Midterm 1

CS 1323, Fall 2016, Sections 1 and 10

Name (printed legibly): _____

Student number: _____

Integrity Pledge

On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Signed: _____

Do not write on the back of pages.

Answer all programming questions in Java.

Unless otherwise indicated, each part of a problem is worth the same number of points.

Show your work to receive partial credit.

Pay careful attention to whether the question asks for a code fragment or a complete program. Do not write a whole program when you are asked for only a few lines of code.

Also pay attention to whether you need to get input from a user or not. When you do not need to get input, the problem will say something like "you may assume that the variables' value was set somewhere else".

Pay careful attention to distinctions like int versus double and String versus char.

Try to move through short problems quickly to leave you sufficient time to write programs and code fragments.

You will have fifty minutes to take the examination.

You do not need to use import statements or exceptions on any code.

You may abbreviate System.out.println as S.o.p., and may abbreviate prompts.

1) (10 points; 2 points each)

What type of data (int, double, String, char, or boolean) would you use to store each of the following things? Do not assume that each type is used exactly once.

a) The number of downloads your favorite song has this month.

int

b) Whether or not you downloaded your favorite song in the last month.

boolean

c) The length of time (measure in hours) that your favorite song plays.

double

d) The name of your favorite singer/musical group.

String

e) The average rating (on a scale of 1 to 5 stars) that your favorite song has on Pandora (an online music service).

double

2) (10 points; 2 points each) Give the value computed for each expression below. Pay careful attention to type, especially char versus String and int versus double. If the expression is not legal, say so.

a) 99 % 10

9

b) 99 / 10.0

9.9

c) 99 / 10

9

d) “99” + “10”

“9910”

e) 99 >= 10

true

3) (20 points; 4 points each part) Find the value assigned to number by each statement below. Show all intermediate steps to get partial credit. Each part is independent, with the values for any variables starting with the ones given below (do not use the results of a) in b), for example). If the expression is not legal in Java, say so.

Be sure to distinguish double and int values by **giving double values a decimal point**, even if it is a zero.

```
int  horses = 9;
int cows =  32;
double  gallons = 4.2;
```

a) int number = cows + horses * 3;
   = 32 + 9 * 3
   = 32 + 27
   = 59

b) int number = cows / horses * 3;
   = 32 / 9 * 3
   = 3 * 3
   = 9

c) int number = cows + (double) horses;
   = 32 + (double) 9
   = 32 + 9.0
   = 41.0
   41.0 cannot be stored in the int number—the expression is illegal

d) double number = gallons + cows / 7;
   = 4.2 + 32 / 7
   = 4.2 + 4
   = 4.2 + 4.0
   = 8.2

e) double numbers = (double) cows / 5;
   = (double) 32 / 5
   = 32.0 / 5
   = 32.0 / 5.0
   = 6.4

4) (15 points) The post office charges different amounts for packages depending on the weight and size of your package. There are three sizes of standard boxes that you can use with fixed shipping costs that do not depend on weight.
    - 6 x 6 x 6 costs $8.99
    - 10 x 10 x 10 costs $10.99
    - 16 x 16 x 16 costs $15.99

Write a code fragment that calculates the shipping price for an object based on measurements alone. All three dimensions must fit within the standard shipping boxes above.

Example: A box that is 2 x 4 x 12 would require a 16 x 16 x 16 box and cost $15.99. A box that is 18 x 10 x 24 cannot be shipped this way.

```
int width;      // value given elsewhere
int height;     // value given elsewhere
int depth;      // value given elsewhere
int price;      // this should contain the cost of the shipping or a negative value if the object
                //cannot be shipped this way.


int biggestSide = Math.max(width, height);
biggestSide = Math.max(biggestSide, depth);

if (biggestSide <= 6)
        price  = 8.99;
else if (biggestSide <= 10)
        price = 10.99;
else if (biggestSide <= 16)
        price = 15.99;
else
        price = -1;
```

5) (15 points; 5 points each part) ***Trace the code fragments*** below in the tables at the right. If there is an infinite loop, trace three iterations and write "infinite loop" in the table. **Remember to include the initial values in the table.**

a)

```
int time = 14;
double multiplier = 1.0;
if (time > 9)
{
    multiplier = 2.0;
}
else if (time > 12)
{
    multiplier = 2.5;
}
else if (time < 4)
{
    multiplier = .75;
}
```

multiplier
1.0
2.0

b)

```
int q = 0;
int f = 7;
int n = 32;
while (n > 0)
{
    n = n – f;
    q = q + 1;
}
```

q	n
0	32
1	25
2	18
3	11
4	4
5	-3

c)

result	count
29	-1

```
int result = 29;
int count = -1;
while (count > 0)
{
      result = result – 5;
      count = count + 1;
}
```

6) (30 points) Write ***a complete program*** that helps a customer of Hearable, an online store that sells audio recordings of books. Hearable works by having users pay for a monthly subscription. The monthly subscription purchases credits and gives the customer a 30% discount on future purchases. One credit purchases one recording. Users can also purchase additional credits for $14.99 each. However, sometimes additional credits cost more than the recordings.

A sample run of the program is shown below:

```
How many additional books do you want to purchase?
3
Enter the price of the next book
40.00
Enter the price of the next book
30.00
Enter the price of the next book
20.00
Purchase 2 extra credit(s).
Total price will be: $43.98
```

Here is an explanation of what the program is doing:
The $40.00 book will cost $28 after the 30% discount. So it will be cheaper for the customer to purchase a credit.
The $30.00 book will cost $21 after the 30% discount. It will still be cheaper for the customer to purchase a credit.
The $20.00 book will cost $14 after the 30% discount. It is cheaper to directly purchase this book than it is to buy another credit.
The total cost to the user is 14.99 for the first credit, 14.99 for the second credit, and 14 for the third book. The total cost is 40.98.

You must use constants in appropriate places and comments to explain your code.

Please start code on the next page

```java
import java.util.Scanner;

public class Hearable
{

	public static void main(String[] args)
	{
		Scanner input = new Scanner(System.in);
		final double DISCOUNT = 0.30;
		final double HEARABLE_CREDIT = 14.99;

		System.out.println("How many additional books do you want to
purchase?");
		int moreBooks = input.nextInt();
		input.nextLine(); // remove the newline at the end of input

		int count = 0;
		int extraCredits = 0;
		double payMe = 0.0;

		while (count < moreBooks)
		{
			System.out.println("Enter the price of the next book");
			double price = input.nextDouble();
			input.nextLine(); // remove the newline character

			price = price * (1.0 - DISCOUNT); // 30% discount

			// Find out if the price for a credit is less
			// than the discounted price
			if (price < HEARABLE_CREDIT) // cheaper to purchase book
			{
				payMe += price;
			}
			else // cheaper to purchase the credit
			{
				extraCredits = extraCredits + 1;
			}

			++count;
		}

		System.out.println("Purchase " + extraCredits
			+ " extra credit(s).");
		System.out.println("Total price will be: $"
			+ (payMe + (HEARABLE_CREDIT * extraCredits)));

	}

}
```