

k7–k12 in 30 optimization tests was selected, and the iterative convergence of the five algorithms was compared, as shown in Figure 5.

Table 1. Five typical test cases of 0–1 knapsack problems.

No.	D	Parameter (w, p, C)	Opt
k_1	10	$w = (95, 4, 60, 32, 23, 72, 80, 62, 65, 46);$ $p = (55, 10, 47, 5, 4, 50, 8, 61, 85, 87);$ $C = 269$	295
k_2	20	$w = (92, 4, 43, 83, 84, 68, 92, 82, 6, 44, 32, 18, 56, 83, 25, 96, 70, 48, 14, 58);$ $p = (44, 46, 90, 72, 91, 40, 75, 35, 8, 54, 78, 40, 77, 15, 61, 17, 75, 29, 75, 63);$ $C = 878$	1024
k_3	50	$w = (80, 82, 85, 70, 72, 70, 66, 50, 55, 25, 50, 55, 40, 48, 59, 32, 22, 60, 30, 32, 40, 38, 35, 32, 25, 28, 30, 22, 50, 30, 45, 30, 60, 50, 20, 65, 20, 25, 30, 10, 20, 25, 15, 10, 10, 10, 4, 4, 2, 1);$ $p = (220, 208, 198, 192, 180, 180, 165, 162, 160, 158, 155, 130, 125, 122, 120, 118, 115, 110, 105, 101, 100, 100, 98, 96, 95, 90, 88, 82, 80, 77, 75, 73, 72, 70, 69, 66, 65, 63, 60, 58, 56, 50, 30, 20, 15, 10, 8, 5, 3, 1);$ $C = 1000$	3103
k_4	80	$w = (40, 27, 5, 21, 51, 16, 42, 18, 52, 28, 57, 34, 44, 43, 52, 55, 53, 42, 47, 56, 57, 44, 16, 2, 12, 9, 40, 23, 56, 3, 39, 16, 54, 36, 52, 5, 53, 48, 23, 47, 41, 49, 22, 42, 10, 16, 53, 58, 40, 1, 43, 56, 40, 32, 44, 35, 37, 45, 52, 56, 40, 2, 23, 49, 50, 26, 11, 35, 32, 34, 58, 6, 52, 26, 31, 23, 4, 52, 53, 19);$ $p = (199, 194, 193, 191, 189, 178, 174, 169, 164, 164, 161, 158, 157, 154, 152, 152, 149, 142, 131, 125, 124, 124, 124, 122, 119, 116, 114, 113, 111, 110, 109, 100, 97, 94, 91, 82, 82, 81, 80, 80, 80, 79, 77, 76, 74, 72, 71, 70, 69, 68, 65, 65, 61, 56, 55, 54, 53, 47, 47, 46, 41, 36, 34, 32, 32, 30, 29, 29, 26, 25, 23, 22, 20, 11, 10, 9, 5, 4, 3, 1);$ $C = 1173$	5183
k_5	100	$w = (54, 95, 36, 18, 4, 71, 83, 16, 27, 84, 88, 45, 94, 64, 14, 80, 4, 23, 75, 36, 90, 20, 77, 32, 58, 6, 14, 86, 84, 59, 71, 21, 30, 22, 96, 49, 81, 48, 37, 28, 6, 84, 19, 55, 88, 38, 51, 52, 79, 55, 70, 53, 64, 99, 61, 86, 1, 64, 32, 60, 42, 45, 34, 22, 49, 37, 33, 1, 78, 43, 85, 24, 96, 32, 99, 57, 23, 8, 10, 74, 59, 89, 95, 40, 46, 65, 6, 89, 84, 83, 6, 19, 45, 59, 26, 13, 8, 26, 5, 9);$ $p = (297, 295, 293, 292, 291, 289, 284, 284, 283, 283, 281, 280, 279, 277, 276, 275, 273, 264, 260, 257, 250, 236, 236, 235, 235, 233, 232, 232, 228, 218, 217, 214, 211, 208, 205, 204, 203, 201, 196, 194, 193, 193, 192, 191, 190, 187, 187, 184, 184, 184, 181, 179, 176, 173, 172, 171, 160, 128, 123, 114, 113, 107, 105, 101, 100, 100, 99, 98, 97, 94, 94, 93, 91, 80, 74, 73, 72, 63, 63, 62, 61, 60, 56, 53, 52, 50, 48, 46, 40, 40, 35, 28, 22, 22, 18, 15, 12, 11, 6, 5);$ $C = 3818$	15,170

Table 2. Randomly generating seven 0–1 knapsack problems.

No.	D	C	Total Values
k_6	200	1948.5	15,132
k_7	300	2793.5	22,498
k_8	500	4863.5	37,519
k_9	800	7440.5	59,791
k_{10}	1000	9543.5	75,603
k_{11}	1200	11,267	90,291
k_{12}	1500	14,335	111,466