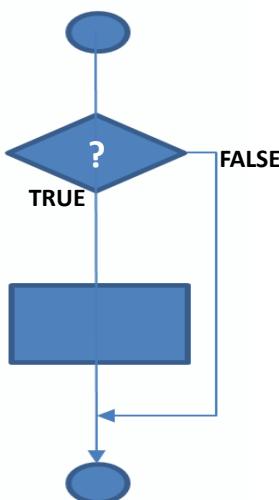


if ... else



The if / else Statements

if



if ... else

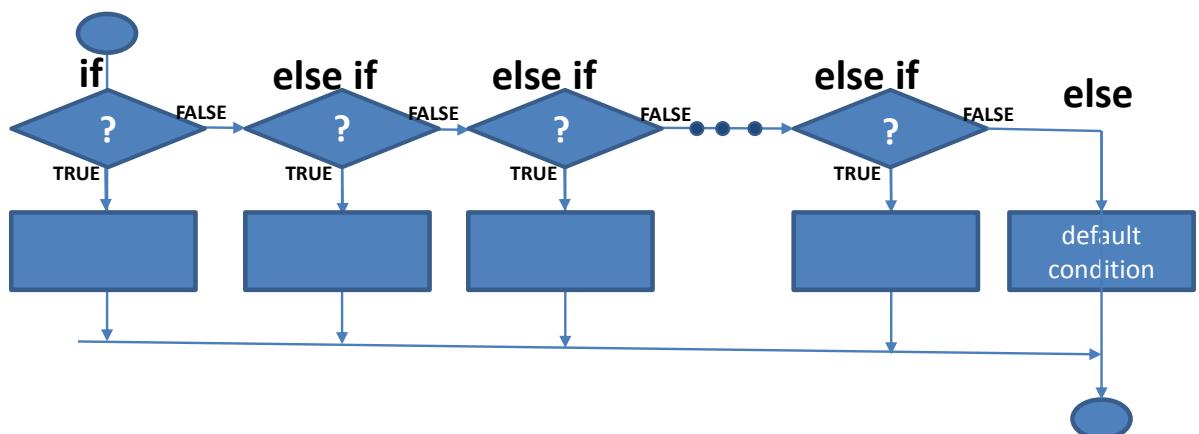


```

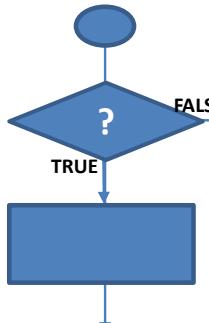
int DMV_score = 82;
String message;

if (DMV_score >= 70)
    message = "You passed";
else
    message = "Try again";
  
```

if / else if / else if / ... / else if / else



if / else

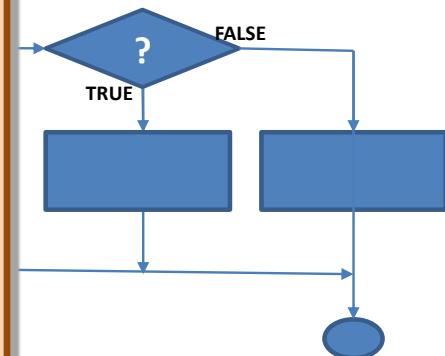


default condition

```
int score = 82;
char grade;
```

```
if (score >= 90 && score <= 100)
    grade = 'A';
else if (score >= 80 && score <= 89)
    grade = 'B';
else if (score >= 70 && score <= 79)
    grade = 'C';
else if (score >= 60 && score <= 69)
    grade = 'D';
else if (score >= 0 && score <= 59)
    grade = 'F';
else
    grade = '?';
```

else if / else



if / else if / else

The following discussion shows examples using the **if** statement, the **else if** statement and the **else** statement

The sample code is only provided as 'code fragments', not full working programs. The code below could be placed in the PROCESSING section of a program that INPUTS some type of data that is used by the **if / else if / else** statements, followed by some type of OUTPUT to display the results of the **if / else if / else** statements.

Using the code in a program

C++ Program	C Program	Java Program
<pre>#include <iostream> #include <string> • • • int score; string message1; char grade = ' '; cout << "Enter score: "; cin >> score; if / else if / else code goes here cout << "Your grade is " << grade; cout << message1 << endl;</pre>	<pre>#include <stdio.h> • • • int score; char *message1 = ""; char grade = ' '; printf ("Enter score: "); scanf ("%d", &score); if / else if / else code goes here printf ("Your grade is %c", grade); printf ("%s\n", message1);</pre>	<pre>import java.util.Scanner; • • • int score; String message1; char grade = ' '; Scanner input = new Scanner(System.in); System.out.printf ("Enter score: "); score = input.nextInt(); if / else if / else code goes here System.out. printf ("Your grade is %c", grade); System.out. printf ("%s\n", message1);</pre>

Syntax of the IF Statement

PSEUDO CODE

```
IF condition THEN
    statement
END IF
```

C / C++ / Java / etc.

```
if (condition)
    statement;
```

NOTES:

1. The word **if** is in lower case
2. Only one statement as part of the **if**
3. Semicolon at the end of the statement

SAMPLE PROGRAM

```
// Need at least 70 to pass the DMV test
if (score >= 70)
    message1 = "You passed";
```

The Compound IF Statement

PSEUDO CODE

```
IF condition THEN
    statement1
    statement2
END IF
```

C / C++ / Java / etc.

```
if (condition)
{
    statement1;
    statement2;
}
```

NOTES:

1. **One or more** statements as part of the **if**
2. A BLOCK OF CODE is enclosed in curly braces
3. Semicolon at the end of each statement
4. No semicolon after the closing curly brace

SAMPLE PROGRAM

```
// Need at least 70 to pass the DMV test
if (score >= 70)
{
    message1 = "Congratulations";
    message2 = "You passed the written test";
}
```

Syntax of the IF...ELSE Statement

PSEUDO CODE

```
IF condition THEN
    statement1
ELSE
    statement2
END IF
```

C / C++ / Java / etc.

```
if (condition)
    statement1;
else
    statement2;
```

NOTES:

1. If the condition evaluates to true, the first statement is executed
2. Otherwise, the statement after the **else** is executed

SAMPLE PROGRAM

```
// Need at least 70 to pass the DMV test
if (score >= 70)
    message1 = "You passed the test";
else
    message1 = "Try again";
```

Compound IF...ELSE

PSEUDO CODE

```
IF condition THEN
    statement1
    statement2
ELSE
    statement3
    statement4
END IF
```

NOTES:

1. Curly braces define the block of code for the **if** and another set of curly braces define the block of code for the **else**

C / C++ / Java / etc.

```
// Need at least 70 to pass the DMV test
if (score >= 70)
{
    message1 = "Congratulations";
    message2 = "You passed the test";
}
else
{
    message1 = "Sorry";
    message2 = "Try again";
}
```

Convert a Score to a Letter Grade

- o Input a score (0-100)
- o Convert score to a letter grade and message
- o Display the grade and a message

score	grade	message
90-100	A	Outstanding
80-89	B	Exceeds Expectations
70-79	C	Acceptable
60-69	D	Poor
0-59	F	Dreadful

```
int score;
...

```

Conversion using only if statements

```
if (score >= 90 && score <= 100)
    grade = 'A';
if (score >= 80 && score <= 89)
    grade = 'B';
if (score >= 70 && score <= 79)
    grade = 'C';
if (score >= 60 && score <= 69)
    grade = 'D';
if (score >= 0 && score <= 50)
    grade = 'F';
```

score	grade	message
90-100	A	Outstanding
80-89	B	Exceeds Expectations
70-79	C	Acceptable
60-69	D	Poor
0-59	F	Dreadful

```
int score;
...

```

Conversion using only if statements

```
if (score >= 90 && score <= 100)
    grade = 'A';
    message1 = "Outstanding";
if (score >= 80 && score <= 89)
    grade = 'B';
    message1 = "Exceeds Expectations";
if (score >= 70 && score <= 79)
    grade = 'C';
    message1 = "Acceptable";
```

```
if (score >= 60 && score <= 69)
    grade = 'D';
    message1 = "Poor";
if (score >= 0 && score <= 59)
    grade = 'F';
    message1 = "Dreadful";
```

If the score is 85, what is:
 grade?
 message1?

```
int score;
...
```

```
if (score >= 90 && score <= 100)
{
    grade = 'A';
    message1 = "Outstanding";
}
if (score >= 80 && score <= 89)
{
    grade = 'B';
    message1 = "Exceeds Expectations";
}
if (score >= 70 && score <= 79)
{
    grade = 'C';
    message1 = "Acceptable";
}
```

Conversion using only if statements

```
if (score >= 60 && score <= 69)
{
    grade = 'D';
    message1 = "Poor";
}
if (score >= 0 && score <= 59)
{
    grade = 'F';
    message1 = "Dreadful";
```

If the score is 85, what is:
 grade?
 message1?

```
int score;
...
```

```
if (score >= 90 && score <= 100)
{
    grade = 'A';
    message1 = "Outstanding";
}
if (score >= 80 && score <= 89)
{
    grade = 'B';
    message1 = "Exceeds Expectations";
}
if (score >= 70 && score <= 79)
{
    grade = 'C';
    message1 = "Acceptable";
}
```



```
if (score >= 60 && score <= 69)
{
    grade = 'D';
    message1 = "Poor";
}
if (score >= 0 && score <= 59)
{
    grade = 'F';
    message1 = "Dreadful";
```

If the score is 105, what is:
 grade?
 message1?
 How about if the score is -5?

double score;
...



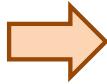
```
if (score >= 90 && score <= 100)
{
    grade = 'A';
    message1 = "Outstanding";
}
if (score >= 80 && score <= 89)
{
    grade = 'B';
    message1 = "Exceeds Expectations";
}
if (score >= 70 && score <= 79)
{
    grade = 'C';
    message1 = "Acceptable";
}
```

```
if (score >= 60 && score <= 69)
{
    grade = 'D';
    message1 = "Poor";
}
if (score >= 0 && score <= 59)
{
    grade = 'F';
    message1 = "Dreadful";
```

If the score is 89.5, what is:
grade?
message1?
How about if score is -5?

Is it OK to modify the requirements?

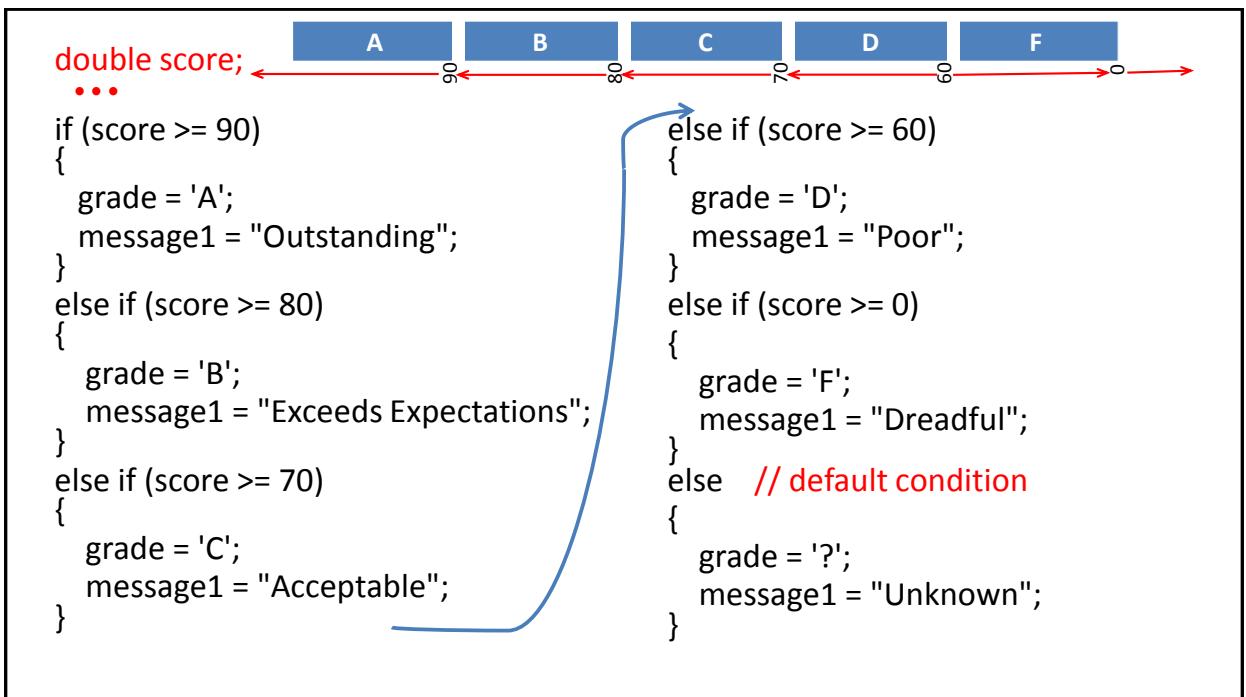
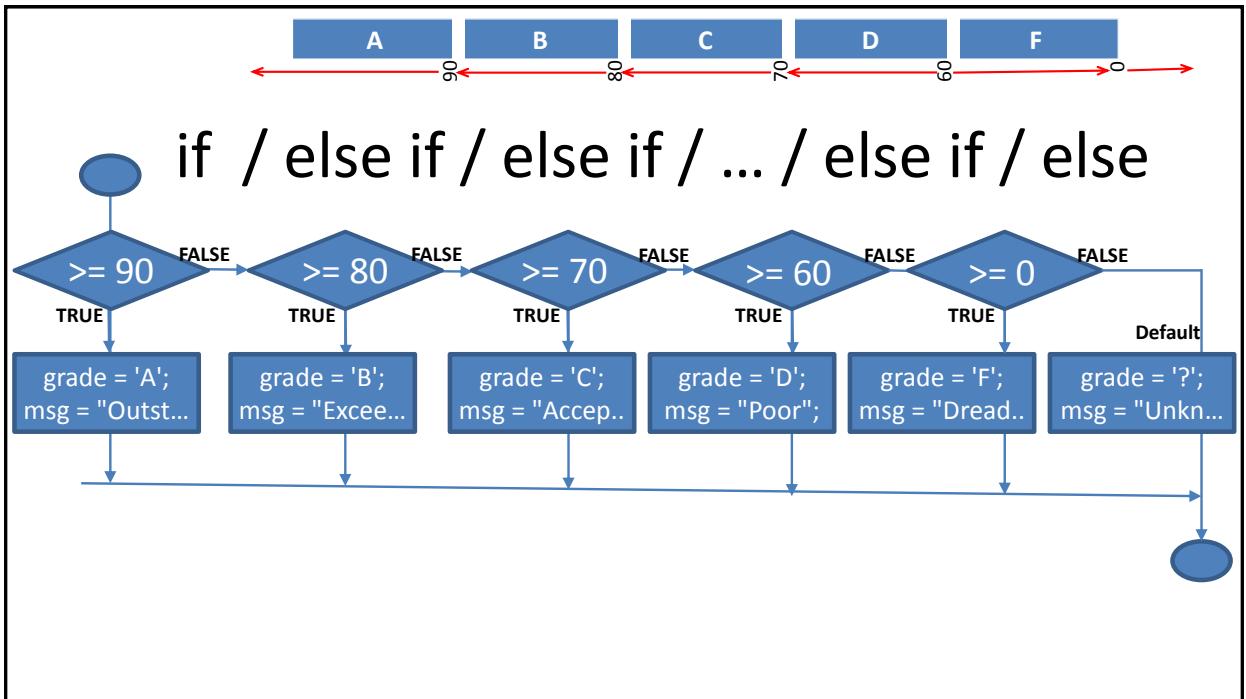
score	grade	message
90-100	A	Outstanding
80-89	B	Exceeds Expectations
70-79	C	Acceptable
60-69	D	Poor
0-59	F	Dreadful



score	grade	message
>= 90	A	Outstanding
>= 80	B	Exceeds Expectations
>= 70	C	Acceptable
>= 60	D	Poor
>= 0	F	Dreadful

Extra credit scores over 100 are now OK

How about if score is -5?



```

double score;
...
score += 0.5; // round up by .5 points
if (score >= 90)
{
    grade = 'A';
    message1 = "Outstanding";
}
else if (score >= 80)
{
    grade = 'B';
    message1 = "Exceeds Expectations";
}
else if (score >= 70)
{
    grade = 'C';
    message1 = "Acceptable";
}

```

How can we Round UP?

```

else if (score >= 60)
{
    grade = 'D';
    message1 = "Poor";
}
else if (score >= 0)
{
    grade = 'F';
    message1 = "Dreadful";
}
else // default condition
{
    grade = '?';
    message1 = "Unknown";
}

```

Debugging a Program

o Debug Messages

o Breakpoints

o Step

o Continue

o Watch

o Hover