**QUICK SORT- RANDOMIZED**

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| **def quick\_sort(A, p, r):** | **QUICKSORT(A, p, r)** |
| if p < r:  q = patition\_randomized (A, p, r)  quick\_sort(A, p, q-1)  quick\_sort(A, q+1, r) | If p < r  q = RANDOMIZED\_PARTITION(A, p, r)  QUICKSORT(A, p, q-1)  QUICKSORT(A, q+1, r) |
| **def patition\_randomized(A, p, r):** | **RANDOMIZED-PARTITION(A, p, r)** |
| i = random.randint(p, r)  A[r], A[i] = A[i], A[r]  return partition(A, p, r) | i = Random (p, r)  exchange A[i] with A[r]  return PARTITION(A, p, r) |
| **def partition(A, p, r):** | **PARTITION(A, p, r)** |
| x = A[r]  i = p - 1  for j in range(p,r):  if A[j] <= x:  i += 1  A[i], A[j] = A[j], A[i]  A[i+1], A[r] = A[r], A[i+1]  return i+1 | x = A[r]  i = p – 1  for j = p to r – 1  if A[j] ≤ x  i = i +1  exchange A[i] with A[j]  exchange A[i+1] with A[r]  return i+1 |