CS 105

Introduction to Scientific Computing

Topic #10 – Branching Statements

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ASSIGNMENT 6

- Compute the breaking distance using the equation
  - $d = \frac{v^2}{2g(f+G)}$
  - Where v is the velocity, f is the coefficient of friction, g is gravity, and G is the roadway grade as a percentage
- Get v, f, and G from the user
- Ensure several things for the computation to work correctly
  - v, f, and G must all be numbers
  - f+G must be positive
  - v must be non-negative
  - f must be in the range [0.1, 0.9]
  - G must be in the range [-1, 1]

SKILLS WE NEED

- How can we test if a user typed a number?
- How can we test if a number is in a valid range?
- What do we do in each case and how to do we tell our script to decide which case to do?

TOPICS

- Conditional & Branching Statements

READING

- Section 3.4: Branches (up to and including 3.4.3)

BRANCHING STATEMENTS

- We were motivated to talk about Boolean expressions in order to make *decisions* on what to do
  - If something is true do this…
  - Otherwise do something else
- The simplest statement that makes use of decisions is a *branching statement*
  - "Branching" because our code does one thing or the other but not both

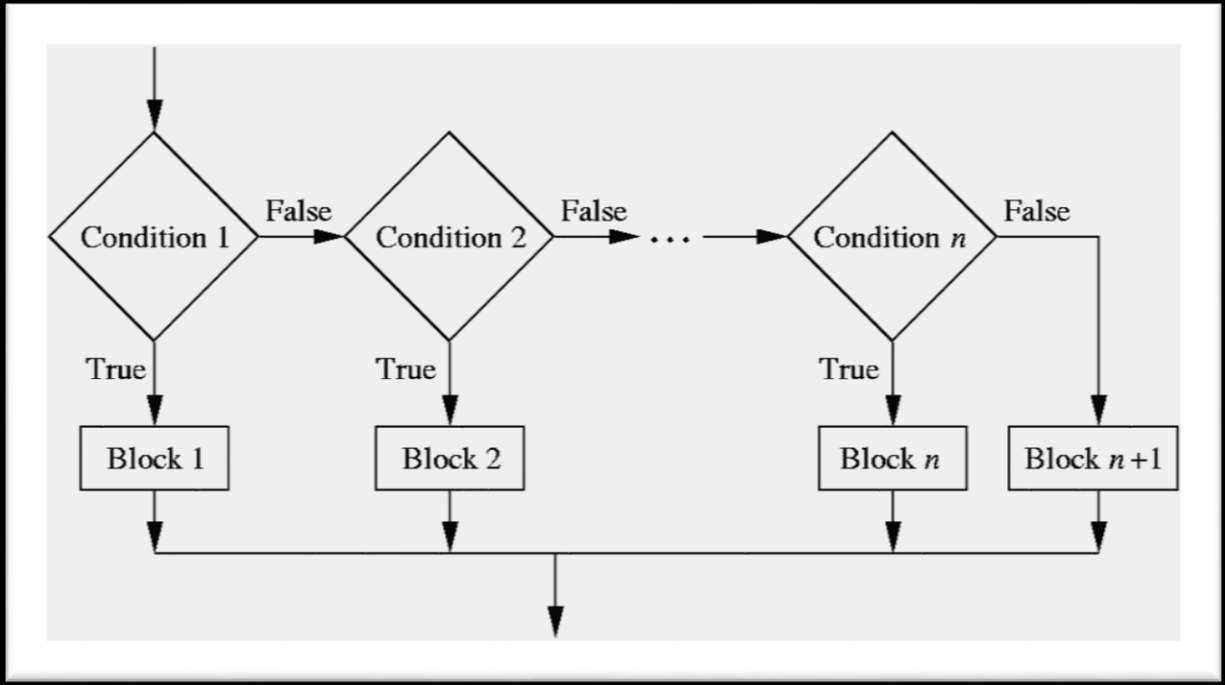
BRANCHING STATEMENTS

- The most common type of branching statement is the ***if/else*** statement
  - There's also the ***if/elseif/…/else*** statement
- This statement comes in the form

```
if(condition)
        %stuff to do if condition is true
else
        %stuff to do if condition is false
end
```

- Statements that start with a keyword (like if) and end with the *end* keyword are called *blocks*
  - The stuff inside of blocks are called the *bodies*
  - NOTE: For readability it is good to indent the body of a block

BRANCHING STATEMENTS



EXAMPLE 1

- WRITE MATLAB statements that do the following:
- If x is greater than or equal to zero, then assign the square root of x to variable sqrt_x and print out the result. Otherwise print out an error message about the argument of the square root function and set sqrt_x to zero

EXAMPLE 2

- WRITE MATLAB statements that do the following:
- A variable fun is calculated as numerator/denominator. If the absolute value of denominator is less than 0.001, write "Divide by 0 error". Otherwise calculate and print out fun

EXAMPLE 3

- WRITE MATLAB statements that do the following:
- The cost per mile for a rented vehicle is $1.00 for the first 100 miles, $0.80 for the next 200 miles, and $0.70 for all miles in excess of 300 miles. Write MATLAB statements that determine the total cost and the average cost per mile for the given number of miles (stored in variable distance)