A. The *save* and *load* Commands

When you exit the MATLAB program, any calculations you may have carried out are lost. If you want to save your work, you can use the `save` command. Here is an example.

```
A = [1, 2, 3; 2, 3, 4; 3, 4, 4];
```

```
b = [14; 20; 23];
```

```
x = A\b
```

```
save('myVars') %This will save the variables A, b, and x in a file named myVars.mat
```

```
clear %This will delete all variables from the workspace
```

```
load('myVars') %This will load the variables A, b, and x back into the workspace
```

If you only need to save some of your variables, you can name the variables you want to save in the `save` command:

```
save('myVars', 'A', 'b')
```

```
clear
```

```
load('myVars')
```

Notice that now only the variable names A and b appear in the workspace window. The mat file created by the `save` command is only readable by MATLAB. To create a readable text file, you can use the command

```
save('myVars.txt','-ascii')
```

With this option, however, the names of the variables are lost.

B. Script File Input and Output

As you know, a script file (with file type .m) is a list of MATLAB commands. There are two ways to have MATLAB execute the commands in a script file:

1. type the name of the file in the command window, or
2. click on the *Run* icon (or hit the F5 key) in the editor window.

There are three ways to assign values to variables in a script file:

1. include a command in the script file that assigns a value to the variable;
2. issue a command in the command window that assigns a value to the variable before you run the script file; or
3. use the `input` command.

To see how the `input` command works, create and run a script file with the following two lines.

```
F = input('Enter a temperature in degrees Fahrenheit: ');
```

```
C = round( (F-32)*5/9 )
```

You can make the output from your script file more informative by using the `disp` command. Edit your script file so it contains the following six lines. (Note the semicolon at the end of the second line.) Run the new script file.

```
F = input('Enter a temperature in degrees Fahrenheit: ');
C = round( (F-32)*5/9 );
disp(F)
disp('degrees Fahrenheit equals')
disp(C)
disp('degrees Celsius.')
```

You can also use the command `fprintf` to generate output from a script file. This command gives you more control over the format of the output, but it is a little more complicated to use. Edit your script file so it contains the following three lines, then run the new script file.

```
F = input('Enter a temperature in degrees Fahrenheit: ');
C = (F-32)*5/9;
fprintf('%6.3f degrees Fahrenheit equals %6.3f degrees Celsius.\n',F,C)
```

In the last command, F and C are the variables whose values are to be displayed. The text `'%6.3f degrees Fahrenheit equals %6.3f degrees Celsius.\n'` tells MATLAB what format to use in displaying the values of F and C. `%6.3f` means "display the number using fixed point format with a total width of 6 characters, including 3 characters after the decimal point." `\n` means "go to the next line after displaying the output."

The most common formats are f (fixed point), e (scientific notation), and g (MATLAB decides on the format depending on the size of the number to be displayed).

Try this example giving a table of values as output.

```
F = -10:10:100;
C = (F-32)*5/9;
tempTable = [F; C];
fprintf('Degrees F   Degrees C\n\n')
fprintf('%6.3g     %6.3g \n',tempTable)
```

Note that `tempTable` is a 2×12 array, but `fprintf` prints it out as a 12×2 array.

C. Sending Output to a Text File

Modify your script file to contain the following commands. This is an example of how you can send output to a text file instead of the command window screen.

```
>> F=-10:10:100;
>> C=(F-32)*5/9;
>> temp_table=[F;C];
>> fid=fopen('sampleoutput.txt','w');
>> fprintf(fid,'Degrees F Degrees C\n\n');
>> fprintf(fid,'%6.3g %6.3g \n',temp_table);
>> fclose(fid)
```

D. Reading Data from an Excel File

Go to the *Class Handouts etc.* link on our course web page. Right click on *Excel File for Use in Class on February 20*, and save the file to your desktop.

Navigate to the desktop by clicking on the toolbar icon that looks like a file folder with a green arrow coming out of it.

Read the contents of the Excel file into an array named A using the command

```
>>A = xlsread('ExcelDataFile.xlsx');
```

Create a column vector named A1 containing the first column of A.

Sort the elements in A1 using the `sort` command, and save the result in an array named sortedA1.

E. Writing Data to an Excel File

Write your sortedA1 array to an Excel file using the command

```
>>xlswrite('sampleOutput',sortedA1)
```

This will create the file `sampleOutput.xls`

```
>>xlswrite('sampleOutput.xlsx',sortedA1)
```

will create the file `sampleOutput.xlsx`

F. Importing Data Using the Import Wizard

Here is an example of another way to import data from a file. Go to the *Class Handouts etc.* link on our course web page. Right click on *Dr. Colby's data file for Use in Class on February 20*, and save the file to your desktop.

In MATLAB, click on the *Import Data* icon on the toolbar. Click on the file UMLdata.

Highlight columns D and E, then click on *Import Selection*, then click on *Import Data*.

You should see a new variable in your Workspace window. You can rename the variable by right clicking on the variable name and selecting *Rename*. You can convert the variable from a table to an array using the `table2array` command.

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Reference for *fprintf* information

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Higham, Desmond J., and Higham, Nicholas J., *MATLAB Guide*, 2nd ed., SIAM, 2005.

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Practice Problems

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1. The wind chill temperature, T_{wc}, is calculated by

$$T_{wc} = 35.74 + 0.6215T - 35.75v^{0.16} + 0.4275Tv^{0.16}$$

where T is the temperature in degrees Fahrenheit and v is the wind speed in miles per hour.

Write a MATLAB script file to calculates T_{wc}. Have the script use the `input` command to ask the user to enter values for T and v. For output have the script use the `fprintf` command to display the message "The wind chill temperature is XX," where XX is the value of the wind

chill temperature rounded to the nearest integer. Execute the program entering T= $25°F$ and v= 15 mi/h.

2. The monthly payment M of a loan amount P for y years and with interest rate r can be calculated by the formula

$$M = \frac{P(r/12)}{1 - (1 + r/12)^{-12y}}$$

Calculate the monthly payment and the total payment for a $100,000 loan for 15, 16, 17, ... , 29, 30 years with an interest rate of 5%. Display the results in a three-column table where the first column is the number of years, the second is the monthly payment, and the third is the total payment.

3. Save your table from problem 2 in an Excel file.

Practice Problem Answers

1. 13

2.

Length of loan (years)	Monthly Payment	Total Payment
15	790.79	142342.85
16	757.68	145474.75
17	728.66	148645.68
18	703.03	151855.31
19	680.28	155103.33
20	659.96	158389.38
21	641.72	161713.10
22	625.28	165074.12
23	610.41	168472.05
24	596.90	171906.48
25	584.59	175377.01
26	573.34	178883.21
27	563.04	182424.64
28	553.57	186000.85
29	544.86	189611.39
30	536.82	193255.78