Matlab Level 4: Comparisons

Often it is necessary to compare two parameters.

```matlab
>>help if

Start by clearing the work space and then creating two variables.

```matlab
>>clear
>>clc
>>a=10;
>>b=10;
```

Now, compare ‘a’ and ‘b’, if they are equal, let c=1; if not, don’t do anything to ‘c’.

```matlab
>>if a==b
    c=1
end
```

Note that when working in the command window, MATLAB waits until the ‘end’ statement before evaluating the comparison and performing any commands.

IMPORTANT: Note that the comparison notation is ‘==’ while the assignment notation is ‘=’ BE CAREFUL – if you type ‘if a=b’ the value of ‘a’ is reassigned and the comparison will not work.

Change ‘b’ value and compare ‘a’ and ‘b’ for equality. If they are equal, let c=1, if not, c=0.

```matlab
>>b=15
>>if a==b
    c=1
else
    c=0
end
```

You can also add in other ‘if’ statements within a comparison.

```matlab
>>b=15
>>if b<10
    c=1
elseif b<13
    c=2
elseif b<20
    c=3
end
```

Check out the other possible comparisons you can make

```matlab
>>help !
```

The ones you will use are:

- `==` equality
- `>` Greater than
- `<` Less than
- `~=` Not equal
Try these problems
1. Given the vectors $x_1=[1 \ 4 \ 3 \ 5 \ 1 \ 3 \ 5 \ 2 \ 6 \ 9]$ and $x_2=[1 \ 1 \ 1 \ 2 \ 9 \ 9 \ 5 \ 2 \ 1 \ 1]$, explain the following expressions
   a. $x_1==x_2$
   b. $x_1>x_2$
   c. $x_1<x_2$
   d. $x_1~=~x_2$
2. Given the vector $x=[3 \ 11 \ 13 \ 10 \ -5 \ -1 \ 9 \ 2 \ 0]$, write commands that will
   a. double the values that are less than zero.
   b. Assign all values that are greater than 1 to a new variable $x_2$
   c. Assign all values beyond the first instance where $x$ is greater than 12 to a new variable $x_3$
   d. Subtract the mean value from each element
3. Given $a=10$, $b=20$ write commands that make $c=1$ if
   a. both ‘a’ and ‘b’ are greater than 5
   b. either ‘a’ or ‘b’ are greater than 15
   c. only if $a<b$ and $b>20$
   d. either $a==b$ or $a<b$
4. Given the vectors $x_1=[1 \ 2 \ 3 \ 4 \ 5]$ and $x_2=[1 \ 1 \ 1 \ 4 \ 1 \ 1 \ 1]$, write commands that let $c=1$ if
   a. the length of $x_1<x_2$
   b. the sum of $x_1>x_2$
   c. the third element in $x_2$ is less than $x_1$
   d. the sum of the odd elements in $x_1$ plus the sum of the even elements in $x_2$ is greater than 15