Correctness of the "Partition" function (slide 4, lecture 6).

Key to showing correctness is defining a "Loop Invariant" and getting this perfect.

"Loop Invariant" (before entering loop in lines 3-6, for any j):

"i is less than j. The items with values $>\text{pivot}$ of $A(p...j-1)$ are exactly those items currently stored in $A(i+1...j-1)$.

Base Case: $j = p, i = p - 1$. Both ranges empty.

Induction Step:

If $(A[j] > \text{pivot})$

Just extend range (having the new $j$)

If $(A[j] \leq \text{pivot})$

Swap (to bring $\leq \text{pivot}$ value into left side of range then move $i$ right to exclude it.

Termination

$A(p) = A(r) = \text{pivot}$. Swap with $A(i+1)$, first item not $\leq \text{pivot}$. 