**1.)**

We have the expression that follows.

The remainder of dividing a⋅x by 𝑛 must be precisely 1. If there is no common divisor between and 𝑛 it means 𝑔𝑐𝑑(𝑎,𝑛) = 1 , the equation always gives a solution. But if 𝑔𝑐𝑑(𝑎,𝑛) 1, there is no solution for this equation.

Understand the necessary steps mathematically and did research on the relevant equation.

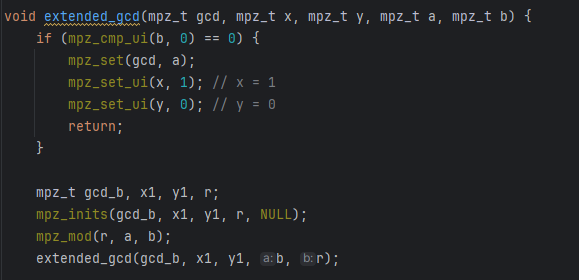
We can write , we observe that

Also we can write this equation

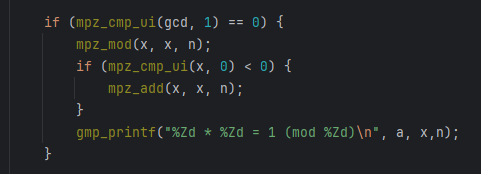
Also we know that

Thanks to this equation, we can start our coding process.

I used a recursive function in my code, the reason for this comes from the basic logic of the Extended Euclidean Algorithm and continues until r = 0. When r = 0, The operation of the function ends and this returns and the coefficients

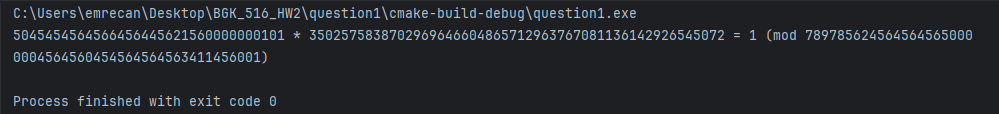
****

When

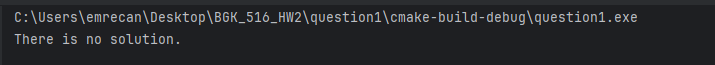
****

**Outputs:**

mpz\_set\_str(a, "5045454564566456445621560000000101", 10);  
mpz\_set\_str(n, "7897856245645645650000004564560454564564563411456001", 10);

****

mpz\_set\_str(a, "3500000000000000000000000000", 10);  
mpz\_set\_str(n,"7000000000000000000000000000000000000000000000000000000",10;

****

mpz\_set\_str(a, "454545242087778", 10);  
mpz\_set\_str(n, "4520402402", 10);

****

**Closure:**

**Identity element:**

**Inverse element**

**Associativity**

**Closure:**

**Identity element:**

**Inverse element**

**Associativity**

**Closure:**

**Identity element:**

**Inverse element**

**Associativity**

**Closure:**

**Identity element:**

**Inverse element**

**Associativity**

In fact, this question is exactly the same as the question in Homework-3, the only difference of the question in Homework-3 is that it asks us to print the x and y values, so the only difference between the 1st question in Homework-3 and this question in my codes is that only the x and y values ​​are not written.

I wanted to understand the necessary steps mathematically and did research on the relevant equation.

We can write . Here, the algorithm is called again with 𝑏 and 𝑟 instead of 𝑎 and 𝑏. This is based on the following mathematical expression

Also we can write this equation

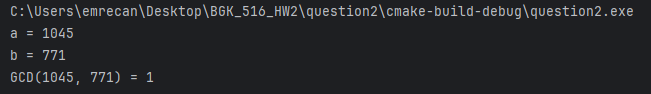
Also we know that

Thanks to this equation, we can start our coding process.

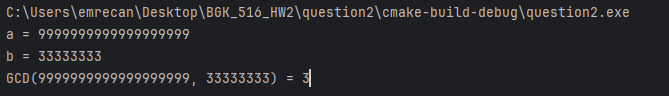
I used a recursive function in my code, the reason for this comes from the basic logic of the Extended Euclidean Algorithm and continues until r = 0. When r = 0, The operation of the function ends and this returns and the coefficients

**Outputs:**

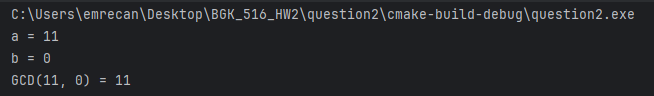
mpz\_set\_str(a, "1045", 10);  
mpz\_set\_str(b, "771", 10);

****

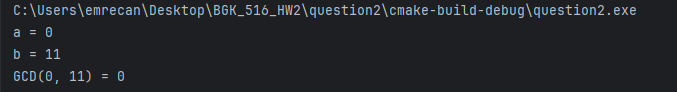
mpz\_set\_str(a, "9999999999999999999", 10);  
mpz\_set\_str(b, "33333333", 10);

****

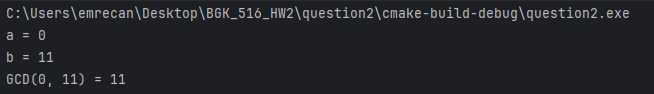
mpz\_set\_str(a, "11", 10);  
mpz\_set\_str(b, "0", 10);

****

mpz\_set\_str(a, "0", 10);  
mpz\_set\_str(b, "11", 10);

****

mpz\_set\_str(a, "0", 10);  
mpz\_set\_str(b, "11", 10);

****