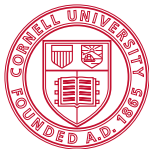


Lecture 03

Branches, Loops

Erdal Yılmaz



Cornell University

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Before we begin

- QZ1 Online quiz on CMS
- HW1 Due June 5, 6pm
- OH Office hours time & location

Today

- Branching using `if/else/end`
- Looping using `while`
- Initialization
- Rounding numbers
- Random numbers
- Formatted print

Branching

- `if/else/end`

if-else-end

if/else/end

Based on conditions different code fragments are executed

Usage

```
if %<condition>
    %<statements executed when
    % the condition is TRUE>
else
    %<statements executed when
    % the condition is FALSE>
end
```

Number Game

numbergame.m

```
number = fix(10*rand);  
guess  = input('enter a digit: ');  
  
if number == guess  
    disp('that is my number!');  
else  
    if number > guess  
        disp('my number is greater');  
    else  
        disp('my number is smaller');  
    end  
end
```

More Conditions

Usage

```
if %<condition1>
    %<statements executed when
    % condition1 is TRUE>
else
    if %<condition2>
        %<statements executed when
        % condition1 is FALSE and
        % condition2 is TRUE>
    else
        %<statements executed when
        % condition1 is FALSE and
        % condition2 is FALSE>
    end
end
end
```

if-elseif-else-end

Usage

```
if %<condition1>
    %<statements executed when
    % the condition1 is TRUE>
elseif %<condition2>
    %<statements executed when
    % the condition1 is FALSE
    % and condition2 is TRUE>
else
    %<statements executed when
    % the condition1 is FALSE
    % and condition2 is FALSE>
end
```


Loops

- while

While Loop

`while`

the condition is true, keep executing the same code block

Usage

```
while %<condition>
    %<this code block will be executed
    % while the condition is true, until
    % it turns into false>
end
```

Compute the sum : $1 + \dots + n$

What is the sum of numbers from 1 to n ?

$$sum = 1 + 2 + \dots + n = \frac{n(n+1)}{2}$$

Let's sum these numbers using while-loop

Compute the sum : $1 + \dots + n$

sum_numbers.m

```
n = input('enter n: '); % Get the maximum number

j = 1; s = 0; % Initialize counter and sum variables

if n >= 1
    while j <= n
        s = s + j;
        j = j + 1;
    end
else
    error('n should be positive');
end

fprintf('The sum is %d \n', s);
```

Number Guessing - Revisited

numbergame.m

```
number = fix(10*rand);  
guess  = -1;  
  
while guess ~= number  
    guess = input('enter a digit: ');  
    if number == guess  
        disp('that is my number!');  
    else  
        if number > guess  
            disp('my number is greater');  
        else  
            disp('my number is smaller');  
        end  
    end  
end  
end
```

Is it a prime number?

Prime number

A positive integer that has no positive divisor other than 1 and itself. If x is prime and $x = a * b$, where a, b are positive integers, a and b have to be either 1 or x .

Fact

If x is not a prime, it should have a divisor less than or equal to \sqrt{x} and greater than 1. (Why?)

isprime

Let's write a function to check if a number is prime or not.

isprime function

isprime.m

```
function p = isprime(n)
% Returns true if n is prime, otherwise returns false.
% Assumes n is a positive integer.

if n == 1, p = false; return; end

m = floor(sqrt(n));

j = 2; p = true;

while j <= m
    if rem(n,j) == 0, p = false; end
    j = j + 1;
end
```