Cairo University
Faculty of Computers and Artificial Intelligence

CS213

Programming II

Assignment 1

Course Professor:

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Ammar Mohamed	Formatting & Operators +, -
Joseph Sameh	Comparisons <, >, = =, <<, >>
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BigReal Algorithms:
isValid:
we used regex library that checks if the the user entered a sign(+/-) and a digit (/d) and after that we checked if he entered a floating point (.) with an optional number after it (\d*)

formattedReal:
deletes the padded zeros (from left in the decimal side and from right in the fraction side) and if the number doesn't have a floating point it adds one to it so every BigReal is handled as a whole number with a floating point

Operators (+/-):
we need to make sure that both of them has same string size if not we just do zero padding and we proceed to addition
We use the usual way of addition and storing variable in one of the variables (memory optimization) and use the variables "sum" to add each digit and "carry" if the sum exceeds 9
The addition is divided into 2 conditions one with adding two same sign values
And the other handles adding different sign values so the subtraction is just a special case of addition

Comparison (</>):

Operator < Algorithm:

1. Check if the signs of the two BigReal numbers are different.

    - If true, return whether the sign of the current BigReal is less than the sign of Big_Real_2.

2. Both numbers have the same sign, so further comparison is needed.
    - If both signs are negative:
        - Compare the number of decimal digits in both numbers.
            - o If the current number has more decimal digits, return true.
            - o If the current number has fewer decimal digits, return false.
            - o If the number of decimal digits is the same, compare the digits one by one.
                - If the current digit is greater in the current number, return true.
                - If the current digit is greater in Big_Real_2, return false.
            - o If all decimal digits are equal, compare the remaining digits.
                - If the current number has more total digits, return true.
                - If the current number has fewer total digits, return false.
                - If both numbers have the same total digits, return false.
    - If both signs are positive:
        - Compare the number of decimal digits in both numbers.
            - o If the current number has more decimal digits, return false.
            - o If the current number has fewer decimal digits, return true.
            - o If the number of decimal digits is the same, compare the digits one by one.
                - If the current digit is greater in the current number, return false.
                - If the current digit is greater in Big_Real_2, return true.
            - o If all decimal digits are equal, compare the remaining digits.
                - If the current number has more total digits, return false.
                - If the current number has fewer total digits, return true.
                - If both numbers have the same total digits, return false.

3. Default case (should not be reached). Return false.

Operator > Algorithm:

1. Check if the signs of the two BigReal numbers are different.

   - If true, return whether the sign of the current BigReal is greater than the sign of Big_Real_2.

2. Both numbers have the same sign, so further comparison is needed.
   - If both signs are negative:
     - Compare the number of decimal digits in both numbers.
       - If the current number has more decimal digits, return false.
       - If the current number has fewer decimal digits, return true.
       - If the number of decimal digits is the same, compare the digits one by one.
         - If the current digit is greater in the current number, return false.
         - If the current digit is greater in Big_Real_2, return true.
       - If all decimal digits are equal, compare the remaining digits.
         - If the current number has more total digits, return false.
         - If the current number has fewer total digits, return true.
         - If both numbers have the same total digits, return false.
   - If both signs are positive:
     - Compare the number of decimal digits in both numbers.
       - If the current number has more decimal digits, return true.
       - If the current number has fewer decimal digits, return false.
       - If the number of decimal digits is the same, compare the digits one by one.
         - If the current digit is greater in the current number, return true.
         - If the current digit is greater in Big_Real_2, return false.
       - If all decimal digits are equal, compare the remaining digits.
         - If the current number has more total digits, return true.
         - If the current number has fewer total digits, return false.
         - If both numbers have the same total digits, return false.
3. Default case (should not be reached). Return false.