

Part 1: Tracing Algorithm by hand

Insertion Sort

random = [D, X, A, B, Y, C, Z]

iteration 0: $\overset{\text{sorted}}{[D]} \mid \overset{\text{unsorted}}{X, A, B, Y, C, Z}$

iteration 1: $\overset{\text{sorted}}{[D, X]} \mid \overset{\text{unsorted}}{A, B, Y, C, Z}$

iteration 2: $\overset{\text{sorted}}{[A, D, X]} \mid \overset{\text{unsorted}}{B, Y, C, Z}$

iteration 3: $\overset{\text{sorted}}{[A, B, D, X]} \mid \overset{\text{unsorted}}{Y, C, Z}$

iteration 4: $\overset{\text{sorted}}{[A, B, D, X, Y]} \mid \overset{\text{unsorted}}{C, Z}$

iteration 5: $\overset{\text{sorted}}{[A, B, C, D, X, Y]} \mid \overset{\text{unsorted}}{Z}$

iteration 6: $\overset{\text{sorted}}{[A, B, C, D, X, Y, Z]} \mid \overset{\text{unsorted}}{}$

Sorted = [a, b, c, d, x, y, z]

iteration 0: ^{sorted} [a | ^{unsorted} b, c, d, x, y, z]

iteration 1 : [a, (b) | c, d, x, y, z]

iteration 2 : [a, b, (c) | d, x, y, z]

iteration 3 : [a, b, c, (d) | x, y, z]

iteration 4: [a, b, c, d, (x) | y, z]

iteration 5: [a, b, c, d, x, (y) | z]

iteration 6: [a, b, c, d, x, y, (z)]

reversed = [z, y, x, D, C, B, A]

sorted unsorted

iteration 0: [z | y, x, D, C, B, A]

iteration 1: [y, z | x, D, C, B, A]

iteration 2: [x, y, z | D, C, B, A]

iteration 3: [D, x, y, z | C, B, A]

iteration 4: [C, D, x, y, z | B, A]

iteration 5: [B, C, D, x, y, z | A]

iteration 6: [A, B, C, D, x, y, z]

Sorted = [A, B, C, D, x, y, z]

[A, B, C, D, x, y, z]

Pivot = A

B, C, D, x, y, z, A

↑

i, j

A, C, D, x, y, z, B

pivot C

D, x, y, z, B, C

↑

↑

B, x, y, z, D, C

↑

↑

j

i

B, C, x, y, z, D

↓

pivot x

B

y, z, D, x

↑

↑

D, z, y, x

↑

↑

j

i

D, x, z, y

↓

pivot z

D

y, z

↓

↑

↑

↑

↑

↑

↑

↑

↑

A, B, C, D, x, y, z

reversed = [z, y, x, d, c, b, a]

z, y, x, d, c, b, a

pivot = z

y, x, d, c, b, a, z

↑ ↑
j i

y, x, d, c, b, a, z

pivot = y ↓

x, d, c, b, a, y

↑ ↑
j i

pivot = x ↓

d, c, b, a, x

pivot = d ↓

c, b, a, d

↓ pivot = c

b, a, c

↓ pivot = b

a, b

↓
a

↓
b

↓
c

↓
d

↓
x

↓
y

a, b, c, d, x, y, z

Cocktail Sort

random = [D, x, H, B, Y, C, z]

Iteration 0: [D, x, H, B, Y, C, z]

x, z 3
D, A, B, x, C, y, z
↑ ↑ ↑

Iteration 1: [D, H, B, x, C, y, z] , 3 swaps
forward

iteration 2: [A, D, B, C, x, y, z]
backward

x, z
H, D, B, C, x, y, z
↑ ↑ ↑
 x, z
a, b, c, d, x, y, z
swaps = 2

iteration 3: [A, B, C, D, x, y, z] swaps = 2
forward

iteration 4: [A, B, C, D, x, y, z] swaps = 0
backward

Sorted = [A, B, C, D, X, Y, Z]

iteration 0: [A, B, C, D, X, Y, Z]

iteration 1 : [A, B, C, D, X, Y, Z] , swaps = 0
forward

reversed = [z, y, x, D, C, B, A]

iteration 0: [z, y, x, D, C, B, A]

yx) 4
y, x, D, C, B, A, z
↑ ↑

iteration 1: [y, x, D, C, B, A, z] swaps = 6
forward

y, x, D, C, B, A, z

iteration 2: [A, y, x, D, C, B, z] swaps = 5
backward

iteration 3: [A, x, D, C, B, y, z] swaps = 4
forward

iteration 4: [A, B, x, D, C, y, z] swaps = 3
backward

iteration 5: [A, B, D, C, x, y, z] swaps = 2
forward

iteration 6: [A, B, C, D, x, y, z] swaps = 1
backward

iteration 7: [A, B, C, D, x, y, z] swaps = 0
forward