Oleg Gleizer

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Division Algorithm

```
            ┌─────────────────┐
            │  Input: (a, b)  │
            └─────────────────┘
                     │
                     ▼
        ┌───────────────────────────┐
        │      p := 0,   q := a     │
        └───────────────────────────┘
                     │
                     ▼
                  ◇ q < b ◇  ──True──►  ( Output: (p, q) )
                     │
                   False
                     ▼
        ┌───────────────────────────┐
        │   p := p + 1,  q := q − b  │
        └───────────────────────────┘
```
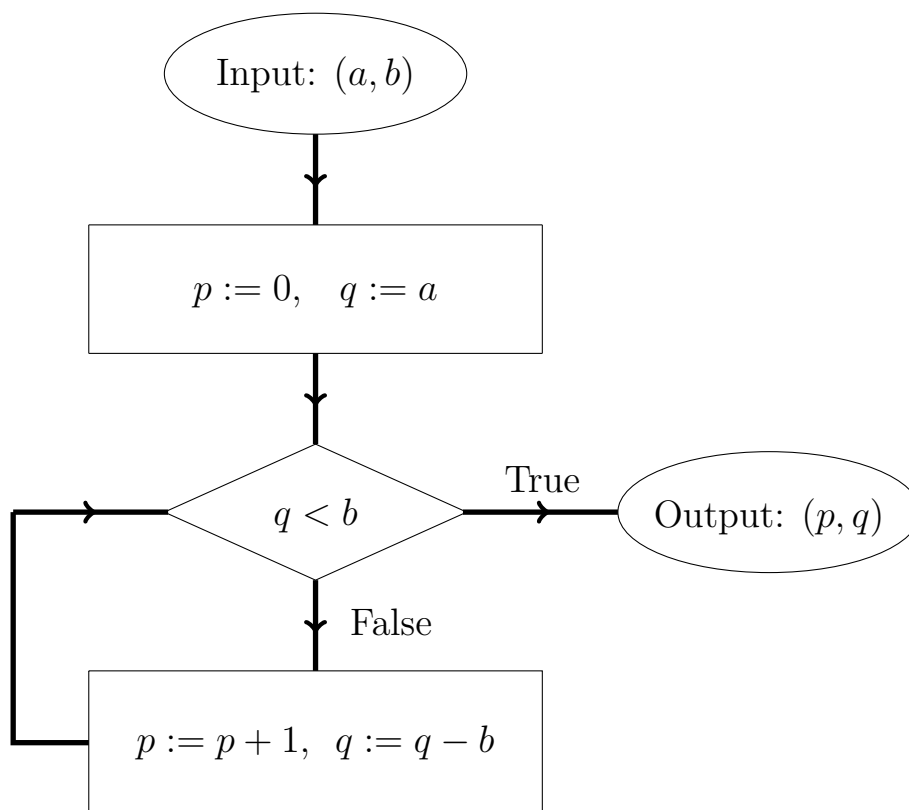
Problem 1 *Input:* $(4, 2)$.

   Cycle 1

   $p =$ $q =$

   Is the statement $q < b$ true or false?

   Cycle 2

   $p =$ $q =$

   Is the statement $q < b$ true or false?

   Cycle 3

   $p =$ $q =$

   Is the statement $q < b$ true or false?

   Output: $(p, q) =$

   What does the output mean?

Problem 2 *Input:* $(2, 3)$.

   Cycle 1

   $p =$ $q =$

   Is the statement $q < b$ true or false?

   Output: $(p, q) =$

   What does the output mean?

Problem 3 *Input:* $(8, 3)$.

   Cycle 1

   $p =$ $q =$

   Is the statement $q < b$ true or false?

   Cycle 2

   $p =$ $q =$

   Is the statement $q < b$ true or false?

Cycle 3

$p =$ $\qquad$ $q =$

Is the statement $q < b$ true or false?

Output: $(p, q) =$

What does the output mean?

Let us switch to the binaries.

Problem 4 *Input:* $(1011, 100)$.

Cycle 1

$p =$ $\qquad$ $q =$

Is the statement $q < b$ true or false?

Cycle 2

$p =$ $\qquad$ $q =$

Is the statement $q < b$ true or false?

Cycle 3

$p =$ $q =$

Is the statement $q < b$ true or false?

Output: $(p, q) =$

What does the output mean?

Let's check...

$1011_2 =$ *decimal value please*

$100_2 =$ *decimal value please*

Divide the first decimal number by the second (with the remainder) and see if everything works out right.