Quick Sort

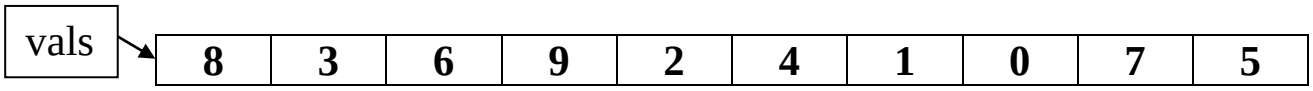
```
// Pre-condition: low and high are value indices into numbers.
// Post-condition: The values in numbers will be sorted in between
//                 indices low and high
void quicksort(int* numbers, int low, int high) {

    // Only have to sort if we are sorting more than one number
    if (low < high) {
        int split = partition(numbers,low,high);

        quicksort(_____________________________________________________);

        quicksort(_____________________________________________________);
    }
}

// Swaps the values pointed to by a and b.
void swap(int *a, int *b) {
     int temp = *a;
     *a = *b;
     *b = temp;
}
```



If we call quicksort(vals, 0, 9) (assume 6 is the partition element) fill in split and what the following recursive calls would contain:

```
split = _____________________________
quicksort(_____________________________)
quicksort(_____________________________)
```

Quick Sort

vals →

8	3	6	9	2	4	1	0	7	5

Assume the 1st time partition is called, i = 2. Show the contents of vals after each iteration of the while loop:

After 1st Loop:

After 2nd Loop:

After 3rd Loop:

After putting partition in the right spot:


```
// Returns the partition index such that all the values stored in vals from low
// to partition are < partition & all the vals from partition to high are > .
int partition(int* vals, int low, int high) {
    int temp;
    int i, lowpos;

    if (low == high) return low;  // A base case that should never really occur.

    // Pick a random partition element and swap it into index low.
    i = low + rand()%(high-low+1);
    temp = vals[i];
    vals[i] = vals[low];
    vals[low] = temp;

     lowpos = low;    // Store the index of the partition element.

     low++;     // Update our low pointer.

     while (low <= high) {
          // Move the low pointer until we find a value too large for this side.
          while (_____________________________________________) low++;

          // Move high until we find a value too small for this side.
          while (_____________________________________________) high--;

          if (low < high)  // Swap the two values that were on the wrong side.
             swap(&vals[low], &vals[high]);
     }
     swap(&vals[lowpos], &vals[high]);  // Swap partition into right spot.

     return high; // Return the index of the partition element.
}
```