# 2nd Smallest Integer in Array

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## Question

Write a program that returns the second smallest integer in an array. The parameters for this method are the array.

## Explanation and Algorithm

There are many ways to approach this problem, but not all of them are efficient. You can sort the array in ascending order and then print out the second entry. Out of all the sorting algorithms, the most efficient one is merge sort which is $O(n\log n)$. Or, you could iterate through the array twice. This would be even worse time complexity $O(n^2)$. Let's try to think of an algorithm to find the second smallest number but with only ONE iteration!

## Hints

1. We're finding the second smallest, but before we do that, we have to find the smallest number. Think: how should we be using the smallest number to compute the second smallest?
2. How should we be initializing the variables at play? (Think of the static methods in the Integer class).
3. Think of the different conditionals that we could use with the array, smallest number, and second smallest.
4. What are some edge cases, if any?

## Code

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```
/*Answer 1: Most Efficient*/
```

```
public int secondSmallest(int [] a){

int smallest = Integer.MAX_VALUE;
int secondSmallest = Integer.MAX_VALUE;
/* initializing to max value, which is opposite ensures that every
    element in the array is checked for smallest and secondSmallest */

for(int i = 0; i < a.length; i++){
   if(a[i]<smallest){
      secondSmallest = smallest
        /* prev smallest element is now secondSmallest */
        smallest = a[i];
    }else
      if(a[i]<secondSmallest){
         secondSmallest = a[i];
            /*if smaller than prev secondSmallest but bigger than
                smallest*/
        }

}

return secondSmallest;
}
```

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## Run time analysis

The run time of this solution is O(n), where n is the number of items in the array. At most you will have to traverse the entire array to find the second smallest number.

## Sources

Found on HackerRank Challenge. **This was an interview question for me**.