Show all of your work clearly in the space provided or on the additional page at the end of the exam. **read each problem carefully**. Note that the exam is double sided.

1. (10 points)
(a) Precisely explain what the following line of Java code does. Draw a picture that shows what happens in memory as a result of this line of code.

```java
double x = 3.14;
```

(b) Precisely explain what the following line of Java code does. Draw a picture that shows what happens in memory as a result of this line of code.

```java
Scanner in = new Scanner(System.in);
```

2. (10 points) What will be displayed if the following line is run:

```java
System.out.println( 3 + 17 / 2 + 1.5 );
```

3. (10 points) What translates Java source code into Bytecode?

4. The following code segment is supposed to print the sum of the numbers 1 through 3 and the product of the numbers 1 through 3. The code currently contains at least one error.

```
1    int count = 1;
2    int sum = 0;
3    int product = 0;
4    while(count <3) {
5       count++;
6       sum += count;
7       product *= count;
8    }
9    if(count==3) {
10      System.out.println("Sum = " + sum);
11      System.out.println("Product = " + product);
12   }
```

(a) (15 points) Trace the program (as written) using the long form tracing technique.

line#	count	sum	product	output

(b) (5 points) Suggest how the program could be fixed so that it would operate as intended.

5. (10 points) Given

`String text = "Why␣do␣fools␣fall␣in␣love?␣␣To␣reproduce␣and␣outnumber␣us.";`

Determine the result of each of the following expressions:

(a) text.substring(0, 4);

(b) text.length();

6. (20 points) Complete the following program that asks the user to enter an integer and displays the sum of the squares of the values between 1 and the number entered by the user. In addition, the program should indicate whether or not the sum of the squares is evenly divisible by the integer the user entered. **You may not use a while loop in your code.**

    Here is an example run of the program when the user enters 4 is shown below:

```
Please enter an integer: 4

The sum of the squares between 1 and 4 is 30.
30 is not evenly divisible by 4.
```

```java
import java.util.Scanner;

public class Exam {

  public static void main(String[] args) {
    System.out.println("Please enter three integer values");
```

7. (20 points) Complete the following program that asks the user to enter a number that displays a pop-up dialog that says "Don't be negative" if the number entered was less than zero. Otherwise (number entered is not less than zero or the user hit "Cancel") the program should do nothing. You do not need to handle the error if the user does not enter a valid number like -17.3 or 738281.112.

```java
public class Exam {
  public static void main(String[] args)
  {
    String answer = JOptionPane.showInputDialog("Please enter a number, e.g., 8.5");
```

```java
  }
}
```

Additional space — indentify which problem your work is associated with.