

Algorithms - Assignment 1

Καζγκούτης Αθανάσιος Charbel Al Haddad
Παπαδόπουλος Δημήτριος-Λάζαρος

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Πρόβλημα 1

- Ερώτημα 1

```
1 function MajorityFinder(A[1...n])
2   majority_person = []
3   maxcount = 0
4   count
5   temp
6   for(i = 1 to n)
7     count = 0
8     temp = A[i]
9     for(j = 1 to n)
10      if(temp == A[j])
11        count++
12      if(count > maxcount)
13        maxcount = count
14        majority_person[1] = temp
15        majority_person[2] = null
16      else if(count == maxcount)
17        majority_person[2] = temp
18  if(maxcount ≥ ⌈ $\frac{n}{2}$ ⌉)
19    return majority_person
20  else
21    return "no person has the majority"
```

- Ερώτημα 2

Merge Sort

```
1 function mergesort(a[1...n])
2   if(n > 1)
3     return merge(mergesort(a[1...⌊ $\frac{n}{2}$ ⌋]), mergesort(a[⌊ $\frac{n}{2}$ ⌋ + 1 ... n]))
4   else
5     return a

1 function merge(x[1...k], y[1...l])
2   if(k = 0)
3     return y[1...l]
4   if(l = 0)
5     return x[1...k]
6   if(x[1] ≥ y[1])
7     return x[1] ◦ merge(x[2...k], y[1...l])
8   else
9     return y[1] ◦ merge(x[1...k], y[2...l])
```

```

1 function MajorityFinder2(A[1...n])
2   majority_person = []
3   mergesort(A)
4   for (i = 1 to n)
5     if (A[i] == A[⌈ $\frac{n}{2}$ ⌉ - 1 + i])
6       if (majority_person[1] == null)
7         majority_person[1] = A[i]
8       else
9         majority_person[2] = A[i]
10  return majority_person

```

- Ερώτημα 3

```

1 function MajorityFinder3(A[1...n])
2   majority_person = []
3   HashMap T
4   for (i = 1 to n)
5     if (T.search(A[i]) == true)
6       T[A[i]] = T[A[i]] + 1
7     else
8       T.put([A[i], 1)
9     if (T[A[i]] ≥ ⌈ $\frac{n}{2}$ ⌉)
10      if (majority_person[1] == null)
11        majority_person[1] = A[i]
12      else
13        majority_person[2] = A[i]
14  return majority_person

```

Πρόβλημα 2

- Ερώτημα 1

Algorithm 1

Έστω πίνακας T με στοιχεία n θετικών ακεραιών με εύρος [0,...,k] (k ακέραιος)

```

1  for i = 0,...,k do
2    H[i] = 0
3  end for
4  for j = 1,...,n do
5    H[T[j]] = H[T[j]] + 1
6  end for
7  for i = 1,...,k do
8    H[i] = H[i] + H[i - 1]
9  end for
10 for j = n,...,1 do
11   S[H[T[j]]] = T[j]
12   H[T[j]] = H[T[j]] - 1
13 end for

```

1	2	3	4	5	6
1	1	1	1	1	1

- Ερώτημα 2