CS 180 Problem Solving and OO Programming

Spring 2019

Practice Problem Set-1

Weeks 1, 2, and 3 (January 4-25, 2019)

Topics covered: Preliminaries, simple programs, selection

Practice Session 1: Sunday January 27, 2019

All problems are to be first attempted by the students and then the instructor can provide any necessary explanation regarding how to solve each problem.

Problem 1:

(a) Convert the following integers to binary: 7, 12, and 19.

(b) Find the decimal equivalents of the following unsigned binary numbers: 1101; 011001, 1111.

(c) Represent binary equivalents of the numbers in (a) assuming 6-bit representation of integers with the leftmost bit being the sign bit (0 for positive integers and 1 for negative integers).

(d) Take the two's complement of each binary number in (c). What are the decimal equivalents of the resulting binary numbers?

(e) Convert the following decimal numbers to binary assuming that only 5-bits are available to represent a real number: 0.75 and 0.3.

(f) Find the decimal equivalents of the binary fractions you derived in (e).

(g) Find the binary equivalents of decimal numbers 7 and 3 and then, assuming 5-bit signed representation, add the binary equivalents. Convert the binary sum to decimal. Do the same for 7 and 8 and convert the result to decimal. Do you observe anything different in this case?

Problem 2:

Write a Java program that performs the following tasks.

1. Inputs two integers, denoted by x and y, from the keyboard;
2. computes and prints the sum and product of x and y; and
3. computes and prints the quotient and remainder obtained when x is divided by y.

Use the Scanner class to read data from the keyboard.

Problem 3:

Compute the value of each expression in the table below. Assume the declarations given below. Indicate the type of the result. Also indicate if an expression is invalid.

int a=7, b=3, c=-5, d=2; **double** x=5.0, y=3, z=4.78, r=4.4;
String p="Hello", q="Hello";

Expression	Value	Type of the result
a/b		
a%b		
a+b*c		
a<<2		
b>>2		
c>>2		
c<<2		
~a		
x/y		
x/b		
p.charAt(2);		
p==q		
a>b && b>c		
a<b|| b>c		
y+2==x		
Math.pow(a, d)		
Math.round(z)		
Math.round(r)		
Math.random()		
Math.sin(Math.PI)		

Problem 4:

(a) What value is printed by the println() statement in the following?

```
int x=3;
x=x+3;
System.out.println(x);
```

(b) What is printed by the format() statement in the following?

```
double x=4.5674,  y=7.891;
System.out.format("%.3f    %4.0f%n", x, y);
```

(c) What is the range of z generated by the following statements? Indicate clearly which values are included in the range and which are not.

```
double y=Math.random();
int z=(int)Math.round(3*y+7); // Why is (int) needed here?
```

(d) What is the range of **x** generated by the following statements?

```
Random r=new Random();
int x=r.nextInt(30);
```

Problem 5:
Write a Java program that simulates a simple checkout counter at a grocery store. The counter **knows** the current price of one item, say tomatoes, per pound. The checkout counter can perform only one transaction. Write your program that does the following.

1. Prompt and input from the keyboard the price per pound and the net weight in pounds of the tomatoes purchased; compute and display the **total price** to be paid by a customer.
2. Input from the keyboard amount paid by the customer; generate the amount of **change** to be returned to the customer.
3. Print a **receipt** as follows.

Tomatoes purchased	3.45 pounds
Unit price	$1.99 per pound
Net price	$6.87
Tax (7%)	$0.48
Total price	$7.35
Cash tendered	$10
Change	$3.13

If the amount paid by the user is less than the price of the item then display an error message and exit.

Suggested steps to solve the problem:

1. Read the problem statement and understand what is required of the program. Resolve any ambiguities.
2. Design your program: What would you name the class?
3. What are the inputs and outputs?

4. What should be the sequence of actions in the main() method?
5. Code your design by writing the class designed and then compile and test.

Problem 6:

Write a Java program that performs the following tasks.

1. Reads two numbers, say x and y, from the keyboard.
2. Reads a third integer, say z, from the keyboard.
3. If z=1 then output x+y
4. If z=2 then output x*y
5. If z=3 then output x/y but only if y is 0, else output an error message
6. If z=4 or greater, or is 0 or less then output “Thank you.”

First solve the above problem using only the **if-statement**. Next solve the problem using the **switch** statement.

Problem 7:

Write a Java program that inputs a **string ss** and two **integers x** and **y**. It finds out if the characters at positions **x** and **y** in string **ss** are the same or not. It prints “Yes, characters are same” or “No, characters are not same.” Make sure that **x** and **y** fall within the string.
