Module 6 Problem Set Hsuan-You(Shaun) Lin

1. My Answer: 9
My reason:

1st Iteration:

use as pivot
3 17 -5 4 13 8 7 6 9
3 -5 17 4 13 8 7 6 9
-5 3 17 4 13 8 7 6 9

2nd Iteration:

use as pivot
-5 3 17 4 13 8 7 6 9
-5 3 9 4 13 8 7 6 17

3rd Iteration:

use as pivot
-5 3 9 4 13 8 7 6 17
-5 3 9 4 6 8 7 13 17
-5 3 7 4 6 8 9 13 17
↳ the 7th smallest element.

⇒ The 7th smallet element is 9. #

2. My Answer: 6
My reason:

1st Iteration:
use as pivot
9 8 6 4 -100
-100 8 6 4 9

2nd Iteration:
use as pivot
-100 8 6 4 9
↳ No swapped, because -100 is the smallest element.

3rd Iteration:
use as pivot
-100 8 6 4 9
-100 4 6 8 9

4th Iteration:
use as pivot
-100 4 6 8 9
↳ No swapped, because 4 is the smallest element.

5th Iteration:
use as pivot (The median of the array.)
-100 4 6 8 9
↳ No swapped, because it's the only one element.

⇒ 6 is the median element in this array. #

3. My Answer:
My reason:

The possible pivot elements should bigger than all numbers in the left.

3 is impossible, because 1 is smaller but it's on the right partition.

1 is impossible, because 3 is bigger but it's on the left partition.

2 is impossible, because 3 is bigger but it's on the left partition.

4 and 5 is possible, because two partition are valid.

8 is impossible, because 6 is smaller but it's on the right partition.

7 is impossible, because 6 is smaller but it's on the right partition.

6 is impossible, because 8 is bigger but it's on the left partition.

9 is possible, because two partition are valid.

∴ The possible pivot elements are 4, 5, 9. #

4. My Answer: [0, 1, 1, 1, 3]
My reason:

Step 1:
1, 2, 3, 4, 5
↳ 0th index is swapped with the 0th.

Step 2:
1, 2, 3, 4, 5
↳ 1st index is swapped with the 1st.

Step 3:
1, 3, 2, 4, 5
↳ 2nd index is swapped with the 1st.

Step 4:
1, 4, 2, 3, 5
↳ 3rd index is swapped with the 1st.

Step 5:
1, 4, 2, 5, 3
↳ 4th index is swapped with the 3rd.

∴ The sequence from the random number generate is 0th, 1st, 1st, 1st, 3rd, which is [0, 1, 1, 1, 3] #

5. My Answer: (a) 27 (b) 6 (c) As explained below

My reason

(a)

Always N possible exchange, so total number of permutations is N^N

$\therefore 3^3 = 27$

$\therefore$ The total number of permutations is 27. #

(b)

Outer loop runs N times, and i possibilities, so total number of permutations is $N!$

$\therefore 3! = 6$

$\therefore$ The total number of permutations is 6. #

(c)

KFY shuffling algorithm generated 6 permutations, and it's equal to the number of combinations, which means an even distribution.

Faulty algorithm generated 27 permutations, which means outcomes are not evenly distributed.