

Q1-Shel Sort (ordered integer array with 10 elements from small to large)

Array	Gap	Displacements	Comparisons
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	5	No displacement. Displacements=0	0 and 5 is compared Comparsion = 1
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	5	No displacement. Displacements=0	1 and 6 is compared Comparsion = 2
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	5	No displacement. Displacements=0	2 and 7 is compared Comparsion = 3
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	5	No displacement. Displacements=0	3 and 8 is compared Comparsion = 4
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	5	No displacement. Displacements=0	4 and 9 is compared Comparsion = 5
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	2	No displacement. Displacements=0	0 and 2 is compared Comparsion = 6
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑	2	No displacement. Displacements=0	1 and 3 is compared Comparsion = 7
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑	2	No displacement. Displacements=0	2 and 4 is compared Comparsion = 8
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑	2	No displacement. Displacements=0	3 and 5 is compared Comparsion = 9
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑ ↑	2	No displacement. Displacements=0	4 and 6 is compared Comparsion = 10
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑ ↑	2	No displacement. Displacements=0	5 and 7 is compared Comparsion = 11
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑ ↑ ↑	2	No displacement. Displacements=0	6 and 8 is compared Comparsion = 12
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑ ↑ ↑	2	No displacement. Displacements=0	7 and 9 is compared Comparsion = 13
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	0 and 1 is compared Comparsion = 14
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	1 and 2 is compared Comparsion = 15
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	2 and 3 is compared Comparsion = 16
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	3 and 4 is compared Comparsion = 17
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	4 and 5 is compared Comparsion = 18
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	5 and 6 is compared Comparsion = 19
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement.	6 and 7 is compared

		Displacements=0	Comparison = 20
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	7 and 8 is compared Comparison = 21
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement. Displacements=0	8 and 9 is compared Comparison = 22

Q1-Shel Sort (ordered integer array with 10 elements from large to small)

Array	Gap	Displacements	Comparisons
4, 8, 7, 6, 5, 9, 3, 2, 1, 0 ↑ ↑	5	Displacements=2	9 and 4 is compared comparison = 1
4, 3, 7, 6, 5, 9, 8, 2, 1, 0 ↑ ↑	5	Displacements=4	8 and 3 is compared comparison = 2
4, 3, 2, 6, 5, 9, 8, 7, 1, 0 ↑ ↑	5	Displacements=6	7 and 2 is compared comparison = 3
4, 3, 2, 1, 5, 9, 8, 7, 6, 0 ↑ ↑	5	Displacements=8	6 and 1 is compared comparison = 4
4, 3, 2, 1, 0, 9, 8, 7, 6, 5 ↑ ↑	5	Displacements=10	5 and 0 is compared comparison = 5
2, 3, 4, 1, 0, 9, 8, 7, 6, 5 ↑ ↑	2	Displacements=12	4 and 2 is compared comparison = 6
2, 1, 4, 3, 0, 9, 8, 7, 6, 5 ↑ ↑	2	Displacements=14	3 and 1 is compared comparison = 7
0, 1, 2, 3, 4, 9, 8, 7, 6, 5 ↑ ↑ ↑	2	Displacements=16	4 and 0 is compared comparison = 8 2 and 0 is compared comparison = 9
0, 1, 2, 3, 4, 9, 8, 7, 6, 5 ↑ ↑ ↑	2	No displacement. Displacements=16	3 and 9 is compared comparison = 10
0, 1, 2, 3, 4, 9, 8, 7, 6, 5 ↑ ↑ ↑ ↑	2	No displacement. Displacements=16	4 and 8 is compared comparison = 11
0, 1, 2, 3, 4, 7, 8, 9, 6, 5 ↑ ↑ ↑ ↑	2	Displacements=18	9 and 7 is compared comparison = 12 3 and 7 is compared comparison = 13
0, 1, 2, 3, 4, 7, 6, 9, 8, 5 ↑ ↑ ↑ ↑ ↑	2	Displacements=20	8 and 6 is compared comparison = 14 4 and 6 is compared comparison = 15
0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ↑ ↑ ↑ ↑ ↑	2	Displacements=22	9 and 5 is compared comparison = 16

			7 and 5 is compared comparison = 17 3 and 5 is compared comparison = 18
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	0 and 1 is compared comparison = 19
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	1 and 2 is compared comparison = 20
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	2 and 3 is compared comparison = 21
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	3 and 4 is compared comparison = 22
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	4 and 5 is compared comparison = 23
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	5 and 6 is compared comparison = 24
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	6 and 7 is compared comparison = 25
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	7 and 8 is compared comparison = 26
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	1	No displacement Displacements=22	8 and 9 is compared comparison = 27

Q1-Shel Sort ({5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11})

Array	Gap	Displacements	Comparisons
5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11	6	No displacement Displacements=0	5 and 6 is compared comparison = 1
5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11	6	No displacement Displacements=0	2 and 8 is compared comparison = 2
5, 2, 1, 9, 1, 7, 6, 8, 13, 15, 4, 11	6	Displacements=2	13 and 1 is compared comparison = 3
5, 2, 1, 9, 1, 7, 6, 8, 13, 15, 4, 11	6	No displacement Displacements=2	9 and 15 is compared comparison = 4
5, 2, 1, 9, 1, 7, 6, 8, 13, 15, 4, 11	6	No displacement Displacements=2	1 and 4 is compared comparison = 5
5, 2, 1, 9, 1, 7, 6, 8, 13, 15, 4, 11	6	No displacement Displacements=2	7 and 11 is compared comparison = 6
5, 1, 1, 9, 2, 7, 6, 8, 13, 15, 4, 11	3	No displacement Displacements=2	5 and 9 is compared comparison = 7
5, 1, 1, 9, 2, 7, 6, 8, 13, 15, 4, 11	3	Displacements=2	1 and 7 is compared comparison = 9
5, 1, 1, 6, 2, 7, 9, 8, 13, 15, 4, 11	3	Displacements=4	9 and 6 is compared comparison = 10
5, 1, 1, 6, 2, 7, 9, 8, 13, 15, 4, 11	3	Displacements=4	2 and 8 is compared comparison = 12

5, 1, 1, 6, 2, 7, 9, 8, 13, 15, 4, 11	3	Displacements=4	7 and 13 is compared comparison = 13
5, 1, 1, 6, 2, 7, 9, 8, 13, 15, 4, 11	3	Displacements=4	9 and 15 is compared comparison = 14
5, 1, 1, 6, 2, 7, 9, 4, 13, 15, 8, 11	3	Displacements=6	8 and 4 is compared comparison = 15
5, 1, 1, 6, 2, 7, 9, 4, 11, 15, 8, 13	3	Displacements=8	13 and 11 is compared comparison = 17 7 and 11 is compared comparison = 18
1, 1, 5, 6, 2, 7, 9, 4, 11, 15, 8, 13	1	Displacements=11	5 and 1 is compared comparison = 19 5 and 1 is compared comparison = 20 1 and 1 is compared comparison = 21
1, 1, 5, 6, 2, 7, 9, 4, 11, 15, 8, 13	1	Displacements=11	5 and 6 is compared comparison = 22
1, 1, 5, 6, 2, 7, 9, 4, 11, 15, 8, 13	1	Displacements=11	6 and 2 is compared comparison = 23
1, 1, 5, 6, 2, 7, 9, 4, 11, 15, 8, 13	1	Displacements=11	5 and 2 is compared comparison = 24
1, 1, 2, 5, 6, 7, 9, 4, 11, 15, 8, 13	1	Displacements=13	1 and 2 is compared comparison = 25
1, 1, 2, 5, 6, 7, 9, 4, 11, 15, 8, 13	1	Displacements=13	6 and 7 is compared comparison = 26
1, 1, 2, 5, 6, 7, 9, 4, 11, 15, 8, 13	1	Displacements=13	7 and 9 is compared comparison = 27
1, 1, 2, 4, 5, 6, 7, 9, 11, 15, 8, 13	1	Displacements=18	9 and 4 is compared comparison = 28 7 and 4 is compared comparison = 29 6 and 4 is compared comparison = 30 5 and 4 is compared comparison = 31 2 and 4 is compared comparison = 32
1, 1, 2, 4, 5, 6, 7, 9, 11, 15, 8, 13	1	Displacements=18	9 and 11 is compared comparison = 33
1, 1, 2, 4, 5, 6, 7, 9, 11, 15, 8, 13	1	Displacements=18	11 and 15 is compared comparison = 34

1, 1, 2, 4, 5, 6, 7, 8, 9, 11, 15, 13	1	Displacements=22	15 and 8 is compared comparison = 35 11 and 8 is compared comparison = 36 9 and 8 is compared comparison = 37 7 and 8 is compared comparison = 38
1, 1, 2, 4, 5, 6, 7, 8, 9, 11, 13, 15	1	Displacements=14	15 and 13 is compared comparison = 39 11 and 13 is compared comparison = 40

Q1-Shel Sort ({'S', 'B', 'I', 'M', 'H', 'Q', 'C', 'L', 'R', 'E', 'P', 'K'})

Array	Displacements	Comparisons
S, B, I, M, H, Q, C, L, R, E, P, K	0	0
C, B, I, E, H, Q, S, L, R, M, P, K	4	6
C, B, I, E, H, M, P, K, R, Q, S, L	10	13
C, B, I, E, H, L, P, Q, M, Q, S, R	13	18
C, B, H, E, I, K, M, L, P, Q, S, R	19	24
B, C, E, H, I, K, L, M, P, Q, R, S	27	32

Q1-Merge Sort (ordered integer array with 10 elements from small to large)

Array	Displacements	Comparisons
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0	0
0, 1, 2, 3, 4 5, 6, 7, 8, 9	0	0
0, 1, 2 3, 4 5, 6, 7, 8, 9	0	0
0, 1 2 3, 4 5, 6, 7, 8, 9	0	0
0 1 2 3, 4 5, 6, 7, 8, 9	0	0
0, 1 2 3, 4 5, 6, 7, 8, 9	0	1
0, 1, 2 3, 4 5, 6, 7, 8, 9	0	3
0, 1, 2 3 4 5, 6, 7, 8, 9	0	
0, 1, 2 3, 4 5, 6, 7, 8, 9	0	4
0, 1, 2, 3, 4 5, 6, 7, 8, 9	0	7
0, 1, 2, 3, 4 5, 6, 7 8, 9	0	7
0, 1, 2, 3, 4 5, 6 7 8, 9	0	7
0, 1, 2, 3, 4 5 6 7 8, 9	0	7
0, 1, 2, 3, 4 5, 6 7 8, 9	0	8
0, 1, 2, 3, 4 5, 6, 7 8, 9	0	9
0, 1, 2, 3, 4 5, 6, 7 8 9	0	9

0, 1, 2, 3, 4 5, 6, 7 8, 9	0	10
0, 1, 2, 3, 4 5, 6, 7, 8, 9	0	13
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	0	18

Q1-Merge Sort (ordered integer array with 10 elements from large to small)

Array	Comparisons
9, 8, 7, 6, 5, 4, 3, 2, 1, 0	0
9, 8, 7, 6, 5 4, 3, 2, 1, 0	0
9, 8, 7 6, 5 4, 3, 2, 1, 0	0
9, 8 7 6, 5 4, 3, 2, 1, 0	0
9 8 7 6, 5 4, 3, 2, 1, 0	0
8, 9 7 6, 5 4, 3, 2, 1, 0	1
7, 8, 9 6, 5 4, 3, 2, 1, 0	2
5, 6, 7, 8, 9 4, 3, 2, 1, 0	4
5, 6, 7, 8, 9 4, 3, 2 1, 0	4
5, 6, 7, 8, 9 4, 3 2 1, 0	4
5, 6, 7, 8, 9 4 3 2 1, 0	4
5, 6, 7, 8, 9 3, 4 2 1, 0	5
5, 6, 7, 8, 9 2, 3, 4 1, 0	6
5, 6, 7, 8, 9 0, 1, 2, 3, 4	8
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	13

Q1-MergeSort ({5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11})

Array	Comparisons
5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11	0
5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11	0
5, 2, 13 9, 1, 7 6, 8, 1, 15, 4, 11	0
5, 2 13 9, 1, 7 6, 8, 1, 15, 4, 11	0
5 2 13 9, 1, 7 6, 8, 1, 15, 4, 11	0
2, 5 13 9, 1, 7 6, 8, 1, 15, 4, 11	1
2, 5, 13 9, 1, 7 6, 8, 1, 15, 4, 11	2
1, 2, 5, 7, 9, 13 6, 8, 1, 15, 4, 11	7
1, 2, 5, 7, 9, 13 6, 8, 1 15, 4, 11	7
1, 2, 5, 7, 9, 13 6, 8 1 15, 4, 11	7
1, 2, 5, 7, 9, 13 6 8 1 15, 4, 11	7
1, 2, 5, 7, 9, 13 6, 8 1 15, 4, 11	8
1, 2, 5, 7, 9, 13 1, 6, 8 15, 4, 11	9
1, 2, 5, 7, 9, 13 1, 4, 6, 8, 11, 15	13
1, 1, 2, 4, 5, 6, 7, 8, 9, 11, 13, 15	22

Q1-Merge Sort ({'S', 'B', 'I', 'M', 'H', 'Q', 'C', 'L', 'R', 'E', 'P', 'K'})

Array	Comparisons
S, B, I, M, H, Q, C, L, R, E, P, K	
S, B, I, M, H, Q C, L, R, E, P, K	

S, B, I M, H, Q C, L, R, E, P, K	
S, B I M, H, Q C, L, R, E, P, K	
S B I M, H, Q C, L, R, E, P, K	
B, S I M, H, Q C, L, R, E, P, K	1
B, I, S M, H, Q C, L, R, E, P, K	3
B, H, I, M, Q, S C, L, R, E, P, K	6
B, H, I, M, Q, S C, L, R E, P, K	
B, H, I, M, Q, S C, L R E, P, K	
B, H, I, M, Q, S C L R E, P, K	
B, H, I, M, Q, S C, L R E, P, K	7
B, H, I, M, Q, S C, L, R E, P, K	8
B, H, I, M, Q, S C, E, K, L, P, R	11
B, C, E, H, I, K, L, M, P, Q, R, S	16

Q1-Heap Sort (ordered integer array with 10 elements from small to large)

Q1-Heap Sort (ordered integer array with 10 elements from large to small)

Q1-Heap Sort({5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11})

Q1-Heap Sort ({'S', 'B', 'I', 'M', 'H', 'Q', 'C', 'L', 'R', 'E', 'P', 'K'})

Q1-Quick Sort (ordered integer array with 10 elements from small to large)

Q1-Quick Sort (ordered integer array with 10 elements from large to small)

Q1-Quick Sort({5, 2, 13, 9, 1, 7, 6, 8, 1, 15, 4, 11})

Q1-Quick Sort ({'S', 'B', 'I', 'M', 'H', 'Q', 'C', 'L', 'R', 'E', 'P', 'K'})