Complex Number Multiplication

Given two strings representing two complex numbers.

You need to return a string representing their multiplication. Note $i^2 = -1$ according to the definition.

Example 1:

```
Input: "1+1i", "1+1i"
Output: "0+2i"
Explanation: (1 + i) * (1 + i) = 1 + i^2 + 2 * i = 2i, and you need convert it to th
e form of 0+2i.
```

Example 2:

```
Input: "1+-1i", "1+-1i"
Output: "0+-2i"
Explanation: (1 - i) * (1 - i) = 1 + i^2 - 2 * i = -2i, and you need convert it to t
he form of 0+-2i.
```

Note:

1. The input strings will not have extra blank.
2. The input strings will be given in the form of **a+bi**, where the integer **a** and **b** will both belong to the range of [-100, 100]. And **the output should be also in this form**.

Solution 1

This solution relies on the fact that (a+bi)(c+di) = (ac - bd) + (ad+bc)i.

```
public String complexNumberMultiply(String a, String b) {
    int[] coefs1 = Stream.of(a.split("\\+|i")).mapToInt(Integer::parseInt).toArra
y(),
          coefs2 = Stream.of(b.split("\\+|i")).mapToInt(Integer::parseInt).toArra
y();
    return (coefs1[0]*coefs2[0] - coefs1[1]*coefs2[1]) + "+" + (coefs1[0]*coefs2[
1] + coefs1[1]*coefs2[0]) + "i";
}
```

written by compton_scatter original link here

Solution 2

```
public String complexNumberMultiply(String a, String b) {
    String result = "";
    String[] A = a.split("\\+");
    String[] B = b.split("\\+");
    int a1 = Integer.parseInt(A[0]);
    int b1 = Integer.parseInt(A[1].replace("i",""));

    int a2 = Integer.parseInt(B[0]);
    int b2 = Integer.parseInt(B[1].replace("i",""));

    int a1a2 = a1 * a2;
    int b1b2 = b1 * b2;
    int a1b2a2b1 = (a1 * b2) + (b1 * a2);

    String afinal = (a1a2 + (-1 * b1b2)) + "";
    String bfinal = a1b2a2b1 + "i";
    result = afinal+"+"+bfinal;
    return result;
}
```

written by jaqenhgar original link here

Solution 3

stringstream is very useful to extract num from a string

```
class Solution {
public:
    string complexNumberMultiply(string a, string b) {
        int ra, ia, rb, ib;
        char buff;
        stringstream aa(a), bb(b);
        aa >> ra >> buff >> ia;
        bb >> rb >> buff >> ib;
        string ans = to_string(ra*rb - ia*ib)+"+";
        ans += to_string(ra*ib + rb*ia) + "i";
        return ans;
    }
};
```

written by beetlecamera original link here