FIRST YEAR PROGRAM
ENGINEERING PROBLEM SOLVING LABS

MAT188: Laboratory #10
Conditional Statements

Operator	Use	Example
<	Less than	if(a<b)
<=	Less than or equal to	if(a<=b)
>	Greater than	if(a>b)
>=	Greater than or equal to	if(a>=b)
==	Equal	if(a==b)
!=	Not equal	if(a!=b)

CONDITIONAL STATEMENTS

In this lab, you will learn how to use conditional statements control the logic and flow of your code based on particular conditions.

Learning Outcomes

By the end of this lab you will…
1) Identify, interpret and demonstrate their understanding of conditional statements and branching operators
2) Understand and analyze an authentic numeric problem, differentiate dynamic and static parts of that problem and set-up a documented solution process
3) Execute, recommend, critique, and summarize that process in a clear, concise, and credible fashion.

Preparation *(Required to do **before** you come to the laboratory session)*
Read through this lab document.

Review – Lab 9

In Lab 9, you learned about how to work with 3D plots in MATLAB, and specifically how to:

1) To display a function of two variables, $z = f(x,y)$, is to use the `meshgrid` function to generate X and Y matrices consisting of repeated rows and columns, respectively, over the domain of the function. The function can then be evaluated and graphed.
2) Create 3D surface plot with `surf()`:
3) Create 3D surface plot with `mesh()`:

For example, to plot $z = (x^2 + y^2)$ over the range $-3 \leq x \leq 3$ and $-3 \leq y \leq 3$:
```
x=-3:0.1:3;
y=-3:0.2:3;
[xx,yy]=meshgrid(x,y)
zz=xx.^2 + yy.^2;
surf(xx,yy,zz)
```

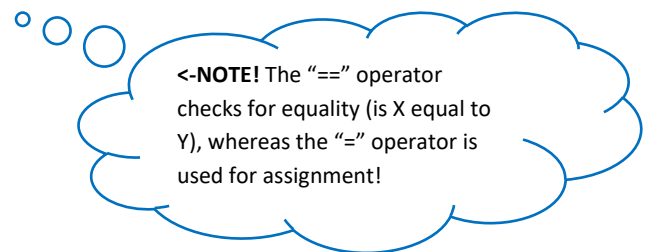## MATLAB Skills and Knowledge: Conditional Statements

The final fundamental concept we will learn about in MATLAB is how we can use conditional statements to enable *branching* within our functions and scripts. This allows us to define different outcomes depending whether or not a particular situation takes place, or is true.

For example, consider the following text:

> if *today* is Tuesday, then
>   set the value of the variable *date* to 3,
> but if *today* is Wednesday, then
>   set the value of the variable *date* to 4,
> otherwise in all other cases, then
>   set the value of the variable *date* to 0.
> end

In MATLAB this can be written using the `if`, `elseif`, `else`, and `end` statements:

```
if today == 'Tuesday'
    date = 3;
elseif today == 'Wednesday'
    date = 4;
else
    date = 0;
end
```

<-NOTE! The "==" operator checks for equality (is X equal to Y), whereas the "=" operator is used for assignment!

Note how the command consisting of the double equals sign, ==, is used to check if a situation is true. But to assign a value to a particular variable you only need to use a single equals sign. Other logical operators, such as <, >, <=, >= can also be used. For example,

```
x = [0:(2*pi/101):2*pi];
y = sin(x);
plot(x,y);
hold on;

count=0;
for e = 1:length(x)
    if y(e) == 0
        plot(x(e),0,'r*');
    elseif y(e) >= 0.8
        plot(x(e),y(e),'b+');
        count=count+1;
    else
        plot(x(e),y(e),'k.');
    end
end
```

What do you think would be the result of this function? What do you think the `count` variable is for? What does the variable `count` tell us after the script is finished? Try it out and see if you are correct.

Now, ***edit this script*** so that it will also plot green squares for the values of the function *below* -0.8.

Exercise, MAT188 Lab #10

Two first-year engineering students, Micah and Chirag, are trying to convert their numerical first-year engineering grades into letter grades (A+, A, A-, etc) and GPA (weighted), because some of the scholarships they are applying for would like the information presented in different ways.

Information about converting from a Numerical Grade to the alternative ways is located at the following website: http://undergrad.engineering.utoronto.ca/academics-registration/calculate-gpa/

Table 1 - Shows the courses and corresponding grades for two students (numbers are fictitious).

Course[1]	Grades for "Micah"	Grades for "Chirag"
APS111	62	92
CIV100	XX	55
APS164	71	60
MAT186	80	YY
MAT188	83	79
APS100[2]	P	H

Table 2 - Table of scholarships and their corresponding requirements

Name	Requirement	Requirement
Orange Scholarship	1.3 CGPA	
Yellow Scholarship		3 C+'s or better
Blue Scholarship	2.2 CGPA	

Set-up: *Pick a number for XX and another number for YY (from 0 to 100)* (see Table #1 above). Clearly indicate what these are when you submit your response to the question below!

Question: *Which scholarship(s) are "Micah" and "Chirag" eligible for? Please describe your process*

Submission guideline:
Please electronically submit, via the MAT188 PRA website, a 1 page document answering the questions above, clearly showing your work (this can include your code, comments, any explanations, etc.). In your submission, also include a concise (1-paragraph suggested) written description of your problem solving process.

Optional Challenge (this is **NOT** part of the required submission, and is **NOT** graded)
Try this with your own grades; for a list of available scholarships, consider visiting the following websites:
http://undergrad.engineering.utoronto.ca/fees-financial-aid/scholarships/

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[1] Remember, that the first five courses have equal weights of 0.5.
[2] Recall, the final grade that will appear of your transcript for APS100 is a High Pass (H), Pass (P), or Fail (F). This does not enter into the GPA calculation because it uses this H, P, or F scale.
*Names, grades, and scholarships listed for exercise are fictitious.

http://www.scholarshipscanada.com/