Name: _____

CS 141: Introduction to (Java) Programming: Exam 1

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1.	(max 18)	4.	(max 16)
2.	(max 12)	5.	(max 12)
3.	(max 24)	6.	(max 18)
Total:			(max 100)

1. (3 pts each, 18 pts total) What is the value of the variable **answer** after each of the following statements given the declarations below.

   These are tricky - pay special attention to variable types!

```
double answer = 10;
double x = 4;
double y = 3;
int n = 2;
int m = 7;
```

   a. answer += 2.5; answer = 10+2.5 = 12.5

   b. answer = n % m; answer = 2 % 7 = 2

   c. answer = m % n; answer = 7 % 2 = 1

   d. answer = 4*n/m; answer = 4*2/7 = 8/7 = 1

   e. answer = 1 + y/x; answer = 1 + 3.0/4.0 = 1.75

   f. answer = n/x; answer = 2 /4.0 = .5

2. (1 pt each, 12 pts total) For each definition, identify the index (e.g. A, B, …) of the vocabulary word it describes. Please write clearly so your answer is unambiguous.

Definitions:

i.	S) Variable	A named location in memory for holding data.
ii.	Q) String	A sequence of characters.
iii.	K) Magic Number	A number that appears in code without explanation.
iv.	O) API	The place a programmer can look at to read about a class's methods.
v.	M) Primitive Type	A variable type which contains a only single value, e.g. int, double or char as opposed to String or Scanner
vi.	J) Concatenation	Combining strings to form a new string.
vii.	T) Lexicographic	The way Java compares and orders strings. (Note, I gave credit for P as well although it isn't specific to strings)
viii.	H) Cast	Explicitly converting a value from one type to a different type.
ix.	I) Character	A single letter, digit or symbol (e.g. ascii code).
x.	G) Sentinel	An input value that is used to signal the end of input.
xi.	F) Runtime Error	An error in a syntactically correct program that causes it to act differently from specification.
xii.	L) Initialization	Setting the value of a variable for the first time, before it is used.

Vocabulary Word

A. Assignment
B. Expression
C. Boolean value
D. Relational operator
E. Compile time error
F. Run-time error
G. Sentinel
H. Cast
I. Character
J. Concatenation
K. Magic Number
L. Initialization
M. Primitive type
N. Class type
O. Application programming interface (API) documentation (Javadoc)
P. Boolean operator
Q. A String
R. Type
S. Variable
T. Lexicographic

3. (4 pts each, 24 pts) Given the declarations:

```
int x;
int y;
char c;
String answer;
String word1;
String word2;
```

Write a Boolean expression for the following:

a. The answer begins with the letter Z

`answer.charAt(0) == 'Z'` alternatively: `answer.substring(0,1).equals("Z")`

b. The mathematical expression 20 < x < 100

```
20 < x && x < 100
```

c. The character c is the letter E or e

c == 'E' || c == 'e'

d. word1 does not equal word2

```
! word1.equals(word2)
```

e. It is not true that x and y are both less than 10

`!(x<10 && y<10)` same as `!(x<10)||!(y<10)` same as `x>=10 || y >=10`

f. y is either less than 100 or more than 200.

```
y < 100 || y > 100
```

4. (4 pts each, 16 pts total) What is the output of the following loops?
Briefly explain your answers (otherwise, no partial credit can be given if your answer is not quite right!)

Loop 1:

```
int cnt = 0;
for (int j = 10; j < 15; j++) {
     cnt++;
}
System.out.println("cnt = " + cnt);
```

Loop 1 Output: j executes 15-10 = 5 times, i.e. for values j = 10, 11, 12, 13, 15

```
cnt = 5
```

Loop 2:

```
int cnt = 0;
for (int j = 5; j < 15; j++) {
     for (int i = 0; i < 10; i++) {
          cnt++;
     }
}
System.out.println("cnt = " + cnt);
```

Loop 2 Output: inner loop loops 10 times, outer loop loops 10 times, so cnt is incremented 100 times

```
cnt = 100
```

Loop 3:

```
int cnt = 0;
for (int j = 0; j < 4; j++) {
     for (int i = 0; i < j; i++) {
          cnt++;
     }
}
System.out.println("cnt = " + cnt);
```

Loop 3 Output: Values of i and j are

j = 0: i = no loop
j = 1: i = 0
j = 2: i = 0, 1
j = 3: i = 0, 1, 2

thus we have

```
cnt = 6
```

Loop 4:

```
int cnt = 0;
for (int j = 0; j < 4; j++) {
    for (int i = 0; i < 5; i++) {
        for (int k = 0; k < 10; k++) {
            cnt++;
        }
    }
}System.out.println("cnt = " + cnt);
```

Loop 4 Output: j loop: 4 times, i loop: 5 times, k loop: 10 times

So that `cnt` is incremented 4x5x10 = 200 times

```
cnt = 200
```

5. (12 pts) Write a ***while-loop*** which sums the integers from a to b (inclusive) and prints the result once at the very end.

```
import java.util.Scanner;
public class LoopPractice {
    public static void main(String[] args) {
          Scanner in = new Scanner(System.in);
          System.out.print("Enter 2 integers: ");
          int a = in.nextInt();
          int b = in.nextInt();

          int sum = 0;
          while (a <= b) {
            sum = sum + a;
            a++;
          }
          System.out.println("sum = " + sum);
   }
}
```

Could also have done (this is better if you later on need the value of a):

```
          int sum = 0;
          int i = a;
          while( i <= b ) {
            sum = sum + i;
            i++;
          }
          System.out.println("sum = " + sum);
```

6. (18 pts total) Multiple Choice - Circle the correct answer. (Please be clear! Ambiguous or hard to read answers will be counted as incorrect.)

A. (1 pt) Which one of the following errors represents a part of a program that is incorrect according to the rules of the programming language?

a) **Syntax errors** c) Logic errors

b) Run-time errors d) Out-of-memory errors

B. (1 pt) Which one of the following types of statements is an instruction to replace the existing value of a variable with another value?

a) Update c) **Assignment**

b) Declaration d) Initialization

Note: Will give credit for a) as well, although c) is a better answer.

C. (1 pt) What is wrong with the following code snippet?

```
public class Area
{
   public static void main(String[] args)
   {
      int width = 10;
      height = 20.00;
      System.out.println("area = " + (width * height));
   }
}
```

a) The code snippet uses an uninitialized variable.
b) **The code snippet uses an undeclared variable**.
c) The code snippet attempts to assign a decimal value to an integer variable.
d) The code snippet attempts to add a number to a string variable.

D. (2 pts) What is the output of the following code snippet?

```
public static void main(String[] args){
{
   String str1 = "I LOVE Willamette";
   String str2 = str1.substring(4, 9);
   System.out.println(str2);
}
```

a) `I LOV`
b) `OVE W`
c) `VE Wil`
d) **`VE Wi`**

E. (1 pt) What will be the output when the following code is executed

```
double x = 2.5;
double y = 0.0;
if ( y != 0  &&  x/y != 1.0) {
    System.out.println(“x/y is not equal to 1”);
}
else { System.out.println(“x/y is equal to 1”);}
```

a) `x/y is not equal to 1`
b) **x/y is equal to 1**
c) There will be no output.
d) The program will crash.

F. (1 pt) What kind of operator is the <= operator?

a) Boolean
c) Inequality
b) Arithmetic
d) Relational

G. (1 pt) Which of the following options refers to the technique of simulating program execution on a sheet of paper?

a) Compiling
c) **Tracing**
b) Prototyping
d) Debugging

H. (1 pt) Which of the following loops executes the statements inside the loop before checking the condition?

a) for
c) **do-while**
b) while
d) do-for

I. (2 pts) Assuming that a user enters 25 as the value for x, what is the output of the following code snippet?

```
Scanner in = new Scanner(System.in);
System.out.print("Enter a number: ");
int x = in.nextInt();
if (x < 100) {
   x = x + 5;
}
if (x < 500) {
   x = x - 2;
}
if (x > 10)  {
   x++;
}
else {
   x--;
}
System.out.println(x);
```

a) 27
c) **29**
b) 28
d) 30

J. (1 pt) Which of the following loop(s) could possibly not enter the loop body at all?
I. for loop
II. while loop
III. do-while loop

a) I only
c) II and III only
b) **I and II only**
d) I and III only

K. (1 pt) A loop inside another loop is called:

a) A sentinel loop
b) **A nested loop**
c) A parallel loop
d) A do/while loop

L. (2 pts) What is the output of the following loop?

```
for (int i = 20; i >= 2; i = i - 6)  {
   System.out.print(i + ", ");
}
```

a) 20, 14, 8,
b) 14, 8,
c) **20, 14, 8, 2,**
d) 14, 8, 2,

M. (2 pts) What is the first and last value of `i` to be printed by the following code snippet?

```
int n = 20;
for (int i = 0; i <= n; i++)
{
   for (int j = 0; j <= i; j++)
   {
      System.out.println("" + i);
   }
}
```

a) **0 and 20**
b) 1 and 20
c) 1 and 19
d) 0 and 19
e) None of the above

N. (1 pt) What will be the output of the following code snippet?

```
boolean token = false;
while (token)
{
   System.out.println("Hello");
}
```

a) "Hello" will be displayed infinite times.
b) No output because of compilation error.
c) **No output after successful compilation**.
d) "Hello" will be displayed only once.

O. (2 pts) What is the output of the following code:

```
int x = 7;
int y = 9;
int z = 5;

x = y;
y = z;
z = x;
System.out.println(x + " " + y + " " + z);
```

a) **9 5 9**
b) 9 5 7
c) 7 9 5
d) 7 7 7