**Short Answer**

1. Define the term abstraction, as it relates to programming.
2. Select all of the function headers below which are syntactically valid. More than one answer may be correct.

a) function [out1 out2] = myFunc(in1)

b) function myFunc(in1, in2, in3)

c) function = myFunc(in1)

d) function [out1] = myFunc(in1 in2)

e) Function out = myFunc()

f) function in = myFunc(in)

1. Write the function header for a function called imageManip which takes in four inputs: an image, and three words. The function outputs the three words, scrambled into unrecognizable form.

**Short Tracing**

1. Consider the following function which is defined in the current MATLAB workspace.

1   function [v a d e r] = Skywalking(in1, in2, in3)

2   evil = in2(in1)

3   v = evil(1:end-1) == 'grape'

4   a = in3(end:-1:1)

5   d = strcmp(evil, in3)

6   e = evil(1:5:end)

7   r = ~all(evil == 'apple')

8  end

The following code is run in the Command Window:

in1 = [1:3 6 7]

in2 = 'Dart throwing'

in3 = 'ekul'

[d e f g h] = Skywalking(in1, in2, in3)

What values are stored in d, e, f, g, and h after this code is run? If a line of code results in an error, write ERROR for the appropriate variable, and briefly explain why an error is caused in the provided space below (3 pts each, 15 pts total).

d: \_\_\_\_\_\_\_\_

e: \_\_\_\_\_\_\_\_

f: \_\_\_\_\_\_\_\_

g: \_\_\_\_\_\_\_\_

h: \_\_\_\_\_\_\_\_

Explain any errors in the space below:

**Short Coding**

Given a string of letters called str, find all the letters preceding the first vowel and all letters after. Then combine the letters together again, with the spot for the first vowel being replaced by a space. Store the answer back in str.

Example: 'thisTestCase' becomes 'th sTestCase'

Given a string of unknown length called str, replace all of the instances of the letter 'e'—both capital and lowercase-- with a period.

Given a vector of integers (called vec), determine how many unique numbers there are inside of the vector. Store your answer in a variable called quant.

Example: For [1 5 3 5 2 5 3], the answer is 4.

**Error Correction and Long Tracing**

Consider the following function, which is intended to encrypt a message using a shifting letter cipher. In the cipher, a text message is encrypted by shifting every letter down some number of spots in the alphabet. The letter "Z" wraps back to "A", and only letters of the alphabet, not punctuation or numbers, are shifted.

Please note that intentional errors have been put in this code.

1 function [code] = cipher(message, shift)

2 capLetters = message(message>='A' & message<='Z');

3 capLetters = capLetters + shift;

4 capLetters(capLetters >'Z') = capLetters(capLetters >'Z') - 26;

5 message(message>='A' | message<='Z') = char(capLetters);

6 lowLetters = message(message>='a' & message<='z');

7 lowLetters = lowLetters + shift;

8 lowLetters(lowLetters>'z') = lowLetters(lowLetters>'z') - 26;

9 message(message>='a' | message<='z') = char(lowLetters);

10 code = message;

11 end

Assume that the following function call is made to the Command Window:

code = cipher(‘Does This Work?’,5);

a. What is the value of the variable capLetters after line 2 is run?

b. What is the class of the variable capLetters immediately after line 4 is run?

c. As the code progresses, the following error appears in the Command Window:

Error in cipher (line 7)

message(message>='A' | message<='Z') = char(capLetters);

In an assignment A(I) = B, the number of elements in B and I must be the same.

This same error appears in line 12, as well. Qualitatively explain what exactly the error is, in these two lines of code. Then, write line 7 so that it works properly.

d. This code only works for shifts of numbers less than 26. Write one line of code which could be added to the function to make it work for any shift, positive or negative. Explain where the line must be inserted.

e. Assume that the user, instead of inputting a string for the first input to the function, inputted the following vector: [14 15 16 17 18]. If all other errors in the function had been corrected, would this code run? If so, what would the function output be? If not, explain which line would cause an error.

**Long Coding**

Function Name: UBWGrades

Inputs  (1): - (double) The original vector of grades

Outputs (2): - (double) The modified grades vector

            - (double) The curve applied to the class

Function Description:

An Underwater Basket Weaving professor is ready to calculate the curve for the final grade. However, he knows that some of his students did extremely well and does not want to include them when calculating the curve. Write a function that does the following steps:

1) Calculate the average grade of the class, *ignoring* the students who had a score greater than 100.

2) Add the same number of points to the *remaining* grades so that this modified average becomes a 75. Do not add points to the students who scored above 100.

3) Output the edited vector.

Notes:

 - The final output needs to have the shifted grades be in the same place in the grade vector as the original grades were.

 - The average will always be below 75 once the high grades are taken out.

Test Case:

     grades = [101, 56, 64, 73, 49, 128, 52, 63, 42]

     [curved\_grades curve] = UBWGrades(grades)

         => curved\_grades = [101, 74, 82, 91, 67, 128, 70, 81, 60]

         => curve = 18