

I hereby pledge that I will strictly adhere to 1801042637 MUUCAY
academic integrity codes and the work done on this examination
is solely my own and I will not receive/give any help from/to anybody
or source during this examination.

a) Design and implement a comparable Java Class to represent a rational number such as $3/2$

- setter getter
- A constructor takes all parameter
- A function that return the number of exist Rational object
- Override toString
- add and Multiply methods
- throw exception if there is any problem

b) Write another class to test your Rational class including exception

```
class Rational implements Comparable<Rational> {
```

```
    private int numerator;
    private int denominator;
    static int counter = 0;
```

```
    Rational (int num, int den) throw Exception {
```

```
        setNumerator (num);
```

```
        setDenominator (den);
```

```
        counter++;
```

```
    } void setNumerator (int num) { numerator = num; }
```

```
    void setDenominator (int den) throw Exception {
```

```
        if (den == 0)
```

```
            throw Divided By Zero Exception;
```

```
        denominator = den;
```

```
    }
```

```

public int getNumerator() { return numerator; }
public int getDenominator() { return denominator; }
static int getCounter() { return counter; }
public String toString() {
    return String.format("%d / %d", numerator, denominator);
}

```

```

}
public int toCompare(Rational other) {
    double currentObj = (double) numerator / denominator;
    double otherObj = (double) other.numerator / other.denominator;

    if (currentObj > otherObj)
        return 1;
    else if (currentObj == otherObj)
        return 0;
    return -1;
}

```

```

}
public void multiply(Rational other) {
    this.numerator = this.numerator * other.numerator;
    this.denominator = this.denominator * other.denominator;
}

```

$$\frac{a}{b} \cdot \frac{b}{a} = \frac{a \cdot b}{b \cdot a}$$

```

}
public void add(Rational other) {
    int tmpden = denominator;
    numerator *= other.denominator;
    denominator *= other.denominator;
    other.numerator *= tmpden;
    numerator += other.numerator;
}
}

```

$$\frac{a}{b} + \frac{b}{a} = \frac{a \cdot a + b \cdot b}{a \cdot b}$$


```

b) class TestRational {
    public static void main (String [] args) {
        try {
            Rational r1 = new Rational (8, 0);
        } catch (DividedByZeroException e) {
            System.out.println ("Denominator cannot be 0");
        }

        Rational r2 = new Rational (2, 3);
        Rational r3 = new Rational (2, 4);
        Rational r4 = new Rational (3, 5);
        Rational r5 = new Rational (13, 13);

        System.out.println ("%d / %d", r2.getNumerator(), r2.getDenominator());

        System.out.println (r2);
        r3.setNumerator (8);
        try {
            r3.setDenominator (0);
        } catch (DividedByZeroException e) {
            System.out.println ("Denominator cannot be zero");
        }

        r4.add(r5); System.out.println (r4);
        r2.multiply(r4); System.out.println (r2);

        int comp = r4.compareTo(r5);

        if (comp > 0) System.out.println (r4 + "bigger than " + r5);
        else if (comp == 0) System.out.println (r4 + "equal to " + r5);
        else System.out.println (r5 + "bigger than " + r4);

        System.out.println (Rational.getCounter());
    } // End of main
} // End of class

```