1) Given an array of $\{4, -2, 5, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -1, 0, -6, -8, -9\}$ integers find the maximum and minimum product that can be obtained by multiplying two integers from that array.

1) array is $\{4, -2, 3, 10, -5, 2, 8, -3, 6, 7, -4, 1, 9, -1\}$ we need to consider the longest and smallest products that can be formed by selecting numbers from array.

2) Sort the array

3) Identify possible candidates for maximum product

4) Identify possible candidates for minimum product calculating maximum product.

* the two largest positive numbers are 10 & 14 =) $10 \times 11 = 110$

* The two smallest negative numbers are -9 & -8 , $-9 \times -8 = 72$

The maximum product is 110.

The largest positive & negative number is $11 \times -4 = -44$

The smallest negative numbers are $-9 \times -8 = 72$

-99 is smaller than 72 so

$$maximum = 110$$
$$minimum = -99.$$

2) Demonstrate the binary search method to search the key = 33 from array = $\{2, 5, 8, 12, 16, 23, 38, 56, 72, 91\}$

Given key = 33 and array = $\{2, 5, 8, 12, 16, 23, 38, 56, 72, 91\}$

1) initialize points

low = 0 & high = 9

Calculate mid = $\frac{low + high}{2} = \frac{6 + 4}{2} = 5$

compare arr[mid] with key:

arr[n] = 16

Since 16 < 23 update low = mid + 1 = 5.

Calculate mid = $\left(\frac{low + high}{2}\right) = \frac{5 + 9}{2} = 7$

compare arr[mid] with key

arr[7] = 56

Since 56 > 23 update high = mid - 1 = 6

arr[mid] = arr[5] = 23