Quach Duc Thien
23020161
Exercise 2:

1. Selection sort

    a) **Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**

        i.   Current index: 1 Min index from 1 to 10: 1, Swap 1 1

        ii.   [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        iii. Current index: 2 Min index from 2 to 10: 2, Swap 2 2

        iv. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        v.   Current index: 3 Min index from 3 to 10: 3, Swap 3 3

        vi. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        vii. Current index: 4 Min index from 4 to 10: 4, Swap 4 4

        viii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        ix. Current index: 5 Min index from 5 to 10: 5, Swap 5 5

        x.   [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xi. Current index: 6 Min index from 6 to 10: 6, Swap 6 6

        xii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xiii. Current index: 7 Min index from 7 to 10: 7, Swap 7 7

        xiv. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xv. Current index: 8 Min index from 8 to 10: 8, Swap 8 8

        xvi. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xvii. Current index: 9 Min index from 9 to 10: 9, Swap 9 9

        xviii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xix. Current index: 10 Min index from 10 to 10: 10, Swap 10 10

        xx. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

    b) **Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]**

        i.   Original array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]

        ii.   Current index: 1 Min index from 1 to 10: 10, Swap 10 1

        iii. [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]

        iv. Current index: 2 Min index from 2 to 10: 9, Swap 9 2

        v.   [1, 9, 8, 7, 6, 5, 4, 3, 2, 10]

        vi. Current index: 3 Min index from 3 to 10: 8, Swap 8 3

        vii. [1, 2, 8, 7, 6, 5, 4, 3, 9, 10]

        viii. Current index: 4 Min index from 4 to 10: 7, Swap 7 4

        ix. [1, 2, 3, 7, 6, 5, 4, 8, 9, 10]

        x.   Current index: 5 Min index from 5 to 10: 6, Swap 6 5

        xi. [1, 2, 3, 4, 6, 5, 7, 8, 9, 10]

        xii. Current index: 6 Min index from 6 to 10: 6, Swap 6 6

        xiii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xiv. Current index: 7 Min index from 7 to 10: 7, Swap 7 7

        xv. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xvi. Current index: 8 Min index from 8 to 10: 8, Swap 8 8

        xvii.[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xviii. Current index: 9 Min index from 9 to 10: 9, Swap 9 9

        xix. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

        xx. Current index: 10 Min index from 10 to 10: 10, Swap 10 10

        xxi. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

    c) **Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]**

i. Original array: [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]
ii. Current index: 1 Min index from 1 to 10: 3, Swap 9 1
iii. [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]
iv. Current index: 2 Min index from 2 to 10: 4, Swap 10 2
v. [1, 10, 9, 2, 3, 4, 5, 6, 7, 8]
vi. Current index: 3 Min index from 3 to 10: 5, Swap 9 3
vii. [1, 2, 9, 10, 3, 4, 5, 6, 7, 8]
viii. Current index: 4 Min index from 4 to 10: 6, Swap 10 4
ix. [1, 2, 3, 10, 9, 4, 5, 6, 7, 8]
x. Current index: 5 Min index from 5 to 10: 7, Swap 9 5
xi. [1, 2, 3, 4, 9, 10, 5, 6, 7, 8]
xii. Current index: 6 Min index from 6 to 10: 8, Swap 10 6
xiii. [1, 2, 3, 4, 5, 10, 9, 6, 7, 8]
xiv. Current index: 7 Min index from 7 to 10: 9, Swap 9 7
xv. [1, 2, 3, 4, 5, 6, 9, 10, 7, 8]
xvi. Current index: 8 Min index from 8 to 10: 10, Swap 10 8
xvii. [1, 2, 3, 4, 5, 6, 7, 10, 9, 8]
xviii. Current index: 9 Min index from 9 to 10: 9, Swap 9 9
xix. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
xx. Current index: 10 Min index from 10 to 10: 10, Swap 10 10
xxi. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

d) Array [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]
i. Original array: [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]
ii. Current index: 1 Min index from 1 to 10: 9, Swap 3 1
iii. [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]
iv. Current index: 2 Min index from 2 to 10: 10, Swap 4 2
v. [1, 4, 5, 6, 7, 8, 9, 10, 3, 2]
vi. Current index: 3 Min index from 3 to 10: 9, Swap 5 3
vii. [1, 2, 5, 6, 7, 8, 9, 10, 3, 4]
viii. Current index: 4 Min index from 4 to 10: 10, Swap 6 4
ix. [1, 2, 3, 6, 7, 8, 9, 10, 5, 4]
x. Current index: 5 Min index from 5 to 10: 9, Swap 7 5
xi. [1, 2, 3, 4, 7, 8, 9, 10, 5, 6]
xii. Current index: 6 Min index from 6 to 10: 10, Swap 8 6
xiii. [1, 2, 3, 4, 5, 8, 9, 10, 7, 6]
xiv. Current index: 7 Min index from 7 to 10: 9, Swap 9 7
xv. [1, 2, 3, 4, 5, 6, 9, 10, 7, 8]
xvi. Current index: 8 Min index from 8 to 10: 10, Swap 10 8
xvii. [1, 2, 3, 4, 5, 6, 7, 10, 9, 8]
xviii. Current index: 9 Min index from 9 to 10: 9, Swap 9 9
xix. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
xx. Current index: 10 Min index from 10 to 10: 10, Swap 10 10
xxi. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

2. Insertion sort
a) Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
xxii. Array already sorted no have to change
b) Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
xxiii. Current key: 9

xxiv.   Move: {10, 9}
xxv.   [10, 10, 8, 7, 6, 5, 4, 3, 2, 1]
xxvi.   Current key: 8
xxvii. Move: {10, 8} {9, 10}
xxviii. [9, 9, 10, 7, 6, 5, 4, 3, 2, 1]
xxix.   Current key: 7
xxx.   Move: {10, 7} {9, 10} {8, 9}
xxxi.   [8, 8, 9, 10, 6, 5, 4, 3, 2, 1]
xxxii. Current key: 6
xxxiii. Move: {10, 6} {9, 10} {8, 9} {7, 8}
xxxiv. [7, 7, 8, 9, 10, 5, 4, 3, 2, 1]
xxxv.   Current key: 5
xxxvi. Move: {10, 5} {9, 10} {8, 9} {7, 8} {6, 7}
xxxvii.   [6, 6, 7, 8, 9, 10, 4, 3, 2, 1]
xxxviii.   Current key: 4
xxxix. Move: {10, 4} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6}
xl.   [5, 5, 6, 7, 8, 9, 10, 3, 2, 1]
xli.   Current key: 3
xlii.   Move: {10, 3} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6} {4, 5}
xliii. [4, 4, 5, 6, 7, 8, 9, 10, 2, 1]
xliv.   Current key: 2
xlv.   Move: {10, 2} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6} {4, 5} {3, 4}
xlvi.   [3, 3, 4, 5, 6, 7, 8, 9, 10, 1]
xlvii. Current key: 1
xlviii. Move: {10, 1} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6} {4, 5} {3, 4} {2, 3}
xlix.   [2, 2, 3, 4, 5, 6, 7, 8, 9, 10]

c) Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]

l.   Current key: 10
li.   Move:
lii.   [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]
liii.   Current key: 1
liv.   Move: {10, 1} {9, 10}
lv.   [9, 9, 10, 2, 3, 4, 5, 6, 7, 8]
lvi.   Current key: 2
lvii.   Move: {10, 2} {9, 10}
lviii. [1, 9, 9, 10, 3, 4, 5, 6, 7, 8]
lix.   Current key: 3
lx.   Move: {10, 3} {9, 10}
lxi.   [1, 2, 9, 9, 10, 4, 5, 6, 7, 8]
lxii.   Current key: 4
lxiii. Move: {10, 4} {9, 10}
lxiv.   [1, 2, 3, 9, 9, 10, 5, 6, 7, 8]
lxv.   Current key: 5
lxvi.   Move: {10, 5} {9, 10}
lxvii. [1, 2, 3, 4, 9, 9, 10, 6, 7, 8]
lxviii. Current key: 6
lxix.   Move: {10, 6} {9, 10}
lxx.   [1, 2, 3, 4, 5, 9, 9, 10, 7, 8]
lxxi.   Current key: 7

lxxii. Move: {10, 7} {9, 10}

lxxiii. [1, 2, 3, 4, 5, 6, 9, 9, 10, 8]

lxxiv. Current key: 8

lxxv. Move: {10, 8} {9, 10}

lxxvi. [1, 2, 3, 4, 5, 6, 7, 9, 9, 10]

d) Array [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

lxxvii. Original array: [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

lxxviii.   Current key: 4

lxxix. Move:

lxxx. [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

lxxxi. Current key: 5

lxxxii. Move:

lxxxiii.   [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

lxxxiv.   Current key: 6

lxxxv. Move:

lxxxvi.   [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

lxxxvii.   Current key: 7

lxxxviii.   Move:

lxxxix.   [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

xc. Current key: 8

xci. Move:

xcii. [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

xciii. Current key: 9

xciv. Move:

xcv. [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

xcvi. Current key: 10

xcvii. Move:

xcviii. [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

xcix. Current key: 1

c. Move: {10, 1} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6} {4, 5} {3, 4}

ci. [3, 3, 4, 5, 6, 7, 8, 9, 10, 2]

cii. Current key: 2

ciii. Move: {10, 2} {9, 10} {8, 9} {7, 8} {6, 7} {5, 6} {4, 5} {3, 4}

civ. [1, 3, 3, 4, 5, 6, 7, 8, 9, 10]

3. Bubble sort

a) Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

cv. Original array: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

cvi. Array after 1 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

cvii. Swap not happened in iteration 1

cviii.   Array is already sorted

b) Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]

cix. Original array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]

cx. Step 1: Swap 10 9

cxi. Step 2: Swap 10 8

cxii. Step 3: Swap 10 7

cxiii.   Step 4: Swap 10 6

cxiv.   Step 5: Swap 10 5

cxv. Step 6: Swap 10 4

cxvi.   Step 7: Swap 10 3

cxvii.   Step 8: Swap 10 2

cxviii.   Step 9: Swap 10 1

cxix.   Array after 1 iteration: [9, 8, 7, 6, 5, 4, 3, 2, 1, 10]

cxx. Step 10: Swap 9 8

cxxi.   Step 11: Swap 9 7

cxxii.   Step 12: Swap 9 6

cxxiii.   Step 13: Swap 9 5

cxxiv.   Step 14: Swap 9 4

cxxv.   Step 15: Swap 9 3

cxxvi.   Step 16: Swap 9 2

cxxvii. Step 17: Swap 9 1

cxxviii.   Array after 2 iteration: [8, 7, 6, 5, 4, 3, 2, 1, 9, 10]

cxxix.   Step 18: Swap 8 7

cxxx.   Step 19: Swap 8 6

cxxxi.   Step 20: Swap 8 5

cxxxii. Step 21: Swap 8 4

cxxxiii.   Step 22: Swap 8 3

cxxxiv.   Step 23: Swap 8 2

cxxxv. Step 24: Swap 8 1

cxxxvi.   Array after 3 iteration: [7, 6, 5, 4, 3, 2, 1, 8, 9, 10]

cxxxvii.   Step 25: Swap 7 6

cxxxviii.   Step 26: Swap 7 5

cxxxix.   Step 27: Swap 7 4

cxl. Step 28: Swap 7 3

cxli. Step 29: Swap 7 2

cxlii.   Step 30: Swap 7 1

cxliii.   Array after 4 iteration: [6, 5, 4, 3, 2, 1, 7, 8, 9, 10]

cxliv.   Step 31: Swap 6 5

cxlv.   Step 32: Swap 6 4

cxlvi.   Step 33: Swap 6 3

cxlvii.   Step 34: Swap 6 2

cxlviii.   Step 35: Swap 6 1

cxlix.   Array after 5 iteration: [5, 4, 3, 2, 1, 6, 7, 8, 9, 10]

cl.   Step 36: Swap 5 4

cli. Step 37: Swap 5 3

clii. Step 38: Swap 5 2

cliii. Step 39: Swap 5 1

cliv. Array after 6 iteration: [4, 3, 2, 1, 5, 6, 7, 8, 9, 10]

clv. Step 40: Swap 4 3

clvi. Step 41: Swap 4 2

clvii.   Step 42: Swap 4 1

clviii.   Array after 7 iteration: [3, 2, 1, 4, 5, 6, 7, 8, 9, 10]

clix. Step 43: Swap 3 2

clx. Step 44: Swap 3 1

clxi. Array after 8 iteration: [2, 1, 3, 4, 5, 6, 7, 8, 9, 10]

clxii.   Step 45: Swap 2 1

clxiii.   Array after 9 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

clxiv.   Array after 10 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

clxv.   Swap not happened in iteration 10

clxvi. Array is already sorted

clxvii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

c) Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]

clxviii.   Original array: [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]

clxix. Step 1: Swap 10 1

clxx.   Step 2: Swap 10 2

clxxi. Step 3: Swap 10 3

clxxii. Step 4: Swap 10 4

clxxiii.   Step 5: Swap 10 5

clxxiv. Step 6: Swap 10 6

clxxv. Step 7: Swap 10 7

clxxvi. Step 8: Swap 10 8

clxxvii.   Array after 1 iteration: [9, 1, 2, 3, 4, 5, 6, 7, 8, 10]

clxxviii.   Step 9: Swap 9 1

clxxix. Step 10: Swap 9 2

clxxx. Step 11: Swap 9 3

clxxxi. Step 12: Swap 9 4

clxxxii.   Step 13: Swap 9 5

clxxxiii.   Step 14: Swap 9 6

clxxxiv.   Step 15: Swap 9 7

clxxxv.   Step 16: Swap 9 8

clxxxvi.   Array after 2 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

clxxxvii.   Array after 3 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

clxxxviii.   Swap not happened in iteration 3

clxxxix.   Array is already sorted

d) Array [3, 4, 5, 6, 7, 8, 10, 1, 2]

cxc. Original array: [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

cxci. Step 1: Swap 10 1

cxcii. Step 2: Swap 10 2

cxciii. Array after 1 iteration: [3, 4, 5, 6, 7, 8, 9, 1, 2, 10]

cxciv. Step 3: Swap 9 1

cxcv. Step 4: Swap 9 2

cxcvi. Array after 2 iteration: [3, 4, 5, 6, 7, 8, 1, 2, 9, 10]

cxcvii. Step 5: Swap 8 1

cxcviii.   Step 6: Swap 8 2

cxcix. Array after 3 iteration: [3, 4, 5, 6, 7, 1, 2, 8, 9, 10]

cc.   Step 7: Swap 7 1

cci.   Step 8: Swap 7 2

ccii. Array after 4 iteration: [3, 4, 5, 6, 1, 2, 7, 8, 9, 10]

cciii.   Step 9: Swap 6 1

cciv. Step 10: Swap 6 2

ccv. Array after 5 iteration: [3, 4, 5, 1, 2, 6, 7, 8, 9, 10]

ccvi. Step 11: Swap 5 1

ccvii.   Step 12: Swap 5 2

ccviii. Array after 6 iteration: [3, 4, 1, 2, 5, 6, 7, 8, 9, 10]

ccix. Step 13: Swap 4 1

ccx. Step 14: Swap 4 2

ccxi. Array after 7 iteration: [3, 1, 2, 4, 5, 6, 7, 8, 9, 10]

ccxii.   Step 15: Swap 3 1
ccxiii. Step 16: Swap 3 2
ccxiv.   Array after 8 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
ccxv.   Array after 9 iteration: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
ccxvi.   Swap not happened in iteration 9
ccxvii. Array is already sorted
ccxviii.   [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

4. Merge sort
a) **Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**
   i.   Current range: 1 2
   ii.   Push 1 to list
   iii. [1, 2]
   iv.   Current range: 1 3
   v.   Push 1 to list
   vi.   Push 2 to list
   vii. [1, 2, 3]
   viii. Current range: 4 5
   ix.   Push 4 to list
   x.   [4, 5]
   xi.   Current range: 1 5
   xii. Push 1 to list
   xiii. Push 2 to list
   xiv. Push 3 to list
   xv.   [1, 2, 3, 4, 5]
   xvi. Current range: 6 7
   xvii. Push 6 to list
   xviii. [6, 7]
   xix. Current range: 6 8
   xx.   Push 6 to list
   xxi. Push 7 to list
   xxii. [6, 7, 8]
   xxiii.   Current range: 9 10
   xxiv.   Push 9 to list
   xxv. [9, 10]
   xxvi.   Current range: 6 10
   xxvii.   Push 6 to list
   xxviii. Push 7 to list
   xxix.   Push 8 to list
   xxx. [6, 7, 8, 9, 10]
   xxxi.   Current range: 1 10
   xxxii.   Push 1 to list
   xxxiii. Push 2 to list
   xxxiv.   Push 3 to list
   xxxv.   Push 4 to list
   xxxvi.   Push 5 to list
   xxxvii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
b) **Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]**
   i. Current range: 1 2

ii. Push 9 to list
iii. [9, 10]
iv. Current range: 1 3
v. Push 8 to list
vi. [8, 9, 10]
vii. Current range: 4 5
viii. Push 6 to list
ix. [6, 7]
x. Current range: 1 5
xi. Push 6 to list
xii. Push 7 to list
xiii. [6, 7, 8, 9, 10]
xiv. Current range: 6 7
xv. Push 4 to list
xvi. [4, 5]
xvii. Current range: 6 8
xviii. Push 3 to list
xix. [3, 4, 5]
xx. Current range: 9 10
xxi. Push 1 to list
xxii. [1, 2]
xxiii. Current range: 6 10
xxiv. Push 1 to list
xxv. Push 2 to list
xxvi. [1, 2, 3, 4, 5]
xxvii. Current range: 1 10
xxviii. Push 1 to list
xxix. Push 2 to list
xxx. Push 3 to list
xxxi. Push 4 to list
xxxii. Push 5 to list
xxxiii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

c) Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]
i. Current range: 1 2
ii. Push 9 to list
iii. [9, 10]
iv. Current range: 1 3
v. Push 1 to list
vi. [1, 9, 10]
vii. Current range: 4 5
viii. Push 2 to list
ix. [2, 3]
x. Current range: 1 5
xi. Push 1 to list
xii. Push 2 to list
xiii. Push 3 to list
xiv. [1, 2, 3, 9, 10]
xv. Current range: 6 7
xvi. Push 4 to list

xvii. [4, 5]

xviii. Current range: 6 8

xix. Push 4 to list

xx. Push 5 to list

xxi. [4, 5, 6]

xxii. Current range: 9 10

xxiii. Push 7 to list

xxiv. [7, 8]

xxv. Current range: 6 10

xxvi. Push 4 to list

xxvii. Push 5 to list

xxviii. Push 6 to list

xxix. [4, 5, 6, 7, 8]

xxx. Current range: 1 10

xxxi. Push 1 to list

xxxii. Push 2 to list

xxxiii. Push 3 to list

xxxiv. Push 4 to list

xxxv. Push 5 to list

xxxvi. Push 6 to list

xxxvii. Push 7 to list

xxxviii. Push 8 to list

xxxix. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

d) Array [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

i. Current range: 1 2

ii. Push 3 to list

iii. [3, 4]

iv. Current range: 1 3

v. Push 3 to list

vi. Push 4 to list

vii. [3, 4, 5]

viii. Current range: 4 5

ix. Push 6 to list

x. [6, 7]

xi. Current range: 1 5

xii. Push 3 to list

xiii. Push 4 to list

xiv. Push 5 to list

xv. [3, 4, 5, 6, 7]

xvi. Current range: 6 7

xvii. Push 8 to list

xviii. [8, 9]

xix. Current range: 6 8

xx. Push 8 to list

xxi. Push 9 to list

xxii. [8, 9, 10]

xxiii. Current range: 9 10

xxiv. Push 1 to list

xxv. [1, 2]

xxvi. Current range: 6 10
xxvii. Push 1 to list
xxviii. Push 2 to list
xxix. [1, 2, 8, 9, 10]
xxx. Current range: 1 10
xxxi. Push 1 to list
xxxii. Push 2 to list
xxxiii. Push 3 to list
xxxiv. Push 4 to list
xxxv. Push 5 to list
xxxvi. Push 6 to list
xxxvii. Push 7 to list
xxxviii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

5. Quick sort

a) Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

ccxix. Current range: [1 10]
ccxx.   Current pivot: 5
ccxxi. Swap 5 5
ccxxii. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
ccxxiii.   Current range: [1 4]
ccxxiv.   Current pivot: 2
ccxxv. Swap 2 2
ccxxvi.   [1, 2, 3, 4]
ccxxvii.   Current range: [3 4]
ccxxviii.   Current pivot: 3
ccxxix.   Swap 3 3
ccxxx. [3, 4]
ccxxxi.   Current range: [6 10]
ccxxxii.   Current pivot: 8
ccxxxiii.   Swap 8 8
ccxxxiv.   [6, 7, 8, 9, 10]
ccxxxv.   Current range: [6 7]
ccxxxvi.   Current pivot: 6
ccxxxvii.   Swap 6 6
ccxxxviii.   [6, 7]
ccxxxix.   Current range: [9 10]
ccxl. Current pivot: 9
ccxli.   Swap 9 9
ccxlii. [9, 10]

b) Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]

ccxliii. Current range: [1 10]
ccxliv. Current pivot: 6
ccxlv. Swap 10 1
ccxlvi. Swap 9 2
ccxlvii.   Swap 8 3
ccxlviii.   Swap 7 4
ccxlix. Swap 6 5

ccl. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
ccli. Current range: [1 5]
cclii. Current pivot: 3
ccliii. Swap 3 3
ccliv. [1, 2, 3, 4, 5]
cclv. Current range: [1 2]
cclvi. Current pivot: 1
cclvii. Swap 1 1
cclviii. [1, 2]
cclix. Current range: [4 5]
cclx. Current pivot: 4
cclxi. Swap 4 4
cclxii. [4, 5]
cclxiii. Current range: [6 10]
cclxiv. Current pivot: 8
cclxv. Swap 8 8
cclxvi. [6, 7, 8, 9, 10]
cclxvii. Current range: [6 7]
cclxviii. Current pivot: 6
cclxix. Swap 6 6
cclxx. [6, 7]
cclxxi. Current range: [9 10]
cclxxii. Current pivot: 9
cclxxiii. Swap 9 9
cclxxiv. [9, 10]
cclxxv. [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

e) Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]

i. Current range: [1 10]
ii. Current pivot: 3
iii. Swap 9 3
iv. Swap 10 2
v. [3, 2, 1, 10, 9, 4, 5, 6, 7, 8]
vi. Current range: [1 3]
vii. Current pivot: 2
viii. Swap 3 1
ix. Swap 2 2
x. [1, 2, 3]
xi. Current range: [4 10]
xii. Current pivot: 5
xiii. Swap 10 5
xiv. Swap 9 4
xv. [5, 4, 9, 10, 6, 7, 8]
xvi. Current range: [4 5]
xvii. Current pivot: 5
xviii. Swap 5 4
xix. [4, 5]
xx. Current range: [6 10]
xxi. Current pivot: 6
xxii. Swap 9 6

xxiii. [6, 10, 9, 7, 8]

xxiv. Current range: [7 10]

xxv. Current pivot: 9

xxvi. Swap 10 8

xxvii. Swap 9 7

xxviii. [8, 7, 9, 10]

xxix. Current range: [7 8]

xxx. Current pivot: 8

xxxi. Swap 8 7

xxxii. [7, 8]

xxxiii. Current range: [9 10]

xxxiv. Current pivot: 9

xxxv. Swap 9 9

xxxvi. [9, 10]

f) Array [3, 4, 5, 6, 7, 8, 10, 1, 2]

i. Original array: [3, 4, 5, 6, 7, 8, 9, 10, 1, 2]

ii. Current range: [1 10]

iii. Current pivot: 7

iv. Swap 7 2

v. Swap 8 1

vi. [3, 4, 5, 6, 2, 1, 9, 10, 8, 7]

vii. Current range: [1 6]

viii. Current pivot: 5

ix. Swap 5 1

x. Swap 6 2

xi. [3, 4, 1, 2, 6, 5]

xii. Current range: [1 4]

xiii. Current pivot: 4

xiv. Swap 4 2

xv. [3, 2, 1, 4]

xvi. Current range: [1 3]

xvii. Current pivot: 2

xviii. Swap 3 1

xix. Swap 2 2

xx. [1, 2, 3]

xxi. Current range: [5 6]

xxii. Current pivot: 6

xxiii. Swap 6 5

xxiv. [5, 6]

xxv. Current range: [7 10]

xxvi. Current pivot: 10

xxvii. Swap 10 7

xxviii. [9, 7, 8, 10]

xxix. Current range: [7 9]

xxx. Current pivot: 7

xxxi. Swap 9 7

xxxii. [7, 9, 8]

xxxiii. Current range: [8 9]

xxxiv. Current pivot: 9

6. Heap sort

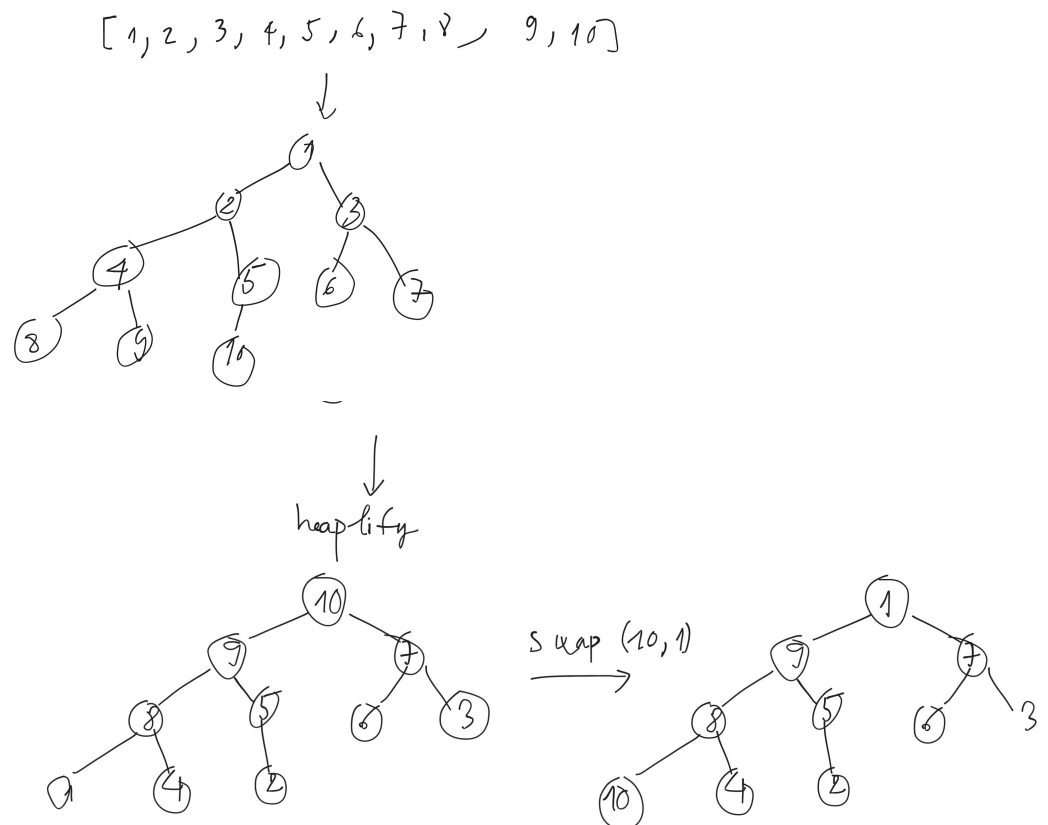**g)** **Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**

h) **Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]**

i) **Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]**

j) **Array [3, 4, 5, 6, 7, 8, 10, 1, 2]**

Reapeat ...
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

7. Radix sort

k) **Array [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]**

l) **Array [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]**

m) **Array [9, 10, 1, 2, 3, 4, 5, 6, 7, 8]**

n) **Array [3, 4, 5, 6, 7, 8, 10, 1, 2]**

The last digit row :

10	1	2	3		5	6	7	8	9
0	1	2	3	4	5	6	7	8	9

Continue with next digit :

9									
8									
7									
6									
5									
3									
2									
1	10								
0	1	2	3	4	5	6	7	8	9

sorted array

1	2	3	5	6	7	8	9	10