1 Bits, Bytes, Characters, Strings (5 points)
- How many bits make up a byte? 8
- If typing 'A' + 4 displays 69 on the screen, what would 'C'-5 display? 62
- How many characters are there in the string 'CS 1109'? 7

2 Variables, Assignment (10 points)
\[
x = 2;
y = 3; p = isprime(x);
z = 5; q = rem(z,y);
z = z + y * x;
x = z - x - y;
y = x / y + z;
\]
What are the final values for:
x: 6  y: 13  z: 11  p: 1  q: 2

3 MATLAB Specific (5 points)
- What is the character used to denote comment lines? %
- What is the command to clear screen? clc
- What is the command to see all the workspace variables? who, whos
- What is the command to clear all the workspace variables? clear all
- What is the command to see which version of a function will be run? which

4 Operators (10 points)
What are the results of the following expressions?
\[
\begin{align*}
2*0+1*2 & \quad \% 5 \\
2*0*12 & \quad \% 0 \\
[2 0 1].^2 & \quad \% [4 0 1] \\
23 \sim 19 & \quad \% 1 \\
17 < 71 & \quad \% 1
\end{align*}
\]
2 > 0 > 1 > 2 % 0
~ (1 && 1 || 0) % 0
1 && 3 < 2 % 0
(~0 & 1)||(0 & 1) % 1
(~(0&1))||(1&1)) % 1

5 Functions (10 points)

function [a,s,r] = compute_triangle (x,y,z)
% using the sidelengths of a triangle, computes the semiperimeter,
% area, and the radius of the tangent circle

p = x+y+z;
s = p/2;
a = sqrt(s*(s-x)*(s-y)*(s-z));
r = a/s;

• What is the name of this function? compute_triangle
• What should be the filename for this function? compute_triangle.m
• Which variables are input variables? x,y,z
• Which variables are output variables? a,s,r
• If we type [a,s,r] = compute_triangle (3,4,5)
  What are values of a: 6 s: 6 r: 1 ?

6 Random Numbers (2 points)

• What is the function which generates a random number between 0 and 1? rand
• What is the function which generates random integers? randi

7 Rounding Functions (3 points)

What are the results of the following statements?
8 Colon Notation (10 points)

Write down the arrays generated by the following statements.

1:pi % [1 2 3]
-2:2:2 % [-2 0 2]
0.1:0.2:0.8 % [0.1 0.3 0.5 0.7]
'K':'Q' % 'KLMNOPQ'
'f':-2:'a' % 'fdb'

9 Branching (5 points)

x = 1/sqrt(2); y = 1/sqrt(3); % coordinates of a point
if x^2 + y^2 > 1
   disp('Outside the unit circle');
else
   disp('Inside the unit circle');
end

• Fill in the condition for the if/else statement, so that the displayed message would be correct. Unit circle is centered at origin with radius 1.

• What will be displayed on the screen? Inside the unit circle

10 While Loop (10 points)

a = 4; b = 10; c = 3;
while a > 3
   a = a + c;
   b = b - c;
   c = - c - 1;
end

What are the final values for

a: 3     b: 11     c: 3
11 Array Indexing  (10 points)

Given \( A = [2, 3, 5, 7, 11] \); \( B = [1, 1, 2, 3, 5] \); \( C = [0, 1, 1, 0, 1] \), write down the results of the following statements.

\[
\begin{align*}
A\text{(end)} & \quad \% \quad 11 \\
A(3)/B(2) & \quad \% \quad 5 \\
A(5) + B(3) \ast C(4) & \quad \% \quad 11 \\
A + B - C & \quad \% \quad [3 \ 3 \ 6 \ 10 \ 15] \\
A \ast C & \quad \% \quad [0 \ 3 \ 5 \ 0 \ 11] \\
C./B & \quad \% \quad [0 \ 1 \ 0.5 \ 0 \ 0.2] \\
\text{sum}(B(2:end-1)) & \quad \% \quad 6 \\
C([1 \ 3 \ 5]) & \quad \% \quad [0 \ 1 \ 1] \\
A(1:2:5) + B(5:-2:1) & \quad \% \quad [7 \ 7 \ 12] \\
C(B(3:end)).\ast A(B(1:3)) & \quad \% \quad [2 \ 2 \ 3]
\end{align*}
\]

12 For Loop  (10 points)

\[
\begin{align*}
p = 1; \quad q = p; \quad s = 2.7; \\
\text{for } j = 3:2:6 \\
p = j*p; \\
q = q^2-p; \\
s = s + j; \\
\end{align*}
\]

What are the final values for

\[
p: \ 15 \quad \quad q: \ -11 \quad \quad s: \ 10.7
\]
13 Matrices (10 points)

Given the matrix $A$,

\[ A = \begin{bmatrix} 2 & 5 & 4 & 3 \\ 7 & 1 & 0 & 2 \\ 6 & 4 & 9 & 8 \end{bmatrix}; \]

\[ [r \ c] = \text{size}(A); \ s = 0; \]
\[ \text{if } r>c, \ \text{m} = c, \ \text{else } m = r, \ \text{end}; \]
\[ \text{for } j = 1:m, \]
\[ \hspace{1cm} s = s + A(j,j); \]
\[ \text{end} \]

What is the final for the variables?

$r$: 3  $c$: 4  $m$: 3  $j$: 3  $s$: 12

14 Bonus

14.1 if/elseif/else (10 points)

The three interior angles of any triangle add up to 180°. Complete the program fragment below to print scalene, isosceles, or equilateral given three angles.

\%
Assume a, b, and c are positive integers that sum to 180
if (a ~= b && a ~= c && b ~= c)
    disp('Scalene triangle')
elseif (a == b && a == c && b == c)
    disp('Equilateral triangle')
else
    disp('Isosceles triangle')
end

14.2 Rectangle (10 points)

Write a function called rectangle which computes the area and perimeter of rectangle using the two side lengths $a, b$.

function [A, P] = rectangle(a, b)

\[ A = a*b; \]
\[ P = 2*(a+b); \]

end
14.3 **Nested Loop** (10 points)

\[
p = 1; q = p; s = 2012; 
\text{for } j = -3:5 
\quad s = q + j; 
\quad \text{for } k = j:2:1 
\quad \quad p = p * k * j; 
\quad \text{end} 
\text{end} 
\]

What are the final values for

\[
p: 0 \quad q: 1 \quad s: 6
\]

14.4 **Switch/Case** (10 points)

\[
N = 10000; p = 0; n = 0; 
\text{for } j = 1:N 
\quad d = \text{fix(10*rand)}; 
\quad \text{switch } d 
\quad \quad \text{case } \{2,3,5,7\} 
\quad \quad \quad p = p + 1; 
\quad \quad \text{otherwise} 
\quad \quad \quad n = n + 1; 
\quad \text{end} 
\text{end} 
\text{fprintf('\%f \%f \n',p/N,n/N);}
\]

When we run the script above, two decimal numbers will be displayed on the screen, what will they be?

\[
p/N: 0.4 \quad (\text{approximately}) \quad n/N: 0.6 \quad (\text{approximately})
\]

14.5 **Mixed** (10 points)

\[
\text{strcmp('CS 1109','cs 1109')} \quad % \ 0 
\text{find([0 1 2 3 4 5 6] == 3)} \quad % \ 4 
\text{primes(20)} \quad % \ [2 \ 3 \ 5 \ 7 \ 11 \ 13 \ 17 \ 19] 
\text{assert(exp(1) < pi)} \quad % \ \text{nothing happens} 
\text{upper('Hello World')} \quad % \ 'HELLO WORLD'
\]