Previous class:
Intro to computer programming
Variables & assignment
Input & output
Script
Calling functions for graphics
Now:
Branching
Nested statements

```
A script (program) is a file with a sequence of
commands
                                     Comment
Variable
        % Quadratic equation solver
holds a
value
        a= input('Enter a: ');
                                      Semi-colon
        b= input('Enter b: ');
        c= input('Enter c: ');
        d = b^2 - 4*a*c;
        r1= (-b-sqrt(d))/(2*a);
        r2= (-b+sqrt(d))/(2*a);
 Assignment operator:
                                  A file with the
 value on RHS is assigned
                                  extension .m
 to variable named on LHS
```

```
% Quadratic equation solver
a= input('Enter a: ');
b= input('Enter b: ');
c= input('Enter c: ');
d= b^2 -4*a*c;
if d >= 0
   r1= (-b-sqrt(d))/(2*a);
   r2= (-b+sqrt(d))/(2*a);
else
   fprintf('Complex roots\n')
end

File: qSolver.m
```

```
The if-else construct

if <condition>
    statements to execute if condition is true
else
    statements to execute if condition is false
end

Only one block of statements

Only one block of statements

will be executed!
```

Relational operators

- < Less than
- > Greater than
- <= Less than or equal to
- >= Greater than or equal to
- == Equal to
- ~= Not equal to

% Quadratic equation solver
a= input('Enter a: ');
b= input('Enter b: ');
c= input('Enter c: ');

Suppose I don't care about the values of the roots—I just

d= b^2 -4*a*c;
if d < 0
 fprintf('Complex roots\n')
end</pre>

The **if** construct

if <condition>

statements to execute if condition is true

end

Logical AND

- Q. When is a real number x in the interval [L,R]?
- A. If x is greater than or equal to L and less than or equal to R.

```
if (x>=L && x<=R)
  fprintf('x is in [L,R]')
else
  fprintf('x is not in [L,R]')
end</pre>
```

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Always use logical operators for multiple conditions

Why is it wrong to use the expression

L <= x <= R

for checking if x is in [L,R]?

Example: Suppose L is 5, R is 8, and xc is 10. We know that 10 is not in [5,8], but the expression $L \le xc \le R$ gives...

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Logical OR

- Q. When is a real number x not in the interval [L,R]?
- A. If x is less than L or less greater than R.

```
if (x<L | x>R)
  fprintf('x is not in [L,R]')
else
  fprintf('x is in [L,R]')
```

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Boolean expressions

- They involve comparisons.
- They have a value that can be thought of as either true or false.

Example:

1. Variables a, b, and c have positive real values. Can we make a triangle with sides that have those values? Yes if the following is true:

divisible by 3 and 5? Yes if the following is true:

2. Variable x has a positive integer value. Is it

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3. Variable y has a positive integer value. Does it name a non-leap year? Yes if the following is true:

Hint: Y is an "ordinary" year if it is not divisible by 4 or if it is a century year not divisible by 400.

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"false" is 0, "true" is non-zero X, Y represent boolean expressions. E.g., d>3.14 Χ X && Y X || Y ~X "and" "or" "not" 1 0 0 1 0 0

Logical operators "short-circuit"

A && condition short-circuits to false if the left operand evaluates to false.

A > b && c > d condition short-circuits to false if the left operand evaluates to false.

Entire expression is false since the first part is false

% Find number of days in month m
m= input('Which month? ');

fprintf("Month %d has %d days\n",...
m, days);

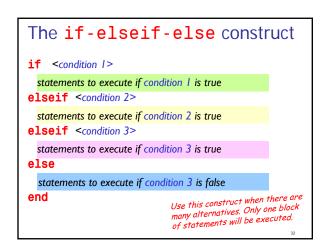
% Find number of days in month m
m= input('Which month? ');

Fill in the necessary code.

There are 3 possibilities: 30, 31, or 28 days.
So we need to choose 1 among 3 options.

fprintf("Month %d has %d days\n",...
m, days);

```
% Find number of days in month m
m= input('Which month? ');
if m==2
   days= 28;
else
   if rem(m,2)==1 && m<=7 ||...
      rem(m,2)==0 && m>=8
      days= 31;
   else
      days= 30;
   end
end
fprintf("Month %d has %d days\n",...
      m, days);
```



Things to know about the if construct	
branch of statements is executed	
There can be	elseif clauses
There can be	else clause
The else clauseconstruct	in the
■ The else clause (boolean expression)	
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