MSCS 630 – SECURITY ALGORITHMS AND PROTOCOLS

Lab 2

FEBRUARY 3, 2018

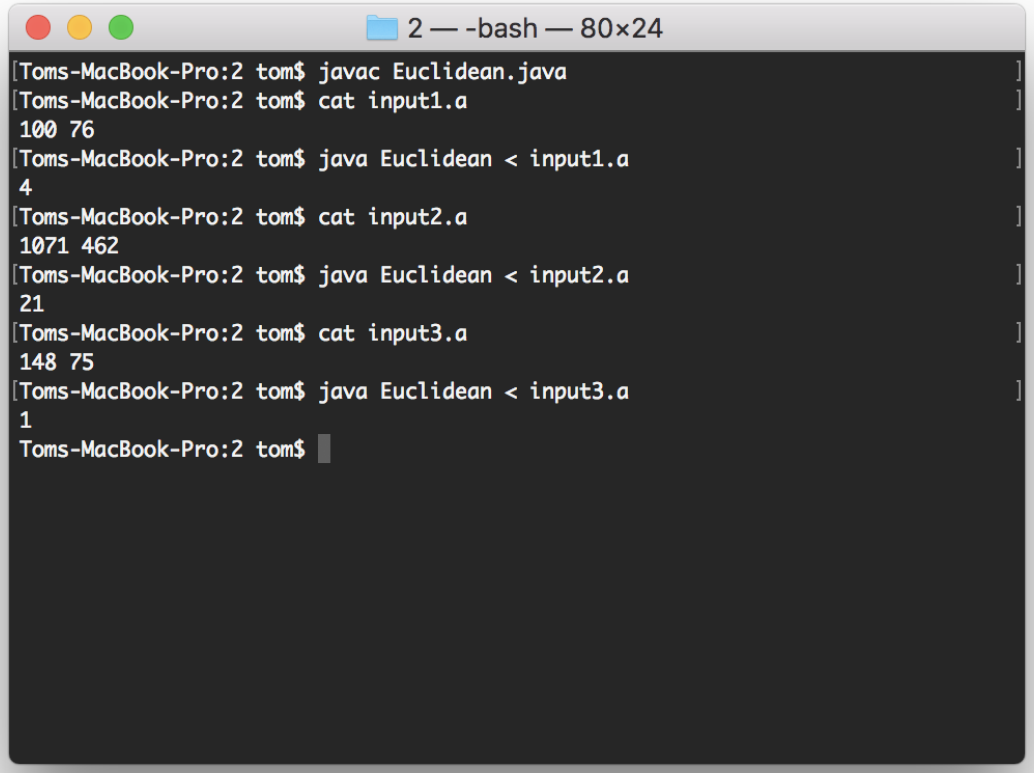
THOMPSON RAJAN
CWID: 20082947

1. Euclidean Algorithm

```java
/**
 * File: Euclidean.java
 * Author: Thompson Rajan
 * Course: MSCS 630 Security Algorithms and Protocols
 * Assignment: Lab 2
 * Due Date: Wednesday, February 7, 2018
 * Version: 1.0
 *
 * This file contains the implementation of the Euclidean Algorithm.
 */

import java.util.Scanner;

/**
 * This class implements the Euclidean Algorithm to find the greatest common
 * divisor of given two numbers.
 */
public class Euclidean {

  /**
   * This method takes two long inputs and return their gcd.
   * @param a - long input
   * @param d - long input
   * @return - returns gcd of a and d, gcd(a,d).
   */
  static long euclidAlg(long a, long d){

    //Get quotient
    long q = Math.floorDiv(a, d);

    //Get remainder
    long r = a - d * q;

    //Call euclidAlg() recursively when remainder is not 0 .
    if(r != 0)
      return euclidAlg(d, r);

    return d;
  }

  public static void main(String[] args) {

    Scanner input = new Scanner(System.in);

    //Get input values
    long a = input.nextLong();
    long d = input.nextLong();

    //Get gcd(a,b)
    long r = euclidAlg(a, d);

    System.out.println(r);
```

```
  }
}
```

Output:



Date: 02-03-18

Thompson Rajan
CWID: 20082947

2. Extended Euclidean Algorithm:

```
/**
 * File: ExtendedEuclidean.java
 * Author: Thompson Rajan
 * Course: MSCS 630 Security Algorithms and Protocols
 * Assignment: Lab 2
 * Due Date: Wednesday, February 7, 2018
 * Version: 1.0
 *
 * This file contains the implementation of the Extended Euclidean Algorithm.
 */

import java.util.Scanner;

/**
 * This class implements the Extended Euclidean Algorithm to find the
 * co - primes x and y from the equation gcd(a,b) = 1 = ax + by
 */
public class ExtendedEuclidean {

  /**
   * This method takes in two long values that are relatively prime, a and b
   * and returns the corresponding the gcd and co - primes x and y.
   * @param a - long input a
   * @param b - long input b
   * @return  - long array where u[0] is gcd(a,b), u[1] is 'x' and u[2] is 'y';
   */
  static long[] euclidAlgExt(long a, long b){

    long u[] = {a, 1, 0};
    long v[] = {b, 0, 1};
    long w[] = new long[v.length];
    long t = 0;

    while(v[0] > 0) {

      //Get floor value of 'a' and 'b'
      t = (long) (Math.floor(u[0] / v[0]));

      //Update w, u and v vectors.
      for(int j = 0; j<v.length;j++)
      {
        w[j] = u[j] - v[j] * t;
        u[j] = v[j];
        v[j] = w[j];
      }
    }
    return u;
  }

  public static void main(String[] args) {

    Scanner input = new Scanner(System.in);

    //Get input values.
    long a = input.nextInt();
    long b = input.nextInt();

    //Get co - primes x and y.
```

```
    long u[] = euclidAlgExt(a, b);

    System.out.println(u[0] + " " + u[1] + " " + u[2]);
  }
}
```

Output: