

Here are some review questions for material covered up to the written midterm (Chapters 1–5 of the textbook). These questions do not cover everything; you should review the lecture notes and textbook. Note that at the back of each Chapter of the textbook are many questions and exercises.

Most of these questions can be answered by a careful reading and understanding of the notes and textbook, or by writing a small Java program. Solutions will be posted on Friday, October 23 for the following: 1(e), 2(d–f), 5(a), 5(d), 6.

1. This question tests your understanding of primitive and reference type variables.

- (a) What value is stored in memory by a variable of primitive type?
- (b) What value is stored in memory by a variable of reference type?
- (c) Suppose a CSE1020 program had a main method with only a single line of code:

```
int x = 17;
```

Draw the memory diagram for the program.

- (d) Suppose a CSE1020 program had a main method with only a single line of code:

```
Fraction f = new Fraction(1, 2);
```

Draw the memory diagram for the program.

- (e) Suppose a CSE1020 program had a main method with only four lines of code:

```
Fraction f = new Fraction(1, 2);
```

```
Fraction g = new Fraction(3, 4);
```

```
Fraction h = g;
```

```
Fraction.isQuoted = false;
```

Draw the memory diagram for the program.

2. This question tests your understanding of operators. Suppose you have the following variables:

```
int x = 10;
```

```
int y = 15;
```

```
int z = 0;
```

Show each step that Java takes to compute the following expressions:

- (a) $5 * x + y$
- (b) $y + ++x * z + y$
- (c) $x-- * (z - 8) \% 2$
- (d) $x < y \ \&\& \ z < y$
- (e) $x > y \ \&\& \ z < y$
- (f) $x < y \ || \ z < y$

3. This question tests your knowledge of conversions.

- (a) Explain what is meant by the term widening conversion (use 1 or 2 sentences, maybe give an example).
- (b) Explain what is meant by the term narrowing conversion (use 1 or 2 sentences, maybe give an example).
- (c) Label each of the following statements as legal or illegal in Java; if the statement is illegal then explain why.

i. `int x = 4L;`

ii. `long y = Math.max(1.0, 5.0);`

iii. `double z = (1 / 2) * (3f + 4L) * Math.PI;`

iv. `int a = (int) Math.sqrt(37.0) + 57.0;`

v. `long b = 25L + 33L % 32L - (int) 64f;`

4. This question tests your ability to read an API; you will need a computer with a web browser and Internet connection to answer this question.

Open the Java 6 API documentation in your web browser and access the `PrintStream` class documentation.

- (a) There is a method that ordinary clients cannot use; what is it?
- (b) How many constructors are there?
- (c) Which constructor is used in the following statement:

```
PrintStream s =  
    new PrintStream("Man these questions are hard");
```

- (d) There is a method named `write` that has 3 parameters.
 - i. What is its signature?
 - ii. What is its return type?
 - iii. Does it have any preconditions?
- (e) Why are there so many versions of `println`?
- (f) Go to the full documentation for the method `printf(String format, Object... args)`.
 - i. What is its signature?
 - ii. What is its return type?
 - iii. How many arguments will it accept?
 - iv. Does it have any preconditions?
 - v. Suppose a client writes the following snippet of code:

```
PrintStream output = System.out;  
output.printf("%f is my favorite number%n", 7);
```

The code compiles but does not produce the expected output. What happens if you tried to run a program that has the above code? Who is at fault, the client or the class implementer?

5. This question tests your knowledge of objects.

- (a) We say that an object has state, identity, and behavior; what does this mean? Perhaps use an example to clarify your answer (you should need only one sentence to explain each term).
- (b) What is the purpose of a constructor?
- (c) Objects should not have `public` attributes; why?
- (d) It is possible to argue that an object or class should not even have a `final public` attribute; why?
- (e) If an object does not have `public` attributes then how does a client get information about the object's state?
- (f) If an object does not have `public` attributes then how does a client change the object's state?
- (g) Suppose a client writes some code that uses two `String` objects named `s` and `t`.
 - i. How should the client check if `s` and `t` refer to the same object?
 - ii. How should the client check if `s` and `t` have the same state?

6. A CSE1020 student writes a program that repeatedly asks a user to enter 3 whole numbers; the first 2 numbers are used to create a `Fraction` object and the third number is used as an exponent to compute the value of the `Fraction` object raised to the exponent. The program is supposed to print out the largest `Fraction` object that is computed after exponentiation. Critique their code assuming that input validation was not a requirement:

```
import java.io.PrintStream;
import java.util.Scanner;

public class FractionExponents
{
    public void main(String[] args)
    {
        PrintStream output = System.out
        scanner input = new Scanner(System.in);

        Fraction max = new Fraction(1, 1);
        output.println("Enter 3 positive whole numbers: ");
        for (; input.hasNext(); )
        {
            long numer = input.nextLong();
            long denom = input.nextLong();
            int exp = input.nextInt();
            Fraction f = new Fraction(numer, denom);

            // compute f to the power exp
            for (int i = 0; i < exp; i++)
            {
                f.multiply(f);
            }

            // is f the largest Fraction so far?
            if (f > max)
            {
                max = f;
            }
            else if (f < max)
            {
            }
            output.println("Enter 3 positive whole numbers: ");
        }
        output.printf("The biggest fraction was %f%n", f);
    }
}
```

Hint: You should try compiling the above code and then try to fix it.