

Armstrong State University
Engineering Studies
MATLAB Marina – While Loops Exercises

1. Create a MATLAB program consisting of the MATLAB code of Figure 1. Run the program and verify that the numbers from 1 to 10 in steps of 0.5 are displayed. Determine the size and value(s) of the variable `number` after the loop has been executed. What determines how many times the loop body is repeated? How is the value of the variable `number` determined for each iteration of the while loop?

```
number = 1;  
endNumber = 10;  
  
while (number <= endNumber)  
    disp(number);  
    number = number + 0.5;  
end
```

Figure 1, Display Numbers Code Segment

2. Write a MATLAB program that will display the numbers from 5 to 25 with a step of 5. The program should display: 5, 10, 15, 20, and 25. Use iteration (while loop) to solve this problem. Run your program and verify that it operates correctly.
3. Modify the program of Exercise 2 so that the numbers from 25 to 5 with a step of -5 are displayed. The program should display: 25, 20, 15, 10, and 5. Use iteration (while loop) to solve this problem. Run your program and verify that it operates correctly.
4. For operations like those in Exercises 1-3, is a for loop or while loop a better choice?
5. The MATLAB program of Figure 2 ensures that a number read in from the user will be greater than zero. Modify the program of Figure 2 to ensure a number between 1 and 100 is read in.

```
% read in number  
number = input('Enter number greater than zero: ');  
% ensure number is greater than 0  
while (number <= 0)  
    number = input('Enter number greater than zero: ');  
end
```

Figure 2, while Loop to Ensure User Enters Valid Data

6. Write a MATLAB program that will sum positive numbers (numbers greater than or equal to zero) read in from the user until the value -999 is entered. Once the value -999 is entered, the sum of the all the positive numbers previously entered should be displayed. Hint: this is a running sum problem but you should use a while-loop since you do not know how many

numbers will be entered. The sentinel value (the value -999 that indicates the end) should not be added to the sum. Use the comment skeleton of Figure 3 as a starting point.

```
% read in first number from user

% while number is not -999 compute sum

    % update running sum

    % read in next number from user
```

Figure 3, Comment Skeleton for Exercise 6

7. Write a MATLAB program that will populate (build) a column vector with values read in from the user until the value -999 is entered. Once the value -999 is entered, the column vector should be displayed. Hint: this is a running array concatenation problem and you should use a while-loop since you do not know how many numbers will be entered. The sentinel value (the value -999 that indicates the end) should not be included in the column vector. Use the comment skeleton of Figure 4 as a starting point and make sure that the concatenation results in a column vector.

```
% start with empty vector

% read in first number from user

% while number is not -999 build column vector

    % concatenate new number to existing vector

    % read in next number from user
```

Figure 4, Comment Skeleton for Exercise 7

8. Write a MATLAB program that will plot cosine functions of different frequencies on the same graph in a figure window. The program should read in the start and end time that will be used for all of the plots and then repetitively read in frequencies and plot the cosine function until a negative frequency is entered. Use the comment skeleton of Figure 5 as a starting point. Hint: MATLAB's `hold on` statement will allow multiple plots to be added to the same axes in a figure window without overwriting previous plots. At the end of the program use the `hold off` statement to return to the default mode for plotting operations. The general form of a cosine function with amplitude A , frequency f in Hertz, and phase shift ϕ is $A \cos(2\pi ft + \phi)$. For this exercise, the amplitude of the cosine functions are one ($A = 1$) and the phase shifts are zero radians ($\phi = 0$).

```
% read in start and end time for plot in seconds
% read in first frequency in Hz
% while frequency is not negative, evaluate and plot cosine
    % create time vector and evaluate cosine function
    % plot cosine function
    % read in next frequency in Hz
```

Figure 5, Comment Skeleton for Exercise 8

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