Finding highest product of three numbers

Task: Create a method that, given a list of integers, returns the highest product between 3 of those numbers. Example: [1, 10, 2, 6, 5, 3] = 300
Please provide tests that show your solution actually works. Please state your assumptions.

Problem Analysis

The computational issues for this problem is to make an algorithm that will return the highest product between 3 numbers from a given list of integers. The input of the program is an array of integers. The output expected to be an integer.
We can use Python lists a built-in sort() method that modifies the list in-place.

1.Test (what expected from the program)	Thinking process
1) [1, 10, 2, 6, 5, 3] = 300 10*6*5 = 300 2) [10, 9, 2, 1, 0, 3] = 270 10*9*3=270 3) [-1, -10, 2, 6, 5, 3] = 90 6*5*3=90 4) [1, -10, 2, -6, 5, 3] = 300 -10*-6*5=300 5) [1, -10, -2, -6, -5, 3] = 180 -10*-6*3= 180 6) [-1, -10, -2, -6, -5, -3] = -6 -1 * -2 * -3 = -6 7) [1, -10, 10, -6, 5, 6] = 600 10*6*5=600	
2. Test 1 algorithm	

```
def pr(arr, n):
    n = len(arr)
    arr.sort()
    a = {}

    r = arr[n-1]
    s = arr[n-2]
    d = arr[n-3]
    product = r*s*d
    return {product}
```

Works with test sample 1-3 , 6
Doesn't work with 4, 5, 7

Plan:

1. Sort the array
2. Find the length of array
3. Keep track of the three maximal elements: `max1 * max2 * max3`.
4. Return the multiplication result

3. Test 2 algorithm

```
def pr(arr, n):
    n = len(arr)
    arr.sort()
    a = {}

    max1 = arr[n-1]
    max2 = arr[n-2]
    max3 = arr[n-3]
    min1 = arr[n-6]
    min2 = arr[n-5]

    product1 = max1*max2*max3
    product2 = min1*min2*max1

    if product1 >= product2:
        return {product1}
    else:
        return {product2}
```

Works with all test samples

Plan (modified 1):

1. Sort the array
2. Find the length of array
3. Keep track of three maximal elements and the two minimal elements: `max1 * max2 * max3` or `min1 * min2 * max1`.
4. Compare the two outputs and return the highest one

Hint: If some of the factors is 0 - the product will be equal 0.

Limitations: The program will only work if we give the array of integers and define the length manually.

4. Test 3 algorithm

```
def pr(arr, n, s):
    arr.sort()
    a = {}

    max1 = arr[n-1]
    max2 = arr[n-2]
    max3 = arr[n-3]
    min1 = arr[0]
    min2 = arr[1]


    product1 = max1*max2*max3
    product2 = min1*min2*max1

    if product1 >= product2:
        return {product1}
    else:
        return {product2}
```

Plan (modified 2):

1. Sort the array
2. Find the length of array
3. Find three max elements
4. Find the smallest element
5. Find the second smallest element
6. Keep track of three maximal elements and the two minimal elements. Do the following multiplication: `max1 * max2 * max3` or `min1 * min2 * max1`.
7. Compare the two outputs and return the highest one