

Written Test 1

CSE 1020 3.0

Section M, Winter 2010

Family Name: _____

Given Name(s): _____

Student Number: |__| |__| |__| |__| |__| |__| |__| |__| |

Guidelines and Instructions:

1. This is a 50-minute test. You can use the textbook, but no electronic aids such as calculators, cellphones etc.
2. Answer questions in the space provided. If you need more space, use the back of the page. Clearly indicate that your answer continues on the back of the page.
3. Write legibly. Unreadable answers will not be marked.
4. Leave your ID on the desk. A sign-up sheet will be distributed during the test. By signing it, you acknowledge that you are registered in the course and you are the owner of the associated ID.
5. Keep your eyes on your own work. At the discretion of the invigilators, students may be asked to move.

Question	Out of	Mark
Q1	20	
Q2	20	
Q3	20	
Q4	40	
Total	100	
Letter grade		

1. [20 marks] The contract for method

```
public static double sqrt(double a)
```

in class `Math` indicates that its precondition is true and that its postcondition is:

The return value is the positive square root of `a`. If the argument is NaN or less than zero, the result is NaN (NaN stands for Not a Number).

Describe an alternative contract for this method, and briefly explain the tradeoffs for the client and the supplier of `Math.sqrt`.

A number of different answers are possible, but the typical situation would be to change the precondition so that it disallows NaN or negative numbers as input. The postcondition is that the return value is the positive square root of `a`.

This new contract puts the onus on the client to select appropriate inputs and makes the work of the supplier easier since they do not have to worry about the case where the input is negative or NaN.

Marking scheme: 10 marks for the description of the alternative contract, 10 marks for the explanation of the tradeoff of the new contract.

2. [20 marks] The regular expression below attempts to match **valid dates** for the year **2010 only** using only one of the following formats:

DD-MM-YYYY

DD/MM/YYYY

If the day or the month require a single digit, then a leading zero must be present, e.g. the first day of the year should be either 01-01-2010 or 01/01/2010.

[0-3] [0-9] [-/] [01] [0-9] [-/] 2010

Describe any problems that you can see with the above regular expression. You do not need to provide a fix for any of the problems.

Each one of the following problems is worth 4 points:

- (a) Day may be more than 31
- (b) Month may be more than 12
- (c) Either month or day may be 00
- (d) Months with less than 31 days are handled incorrectly, e.g. 31-02-2010 is accepted
- (e) Inconsistent separators are allowed, e.g. 01-01/2010

3. [20 marks] You are asked to perform testing on a method that takes two int parameters and returns a String. The method's precondition states that the two integers must be positive and less than 50. By doing black box testing, you have identified the following adequate test vector:

(1,3), (3,5), (10,49), (1,49), (49,1), (49,15)

Suppose you are asked to perform white box testing on the same method. Provide an example of something that you might see in the code of this method that would make you want to add more test cases to your test vector.

An internal boundary such as an if statement that tests whether, say, the first input is less than 25. Since the behaviour of the program will be different if the first input is less or more than 25, we should add some test cases such as

(24, 1), (25, 1), (24, 49), (25, 29).

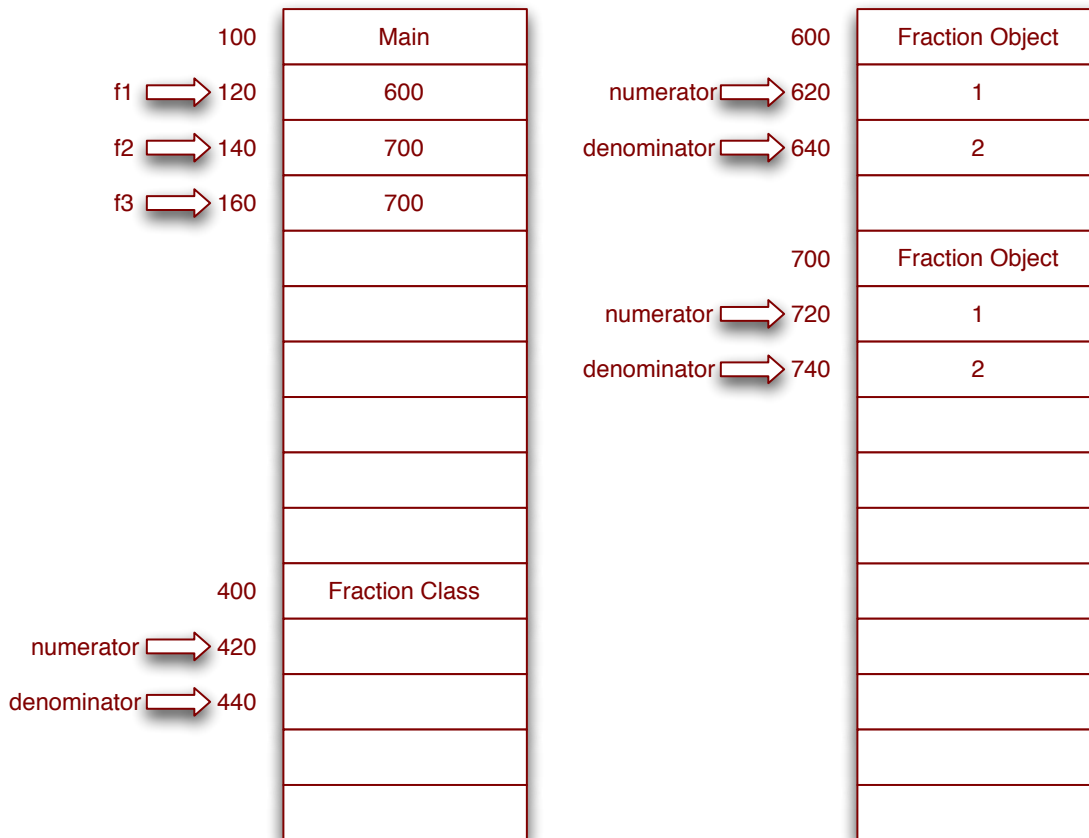
4. [40 marks] Consider the following app (only the body of the main method is shown) that compiles and runs without errors.

```

1 Fraction f1, f2, f3;
2 f1 = new Fraction(1,2);
3 f2 = new Fraction(2,4);
4 f3 = f2;
5 boolean testA = f1 == f2;
6 boolean testB = f2 == f3;
7 boolean testC = f1.equals(f2);
8 f3.add(f2);
9 boolean testD = f3.equals(new Fraction(1,1));
10 boolean testE = f2.equals(new Fraction(1,1));
11 f2 = f1;
12 f3 = f1;

```

(a) [10 marks] Draw a memory diagram to reflect the contents of memory following the completion of the first four lines of code.



(d) [10 marks] Draw a memory diagram to reflect the contents of memory following the completion of *all* the code *and* following the invocation of the garbage collector. You don't need to redraw fully the parts that are unchanged from the previous diagram, but indicate these unchanged parts clearly.

