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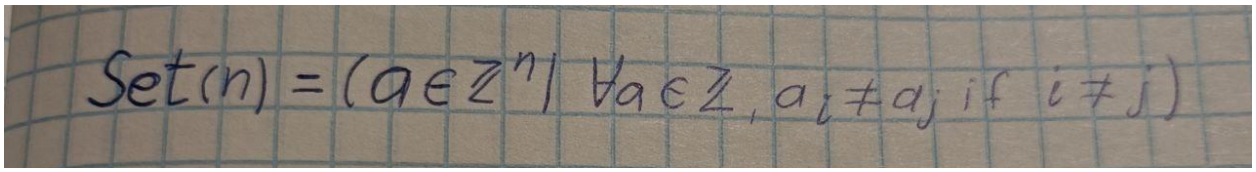
Group 10

Task

Implement the set type which contains integers. Represent the set as a sequence of its elements. Implement as methods: inserting an element, removing an element, returning whether the set is empty, returning whether the set contains an element, returning a random element without removing it from the set, returning the number of even numbers in the set (suggestion: store the number of even numbers and update it when the set changes), printing the set. A set can store every element only once.

Set type

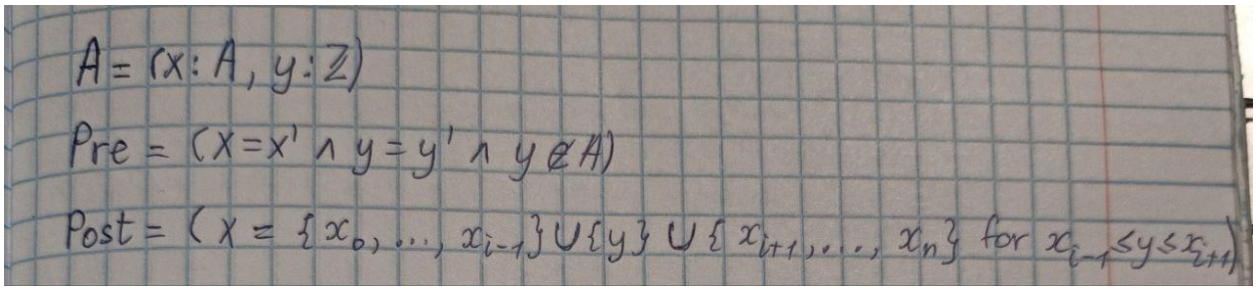
Set of values



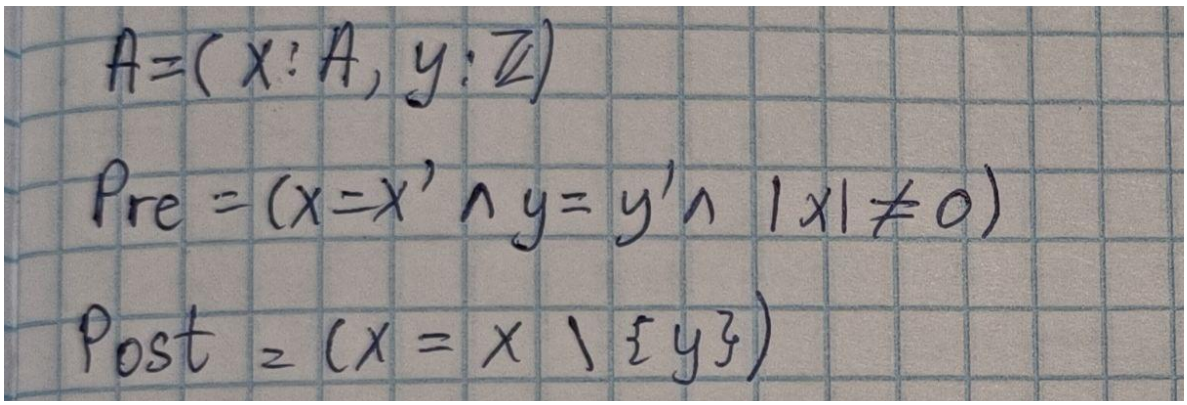
*For later usage, I will shortly denote it as Set(n) = A

Operations

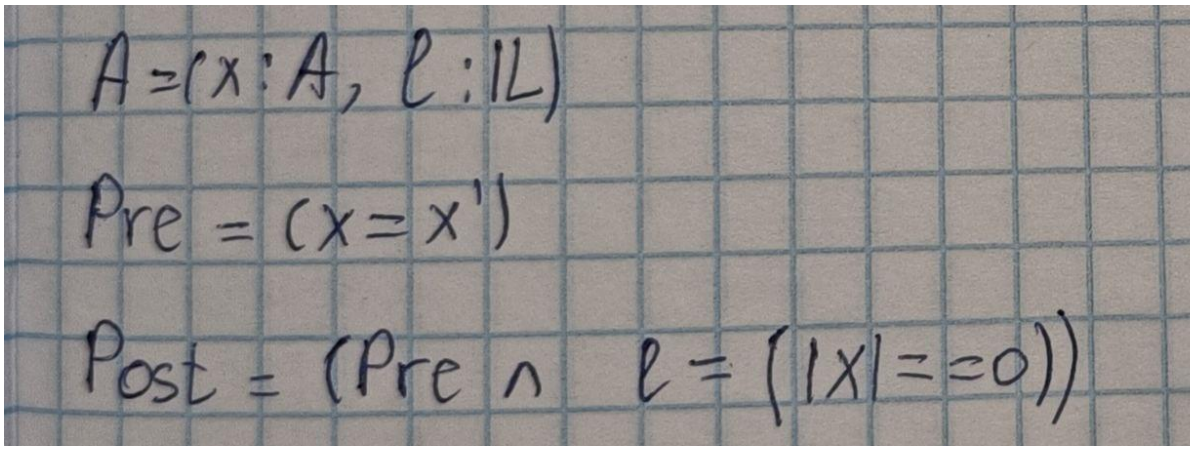
1. Insert an element



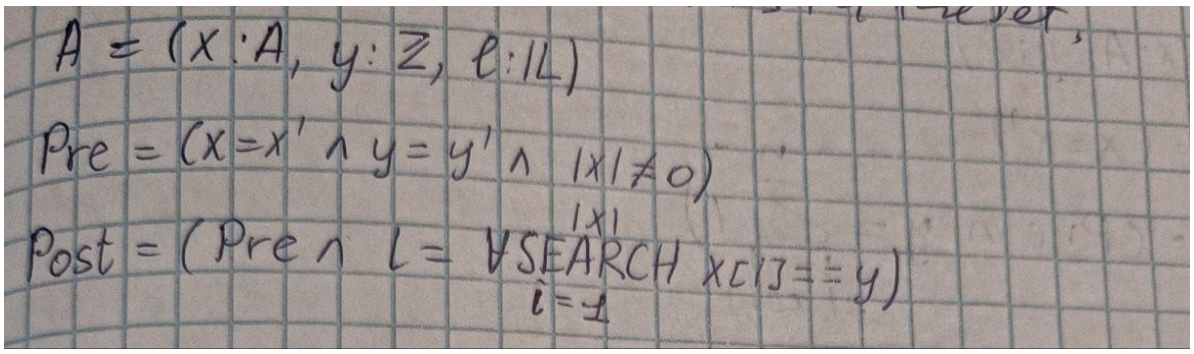
2. Remove an element



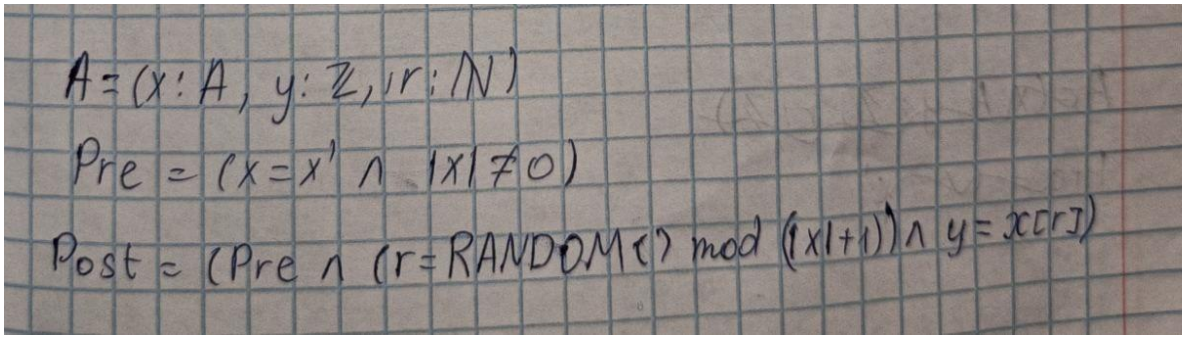
3. Check if the set is empty



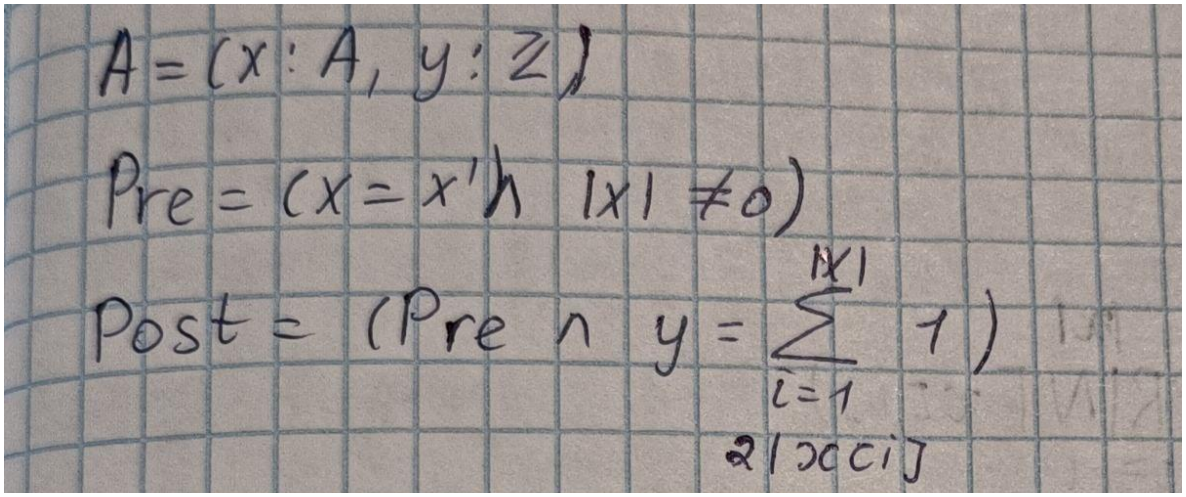
4. Check if an element is in the set



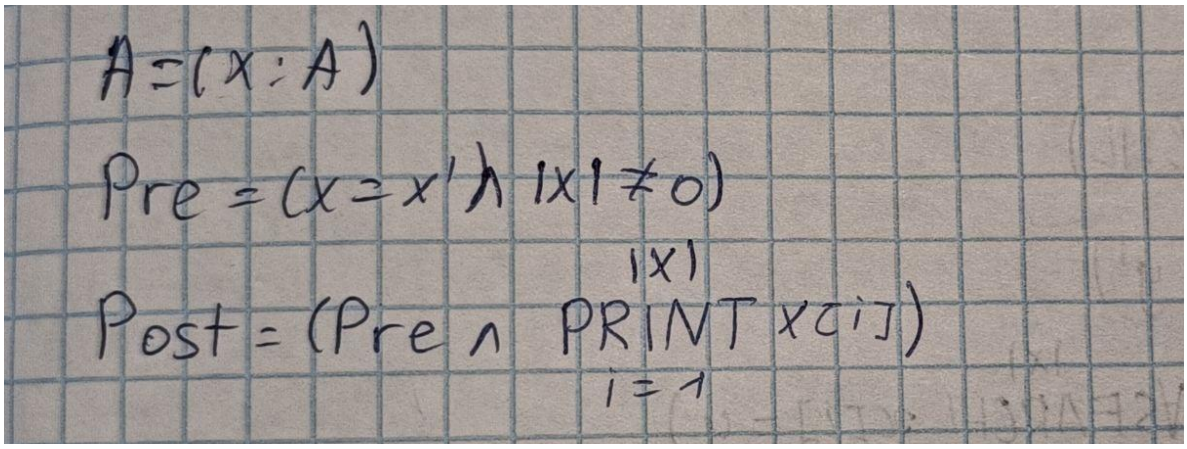
5. Returning the random element of a set



6. Returning the number of even numbers



7. Print all the element of a set



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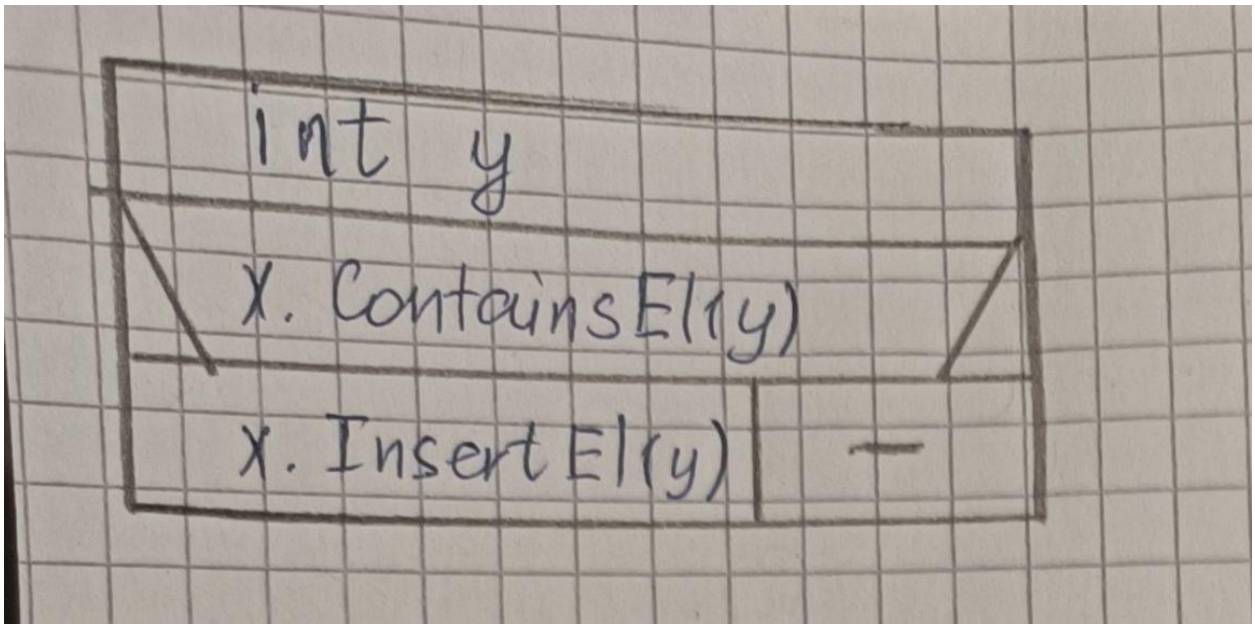
Representation

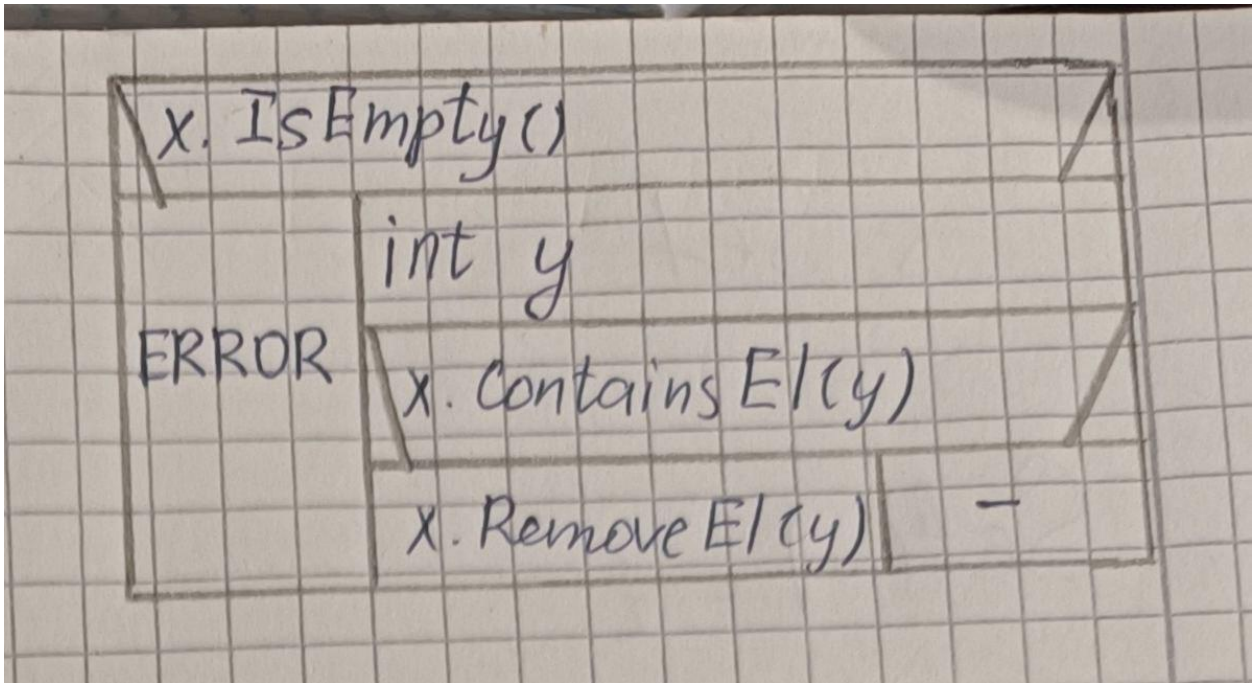
Integers in the set are inserted in the sequence in ascending order
E.g. Set(n) = 1 3 5 6 7 10

Implementation

1. Inserting an element



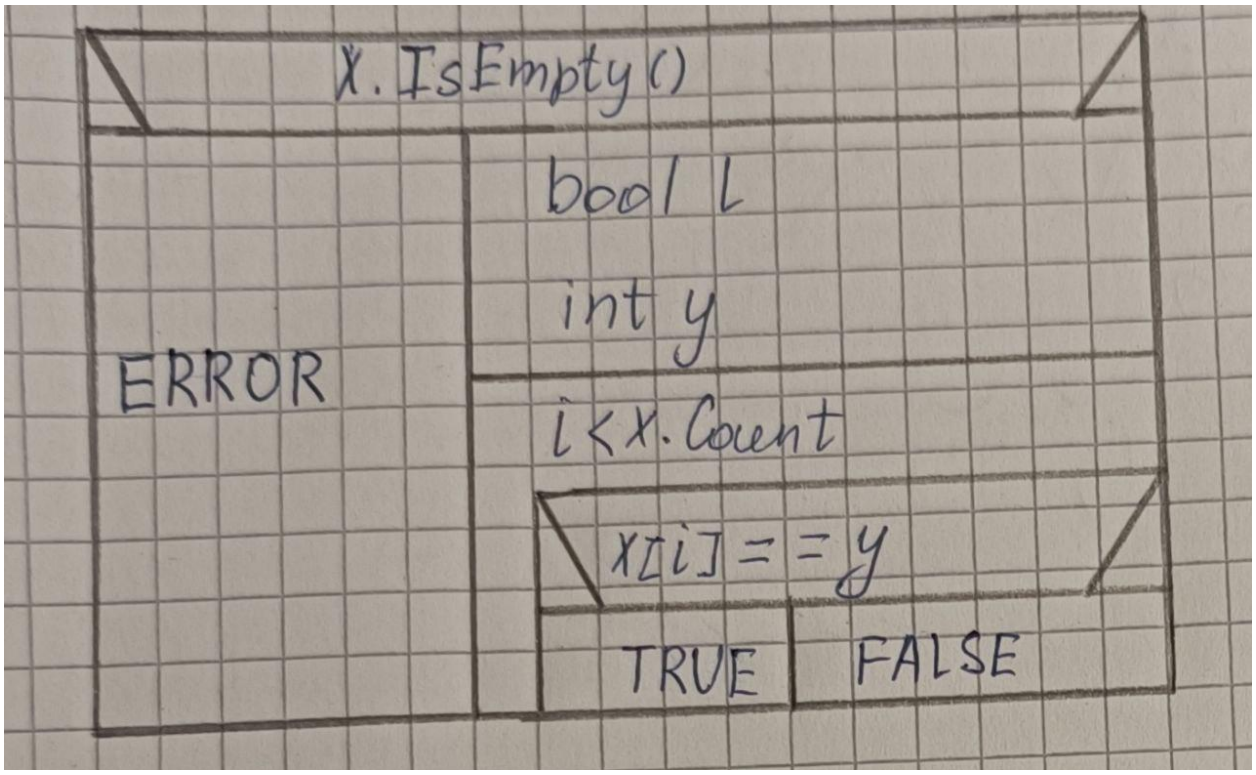
2. Removing an element



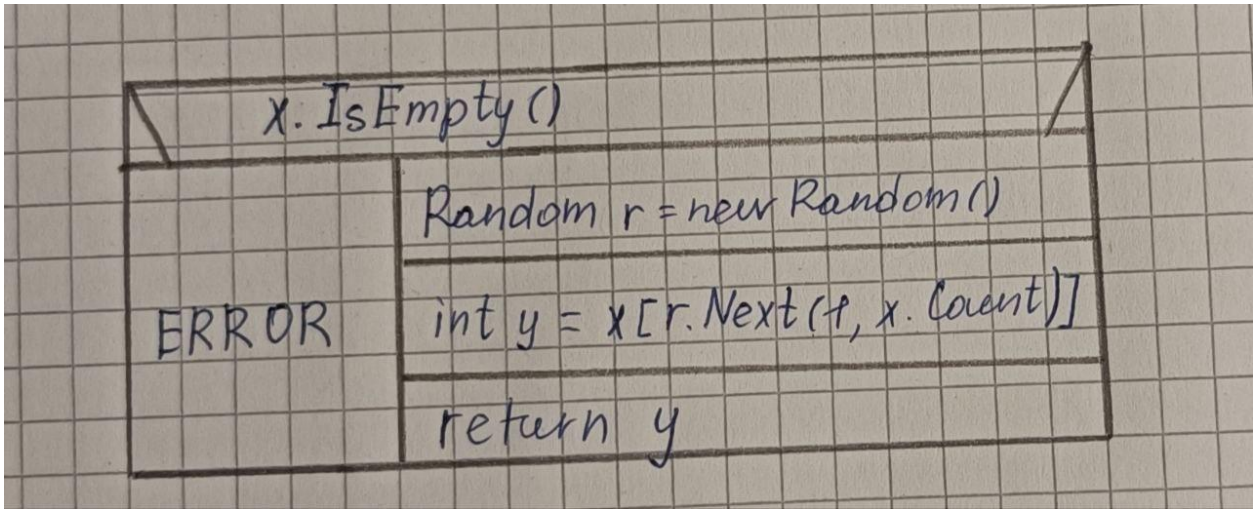
3. Check if the set is empty

   x.IsEmpty()

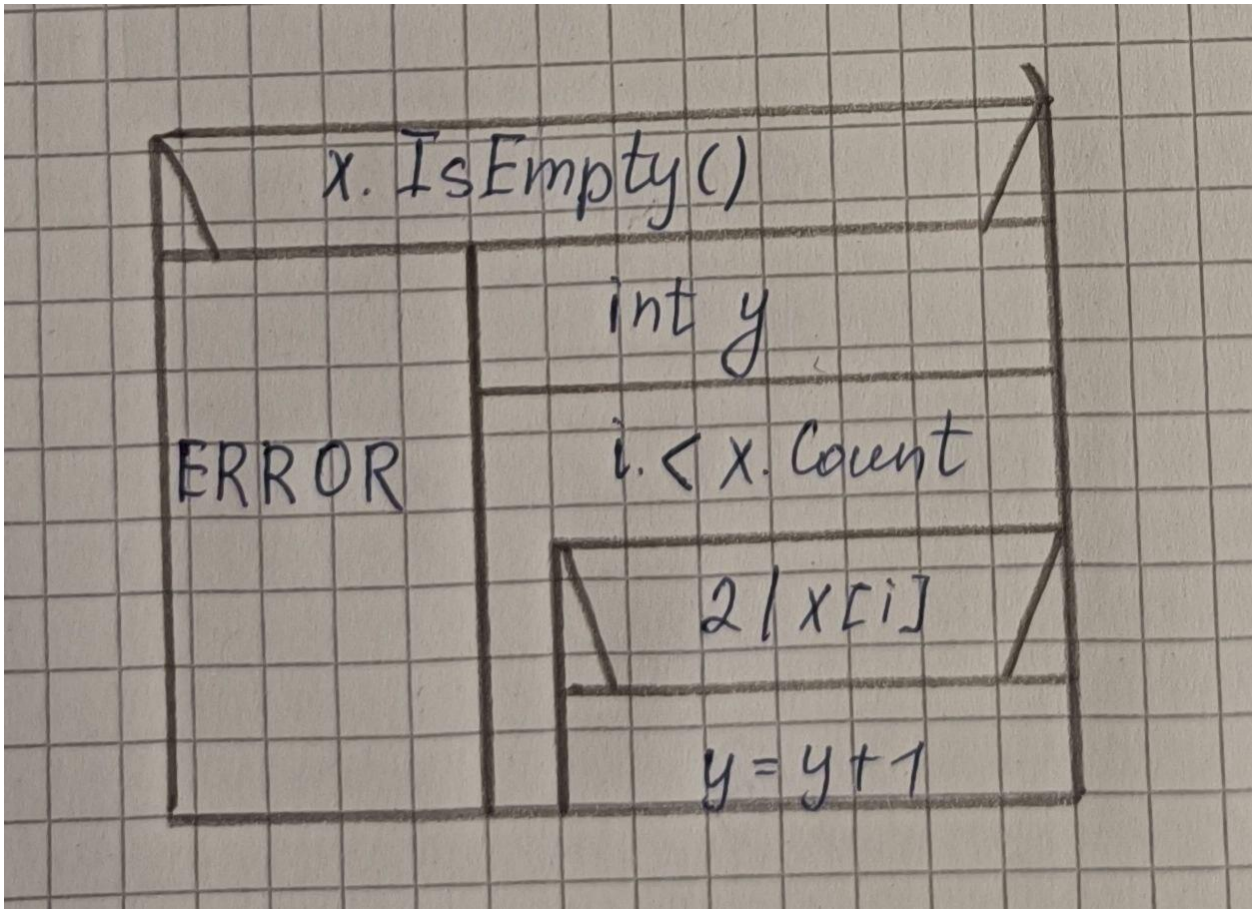
4. Check if the element is in the set



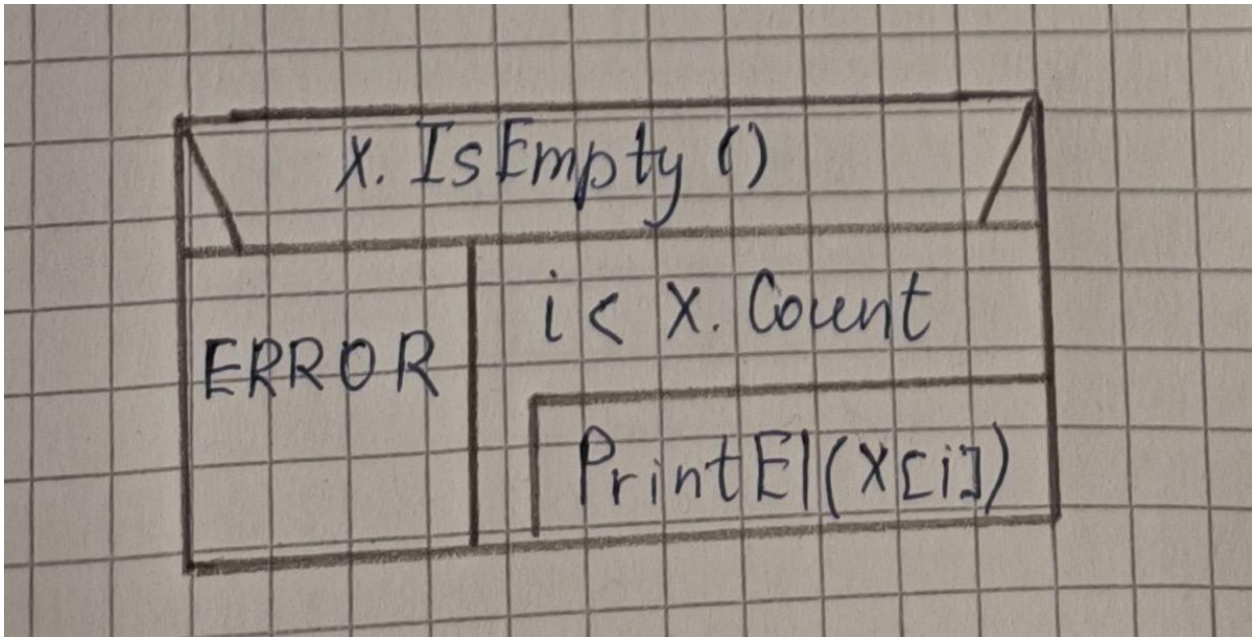
5. Returning random element



6. Returning the number of even elements



7. Printing the set



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Testing

Testing operations

1. Testing InsertEl()
    - Check the size to see that new Set is empty
    - Insert 5 and check that the size of the set has changed to 1
    - Insert 3 and check that it's at position 0, because it's a sorted set
    - Try to insert 3 again, check if the size of the set is 2, containing (3, 5), then check that the element at position 0 is 3 and the element at position 1 is 5

2. Testing RemoveEl()
    - Insert 2, insert 3, then check if the set contains element 2
    - Remove 2, check if the set does not contain 2

3. Testing IsEmpty()
    - Instantiate new Set and check that is it empty
    - Insert 1, check that the set has an element
    - Remove 1, check if the set is empty now

4. Testing ContainsEl()
    - Insert 3, 4 and check if the set contains both of them
    - Check if the set contains element 5, which was not inserted

5. Testing ReturnRandomEl()
    - Insert 5, 6, 7, then return any random element and check that set contains the returned element
    - Check if the random element equals 4, which is not in the set

6. Testing EvenNums()
    - Insert 5, 6 and 4 and check if the number of even numbers equals 2
    - Remove 4 and check if the number of even numbers is 1 now

Testing exceptions

1. Check if the EmptySetException is thrown when the set is empty for operations:
    - RemoveEl()
    - ContainsEl()
    - ReturnRandomEl()
    - EvenNums()