

GEO111 – NUMERICAL SKILLS IN GEOSCIENCE

week #02: Fundamentals of computer programming

9th October 2017

Work plan

Work through Chapter #2 of the GEO111 course text – aim to complete Sections 2.1 through 2.3 during the Monday am lab, and Sections 2.4 through 2.6 during the Friday pm class. If you complete 2.1-2.3 before the end of the Monday lab, firstly ensure that you have completed everything in Chapter #1, then start on Section 2.4. (Note that Sections 2.4-2.6 are currently being updated ready for Friday ... but will not change out of all recognition.)

A brief guide as to what you will be doing/seeing as you go through Chapter #2 is as follows:

1. Section 2.1. Introduction to scripting (programming!) in MATLAB

Basic information about '*m-files*' – (plain text) code files used in **MATLAB**, and *script* files. Also some pointers to programming good practice and debugging code.

2. Section 2.2. Functions

What *functions* are in MATLAB and how they are used.

3. Section 2.3. Conditionals '101'

What the the *conditional* structure is, how it is used, and what the different forms this can take in **MATLAB**. Many many examples ...

4. Section 2.4. Loops '101'

What the the *loop* structure is, how it is used, and what the different forms this can take in **MATLAB**. Many many examples ...

5. Section 2.5. Loops and conditionals ... together(!)

Combining conditional and loop structures in the same program code.

6. Section 2.6. Even more (and loopier) loops

Further examples.

Micro Assessment #2

Your assessment for this week is firstly, to write 2 short programs:

1. Write a script program that asks for the current month (a string) at the command line, and displays at the command line, the number of days in that month. If the month given as input does not exist, a message should state this in some way.
2. Debug (i.e. get working) the following code, adding any comments you feel appropriate and making any 'improvements' you feel justified. The code is designed as a *function* ... it takes 2 inputs, **ip1** and **ip2** (numbers), and returns 2 outputs: **ans1** and **ans2** (also numbers). The first output (**ans1**) should be equal to **ip1** divided by **ip2**, and the second output (**ans2**) should be equal to **ip2** divided by **ip1**. If either input is equal to zero (a divide-by-zero situation), both outputs are meant to be set equal to zero.

```

function [ans1 ans1] = divide_both_ways(ip1,ip2)
% function to plot a sine wave
ans1 = ip1/ip2
ans2 = ip2/ip1
if ((ip1 == 0) && (ip2 == 0))
ip1=0
ip2=0
end
end
end

```

Submit by email (andy@seao2.org) as separate .m files. You will be marked for basic program structure and commenting of the code, in addition to the code correctly working! 80% of the total marks is available simply for working code that has adequate commenting. Maximum marks (100%) will be awarded for neat and compact code and/or clever solutions. Please include somewhere a comment line with your name in it to ensure there can be no file mix-up.

In addition,

3. Provide a figure (in any common graphics format you like) of past relative sealevel (see Section 1.7). Your graph should have a title that includes your name. It should be in the form of a scatter plot, with filled circles as the data markers. For maximum marks, the data points should be color-coded by oxygen isotope value (not reconstructed sealevel). This should also be submitted by email.

The deadline (for the emails to appear in my in-box) is noon (12 pm) on Friday 13th October.

Learning goals (aka: 'what specifically should I have got to grips with?')

Topics and methodologies you should be familiar with:

- scripts and functions
- good programming practices
- debugging strategies
- conditionals
- loops

specific MATLAB commands you should be familiar with:

- the `function` definition
- conditional structures: (1a) `if ... end`, (1b) `if ... else ... end`, (1c) `if ... elseif ... else ... end`, (2) `switch ... case ...`
- loop structures: `for ...`, `while ...`
- misc: `disp`, `input`, `strcmp`