CS100M Fall 2007 Prelim 2 Oct 16 7:30–9:00pm
CIS121 Final Exam

Name: _____
(Legibly print last name, first name, middle name)

NetID: _____

Statement of integrity:
I did not, and will not, violate the rules of academic integrity on this exam.

_____ (Signature)

Q1: (30)	_____	____
Q2: (20)	_____	____
Q3: (25)	_____	____
Q4: (25)	_____	____
Total: (100)	_____	____

Check here if you are in CIS121 ☐

Circle your lecture time: 9:05 or 11:15

Circle your section instructor's name:

	Tuesday	***Wednesday***
10:10		Chris Scheper
11:15		Lucian Leahu
12:20	Lucian Leahu	Chris Scheper
1:25	Lucian Leahu	Chris Scheper
2:30	Mateo Restrepo	Mateo Restrepo
3:35	Mateo Restrepo	Kenneth Tsung

Instructions:
- This is a 90-minute, closed-book exam; no calculators are allowed.
- The exam is worth a total of 100 points, so you should try to spend no more than about 18 minutes on a 20-point question.
- Read each problem completely, including any provided code, before starting it.
- Raise your hand if you have any questions.
- Use the backs of pages or ask for additional sheets of paper as necessary.
- Clarity, conciseness, and good programming style count for credit.
- If you supply multiple answers, we will grade only *one*.
- Use only MATLAB code. No credit for code written in other programming languages.
- Assume there will be no input errors.
- Write user-defined functions only if asked to do so.
- Do not use cell arrays or structures.
- Do not use `switch`, `try`, `catch`, or `break` statements.
- You may find the following MATLAB predefined functions useful:
  `abs`, `sqrt`, `rem`, `rand`, `floor`, `ceil`, `input`, `sprintf`, `disp`

Examples: `rem`(5,2) → 1, the remainder of 5 divided by 2
`rand(1,4)` → a row vector of 4 random real values, each in interval (0,1)
`floor`(6.9), `floor`(6) → 6, rounds down to the nearest integer
`ceil`(8.1), `ceil`(9) → 9, rounds up to the nearest integer
`strcmp('At','at')` → 0, the two strings do not match; `strcmp('at','at')` → 1

Question 1: (30 points)

Part (a): (2 points)

What does vector `v` look like after the following script is executed?

```
v = [0 1];
for k = 1:3
    v = [1 v];
end
```

Before: 0 1

After: _____

Part (b): (2 points)

What does vector `w` look like after the following script is executed?

```
w = [3 2 1];
w(w(3)) = w(1);
```

Before: 3 2 1

After: _____

Part (c): (10 points)

Assume that `a` and `b` are initialized scalars with `a<b`. Consider the following code fragment:

```
x= linspace(a,b,n);
y= sin(x);
```

Write an equivalent fragment that does not use function `linspace` and only calls the sine function with scalar input values.

Question 1 continues on next page

Part (d): (6 points)

Assume that `score` is an initialized vector containing integer values in the interval [0,100]. (For example, `score` is a vector of student scores on a test). Write one statement on the blank below to complete the code fragment for drawing a histogram of the scores (with one bar for each score value 0, 1, 2, …, 100).

```
count= zeros(1,101);  % count will be used to store the histogram data
for k= 1:length(score)

    _____________________________________________________________________
end
bar(0:100, count)  % draw a histogram of the scores
```

Part (e): (5 points)

Given the following function:

```
function f = evaluateQuadratic(a,b,c,x)

f= a*(x^2) + b*x + c;
```

What is the output when the following script is executed?

```
a=1;  b=-1;  c=3;  x=2;

f= evaluateQuadratic(c,b,a,x)
```

Output:

Part (f): (5 points)

Given the following function:

```
function y = flip(x)

n= length(x);
for k= 1:n
    x(n-k+1)= x(k);
end
y= x;
```

What is the output when the following script is executed?

```
y= [10 20 30 40];

y= flip(y)
```

Output:

Question 2: (20 points)

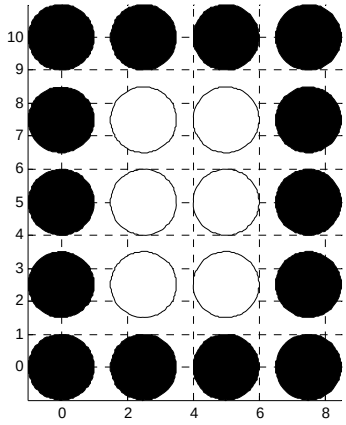
Write a function `s2hms` to convert a time in seconds to a time in hours, minutes, and seconds. The function has one parameter (`sec`) and returns three numbers: `h`, `m`, and `s`. Read the given function comment below; write the function header and the function body.

```
% Convert a time expressed in seconds (sec) to the number of hours (h),
% minutes (m), and seconds (s).  h and m are integer values and
% 0<=m,s<60.  Assume sec>=0.
```

Assume function `s2hms` has been written correctly. Write a script to print the number of times in a day that h>m>s. Check whole seconds from 0 to 60×60×24-1. You must use function `s2hms` to solve this problem.

Question 3: (25 points)

Complete function `drawFrame` below to draw a "frame" made up of black and white disks. Each disk is of unit radius and the lower left disk is centered at (0,0). Shown on the right is an example of a 5-by-4 frame with a spacing of 0.5 between disks. The function call to produce this example is `drawFrame(5,4,0.5)`.



Assume that function DrawDisk is available. To draw a black disk of unit radius at position (3,4): `DrawDisk(3,4,1,'k')`

Write only the code to draw the disks. The grid lines are provided for your convenience—you do not need to draw them.

```
function drawFrame(h,w,s)
% Draw a frame composed of h-by-w black and white disks of unit radius
% with space s between the disks.  Black disks form the border; white
% disks are in inside.  The lower left disk is centered at (0,0).
% Assume h,w>2 and s>=0.

axis equal
hold on
```

```
hold off
```

Question 4: (25 points)

Complete function `findPrefix(p,s)` below to return the position of the first occurrence of a word that begins with string `p` in string `s`. If no word in `s` begins with string `p`, the function returns -1. For full credit, your algorithm should be efficient—stop after the first occurrence has been found. The only built-in functions that you may use are `length` and `strcmp`. Assume that `p` contains only lower case letters and `s` contains lower case letters and blanks. Below are four examples:

p	s	*Returned value*
mat	there is a mat in the lab	12
mat	there is a bat in the lab	-1
mat	matt uses matlab on a mat	1
mat	format a plot in matlab	18

```
          123456789111111111222222
                  0123456789012345
```

In the last example above, the word "format" in `s` includes the substring 'mat' but that doesn't count since 'mat' does not appear in the beginning of the word.

```
function k = findPrefix(p, s)
% k is the position in string s of the first occurrence of a word that
%   begins with string p
% k is -1 if no word in string s begins with string p
% p contains lower case letters only
% s contains lower case letters and blanks only
```