

Illustration of illustration

Illustrate QuickSelect(A, 8) where $A = \{9, 3, 5, 1, 4, 2, 7, 6, 8, 10, 11\}$. Please use “median of the three” to pick your pivot and show details as in your class notes. (otherwise, no credit).

$k = 8$.

First = A[0] = 9, last = A[10] = 11, middle value = A[(0 + 10)/2] = A[5] = 2.

So the median of three values $\{9, 11, 2\}$ is 9. Hence the pivot = 9.

Swap pivot and last

11 3 5 1 4 2 7 6 8 10 9

```
i      j      j      //move l and j
```

8 3 5 1 4 2 7 6 11 10 9 //swap A[i], A[j]

i	j	//i++,j--
1	1	1
1	2	1
1	3	1
1	4	1
1	5	1
1	6	1
1	7	1
1	8	1
1	9	1
1	10	1
1	11	1
1	12	1
1	13	1
1	14	1
1	15	1
1	16	1
1	17	1
1	18	1
1	19	1
1	20	1
1	21	1
1	22	1
1	23	1
1	24	1
1	25	1
1	26	1
1	27	1
1	28	1
1	29	1
1	30	1
1	31	1
1	32	1
1	33	1
1	34	1
1	35	1
1	36	1
1	37	1
1	38	1
1	39	1
1	40	1
1	41	1
1	42	1
1	43	1
1	44	1
1	45	1
1	46	1
1	47	1
1	48	1
1	49	1
1	50	1
1	51	1
1	52	1
1	53	1
1	54	1
1	55	1
1	56	1
1	57	1
1	58	1
1	59	1
1	60	1
1	61	1
1	62	1
1	63	1
1	64	1
1	65	1
1	66	1
1	67	1
1	68	1
1	69	1
1	70	1
1	71	1
1	72	1
1	73	1
1	74	1
1	75	1
1	76	1
1	77	1
1	78	1
1	79	1
1	80	1
1	81	1
1	82	1
1	83	1
1	84	1
1	85	1
1	86	1
1	87	1
1	88	1
1	89	1
1	90	1
1	91	1
1	92	1
1	93	1
1	94	1
1	95	1
1	96	1
1	97	1
1	98	1
1	99	1
1	100	1
2	1	1
2	2	1
2	3	1
2	4	1
2	5	1
2	6	1
2	7	1
2	8	1
2	9	1
2	10	1
2	11	1
2	12	1
2	13	1
2	14	1
2	15	1
2	16	1
2	17	1
2	18	1
2	19	1
2	20	1
2	21	1
2	22	1
2	23	1
2	24	1
2	25	1
2	26	1
2	27	1
2	28	1
2	29	1
2	30	1
2	31	1
2	32	1
2	33	1
2	34	1
2	35	1
2	36	1
2	37	1
2	38	1
2	39	1
2	40	1
2		

```
8   3   5   1   4   2   7   6   11  10  9   // move l and j
```

j i

```
[8  3  5  1  4  2  7  6][ 9 ][ 10 11] //swap A[i], pivot
```

 $|L| = 8. \quad |E| = 1. \quad |G| = 2.$

Since $|L| = 8 \leq k$, k remains as 8.

Recursive call QuickSelect(L, 8).

8 3 5 1 4 2 7 6

First = $A[0] = 8$, last = $A[7] = 6$, middle value = $A[(0 + 7)/2] = A[3] = 1$. So the median of three values $\{8, 6, 1\}$ is 6. Hence the pivot = 6.

Swap pivot and last

```

8   3   5   1   4   2   7   6
i                                     j <- j           //move l and j
2   3   5   1   4   8   7   6           //swap A[i], A[j]
2   3   5   1   4   8   7   6
      i               j           //i++, j--
2   3   5   1   4   8   7   6
                        j   l           //move l and j
[2   3   5   1   4 ] [ 6 ] [ 7   8]           //swap A[i], pivot

```

$|L| = 5$. $|E| = 1$. $|G| = 2$. Since $|L| + |E| = 6 < k = 8$, the k value changes to $k - (|L| + |E|) = 8 - 6 = 2$.

Recursive call QuickSelect(G , 2).

```

7   8

```

First = $A[7] = 7$, last = $A[8] = 8$, middle value = $A[(7 + 8)/2] = A[7] = 7$. So the median of three values $\{7, 8, 7\}$ is 7. Hence the pivot = 7.

Swap pivot and last

```

8   7

```

```

l j           //move l and j.

```

```

J ←

```

```

[7] [ 8]           //swap A[i], pivot

```

$|L| = 0$. $|E| = 1$. $|G| = 1$.

Since $|L| + |E| = 1 < k = 2$, the k value changes to

$k - (|L| + |E|) = 2 - 1 = 1$.

Recursive call `QuickSelect(G, 1)` returns 8 since G has only one item.