## Functions

## Learning Objectives

* Explain a Matlab function file.
* Define a function that takes parameters.
* Test a function.
* Know why we should divide programs into small, single-purpose functions.

**Part 1 – Inbuilt Functions**

Function syntax

When called in script or command line

[Out1, Out2, ...] = function\_name(In1, In2, ...)

In first line of function definition

function [Out1, Out2, ...] = function\_name(In1, In2, ...)

Functions we’ve used so far

Mean M = mean(A,dim)

Max M = min(A,[],dim)

Num2str s = num2str(A)

Etc.

Input and Output arguments in documentation

**Part 2 – Writing Functions**

Variable scope – variables defined in functions are only visible there.

* For something to be useable in a function you have to either pass it to it, or define it within.

% file fahr\_to\_kelvin.m

function ktemp = fahr\_to\_kelvin(ftemp)

ktemp = ((ftemp - 32) \* (5/9)) + 273.15;

end

saving a function

% file kelvin\_to\_celsius.m

function ctemp = kelvin\_to\_celsius(ktemp)

ctemp = ktemp - 273.15;

end

CHALLENGE

* Write a function that takes two numbers and returns the sum of the numbers and the product of the numbers (two inputs and two outputs)
* Include in the function an “if statement” that tests whether the sum or product is bigger, and returns a third output that is a string stating whether the sum or product is bigger (ie. ‘sum is bigger’ or ‘product is bigger’)

function [vsum, vprod, checksize] = sumprod(v1, v2)

vsum=v1+v2;

vprod=v1\*v2;

if vsum>vprod

checksize='sum is bigger than product';

elseif vprod>vsum

checksize='product is bigger than sum';

else

checksize='sum and product are same size';

end

end

**Part 3 – Commenting Functions**

We need to write documentation about functions to help other people (and our future selves)

Put into sumprod code:

% [vsum, vprod] = sumprod(v)

% Calculate the sum (vsum)

% and the product (vprod)

% of the inputs v1 and v2.

% Also return a string (checksize) stating the relative size of vsum

% and vprod

Things we do to every data set can be put in functions

Want to shift our data so that the mean = whatever we want it to be

out = (data - mean(data)) + desired

Challenge

* Make a function called “centre\_shift” that will shift your data to a desired mean, and use it in your analyse\_data.m script
* Add documentation to your function so that if you type “help centre\_shift” in the command line, useful information about how to use the function will show up

Answer:

function out = center\_shift(data, desired)

% Center data around a desired value.

%

% center(DATA, DESIRED)

%

% Returns a new array containing the values in

% DATA centered around the value.

out = (data - mean(data)) + desired;

end

**Part 3 – Commenting Functions**

Use of functions, with an example

SCplot or customfig

Challenge

In groups, discuss some ideas of what you might want to use functions for, and what would be your inputs and outputs to those functions.