

## APM 153 LECTURE TWELVE – Calculating a Bank Balance

### Introduction

(1) For lab this week, we will be writing a Matlab function called **bank.m** which will calculate the amount of money (i.e. the “balance”) in a bank account over a period of time.

(2) The goals of this assignment are to learn how to use for-loops and nested for-loops, and how to plot using the **plot** function in Matlab.

### State the Problem

(3) We want to write a function that calculates the daily balance in a bank account for a given number of years with interest compounded any one of three ways: annually, monthly, or daily.

### Define the Inputs and Outputs

(4) The input arguments for the function will be,...

- A. the starting balance
- B. the interest rate
- C. the number of years to calculate the balance
- D. whether to compound interest once a year, once a month, or once a day.

(5) The output arguments of the function will be,...

- A. the final balance at the end of the calculation
- B. the daily balance regardless of what type of interest is earned.

### How to Handle Character Data Input

(8) When you run your bank.m function you will type in something like the following..

```
>> bank(1000, 0.05, 10, 'a')
```

(9) These input arguments represent a \$1000 starting balance, 5% interest, calculated for 10 years using “annual” interest. The ‘a’ means “annual”. Note the **single quotes**.

(10) Your bank.m will need an extended if-then statement which will calculate interest either annually, monthly, or daily.

(11) We can use the same logical operators, such as ==, >, and < to work with character data as in the lines of pseudocode below.

```
if method == 'a'           % interest will be compounded once a year
    calculate interest once a year
elseif method == 'm'       % interest will be compounded once a month
    calculate interest once a month
else
    calculate interest once a day
end
```

(12) In the lines of pseudocode above, the variable “method” holds one character. The if-then statements compare the character string stored in method with the single characters ‘a’ and ‘m’.

(13) Notice that for the if-then statement to work in Matlab, the character strings ‘a’ and ‘m’ must be surrounded by **single quotes**.

(14) Note also, that when we call the function, ‘a’ is in single quotes as well.

### **One Line of Matlab Code**

(15) Because bank.m is a function with input and output arguments the first line of code in our function should look like the following.

```
function output = bank(balance, interest, years, method)
```

### **Design the Algorithm**

(6) Before you come to lab on Friday, **you must write out your algorithm** as pseudocode **and** as a flowchart. Your algorithm must be as complete as possible. Start by using the following pages as a scratch sheet to write out your algorithm.



