Pseudocode – 40 points

Problem 1: Solve a Problem Using Pseudocode (20 points)

Given two integers, print them in ascending order if they are both positive.

a) (**6 points**) Identify input, output and error condition.

b) (**8 points**) Write Pseudocode to solve the problem.

c) **(6 points)** Design test cases which can make sure each statement is executed.

Problem 2: Pseudocode WHILE Count Operations (10 points)

Consider the following algorithm written in pseudocode, then answer the questions below.

```
READ y
SET i TO 2001
WHILE i < y
    IF i%400 IS 0 THEN
          DISPLAY i is leap year
    ELSE
          IF i%4 IS 0 AND i%100 IS NOT 0 THEN
               DISPLAY i is leap year
          ELSE
               DISPLAY i is not leap year
          ENDIF
    ENDIF
    ADD 1 TO i
ENDWHILE
```

a) (**6 points**) How many times the loop control condition `i < y` is evaluated for any y that is larger than 2001? Your answer should be a function of y. Given the reasoning.

b) (**4 points**) What is the total operations of `DISPLAY` for any y that is larger than 2001? Your answer should be a function of y. Given the reasoning.

Problem 3: Pseudocode IF operations (10 points)

Consider the following algorithm, which is used by Jane to determine whether she will accept a job offer or not.

```
READ salary
READ commuteTime
READ freeCoffee
IF salary < 60000 THEN
    DISPLAY decline offer
ELSE
    IF commuteTime < 60 THEN
          IF freeCoffee IS true THEN
               DISPLAY accept offer
          ELSE
               DISPLAY decline offer
          ENDIF
    ELSE
          DISPLAY decline offer
    ENDIF
ENDIF
```

Answer the following questions based on Jane's algorithm:

a) (**5 points**) What is the maximum number of operations executed in the program?
b) (**5 points**) What is the minimum number of operations executed in the program?

Basic Java – 50 points

Problem 1 (12 points)

1.a (3 points) Suppose x and y are two integer variables. What does the following code do?

```
x = y;

y = x;
```

A. Swaps the values of x and y
B. Make both values equal to the original value of x
C. Make both values equal to the original value of y
D. This code is syntactically incorrect

1.b (3 points) Suppose x and y are two integer variables. What does the following code do?

```
int t = x;
y = t;
x = y;
```

A. Swaps the values of x and y
B. Make both values equal to the original value of x
C. Make both values equal to the original value of y
D. This code is syntactically incorrect

1.c (3 points) What is the value of the following Boolean expression

```
(!(a <= b) && !(a >= b))
```

1.d (3 points) What is the output of the following code?

```
String a, b;

int c = 10;

a = "Hello,";

b = "Bob";

a = a + b + c;

System.out.println(a);
```

Problem 2 (18 points)

(a) (10 pts) Write a simple Java program to compute the Body Mass Index (BMI) given weight (in lbs) and height (in inches). The formula for computing BMI is given by (weight in lbs)/(height in inches)^2 * 703. You can consider weight to be whole number and height to be a decimal number. Complete the missing code below:

(b) (8 pts) Suppose that the program is saved in a file called BMI.java. Write two lines to instructions to compile and run the code with height = 68.5 and weight = 162.

a. Compile: _____

b. Run: _____

Problem 3: Data Types (20 points) - Evaluate each Java expression and write the resulting type and literal value in the provided Type and Value column respectively. If the expression cannot be compiled, write "illegal" under the type and place an "x" in value.

	Java Expression	Type	Value
a)	(25 / 6)	Write Answers in Answer sheet	Use Answer Sheet
b)	(9 / 2) * 1.0	Write Answers in Answer sheet	Use Answer Sheet
c)	"3" * 2	Write Answers in Answer sheet	Use Answer Sheet
d)	4 + 4 + "5"	Write Answers in Answer sheet	Use Answer Sheet
e)	true == false	Write Answers in Answer sheet	Use Answer Sheet
f)	Integer.parseInt("2")	Write Answers in Answer sheet	Use Answer Sheet
g)	Math.pow (2, 2)	Write Answers in Answer sheet	Use Answer Sheet
h)	(5 <= 3) || (3 < 2)	Write Answers in Answer sheet	Use Answer Sheet
i)	(3 < 4) && (3 > 2)	Write Answers in Answer sheet	Use Answer Sheet
j)	(3 < 5) && ((3 < 9) || (2 > 3))	Write Answers in Answer sheet	Use Answer Sheet

Conditionals & Loops – 60 points

1. **(5 points)** Consider the following code segment.

```
int count = 0;
for(int i = 0; i < 5; i++){
  for (int k = 0; k < 3; k++){
    if (k < i){
        count++;
    }
}
```

What is the value of the variable **count** after executing the code segment?

2. **(5 points)** Consider the following code segment.

```
For(int i = 1; i <=6; i++){
   for (int k = i; k <= 6; k++){
       if (k % 2 == 0){
          System.out.print(k + " ");
       }
   }
   System.out.println();
}
```

What will be printed as a result of executing the code segment?

a) 2 4 6 4 6 6	b) 2 4 6 2 4 6 2 4 6	c) 2 4 6 2 4 6 4 6 4 6 6 6	d) 2 4 6 2 4 6 2 4 6 2 4 6 2 4 6 2 4 6

3. **(5 points)** Consider the flowing code segment that is intended to determine the smaller of two values entered by the user on the command line. The code contains errors in several of the lines of code below. List the line numbers of FIVE lines that contain errors and indicate how the error(s) on that line would be fixed.

```
1.  int a = args[0];
2.  int b = args[1];
3.  smaller == a;

4.  if ( a < b) {
5.       smaller = a;
6.  } else  (a >= b){
7.      smaller = b;
8.  }
9.  if {smaller = a}{
10.     System.out.println(a  " is smaller");
11. }
12. else{
13.     System.out.println(b  + " is smaller");
14. }
```

4. **(15 points)** You are to write a java code segment that will accept an unknown number of integers from the command line and print to the terminal **only** those numbers input that are **strictly between** the first two values entered. You can assume that at least 3 numbers are entered by the user.
(Hint : Use args.length to determine how many integers were entered)

EXAMPLES

Numbers entered	**Numbers printed**
3 1 8 7 6 2 90 2 7	2 2
3 3 1 4 7	*Nothing is printed.*
1 8 3 7 1 6 8 10	3 7 6

```
public class BETWEEN2{

    public static void main(String[] args){

        //your code would go here

    }

}
```

5. (15 Points)

You and your friends went to a Rutgers football game. Your group came out with different opinions about how well the game went so you decided to collect the rating each group member assigned to the game. Ratings range from 1 to 5 (best game ever). Since you are taking CS111 you decided to write a program to find the ratings average.

The following program averages the ratings of your group. Rewrite the program to discard ratings that fall out of the range 1 to 5.

If the group has 4 members and the ratings are 3, 2, 1, 4 the program displays 2.5

If the group has 6 members and the ratings are 3, 1, 8, 1, 3, 2 the program displays 2.5 (it discards the rating 8)

(Remember: args.length is the number of values given at the command line)

```
public class RutgersGame {
    public static void main (String[] args) {
        int nbrFriends = args.length;
        int sum = 0;
        int i = 0;

        while ( i < nbrFriends ) {
            int rating = Integer.parseInt(args[i]);
            sum = sum + rating;
            i = i + 1;
        }
        double avg = (sum * 1.0) / nbrFriends;
        System.out.println("The game's ratings average is " + avg);
    }
}
```

6. (15 Points)

Rewrite the while loop from problem 5 into a for loop. Fill in the for loop below:

for (; ;)

Scratch Space