

Test Data for 2D Bin Packing Problems

Submitted by Eva Hopper
HopperE@gmx.net

For more info see also:

<http://home.t-online.de/home/villahost/eva/>

<http://villahost.homeip.net/villa/eva/>

These test problems have been used in the following article:

Hopper E. and Turton B. C. H., 2002.

An empirical study of meta-heuristics applied to 2D rectangular bin packing.

Special Issue on Cutting, Packing and Knapsacking Problems, *Studia Informatica*, vol. 2, no. 1. ISBN 2-912590-13-2; ISSN Regular 1625-7545.

The corresponding Excel-file contains an editable version of this pdf-file.

Test Problems

Three problem categories have been created with the problem generators described in [H00] that contain different sized items and objects (Table 1).

Each problem category contains five test problems.

The test problems have been constructed such that the optimum solution is not known, but the number of objects is large enough to accommodate all items.

The item dimensions have been generated randomly with the longer side ranging between 10% and 100% of the object width.

After all items have been created, their dimensions have been scaled by a factor (>1) so that the five problems in one category have roughly the same total item area.

[HT00] Hopper E. & Turton B. C. H. An empirical investigation of meta-heuristic and heuristic algorithms for a 2D packing problem. *European Journal of Operations Research*, vol. 128/1, pp. 34-57, 2000.

Table 1: Constructed test problems for 2D rectangular bin packing

problem name	item number	object number
M1a, M1b, M1c, M1d, M1e	100	16
M2a, M2b, M2c, M2d, M2e	100	18
M3a, M3b, M3c, M3d, M3e	150	20

objects for
problem category: **M1**

size: 16

width	height	number
20	20	2
10	30	3
10	10	3
20	30	2
10	20	3
10	40	3

objects for
problem category: **M2**

size: 18

width	height	number
60	40	2
30	90	3
30	30	4
60	90	2
30	60	4
30	120	3

objects for
problem category: **M3**

size: 20

width	height	number
60	50	3
30	100	3
40	30	3
60	100	4
30	60	4
30	120	3

name:	M1a	name:	M1b	name:	M1c	name:	M1d	name:	M1e
size:	100	size:	100	size:	100	size:	100	size:	100
item area:	2520	item area:	2597	item area:	2554	item area:	2846	item area:	2665

<i>no</i>	width	height	width	height	width	height	width	height	width	height
1	1	6	7	9	4	9	8	9	6	9
2	2	8	2	4	4	4	6	9	5	5
3	6	5	2	9	9	8	1	6	5	9
4	4	9	5	9	5	8	8	4	9	2
5	8	7	1	6	7	4	3	3	3	2
6	2	8	1	4	3	1	1	6	7	9
7	7	5	9	3	5	9	4	1	6	1
8	3	1	3	7	4	3	1	5	6	1
9	1	4	4	2	6	3	8	9	6	5
10	2	2	6	6	7	9	4	7	5	1
11	9	5	5	5	4	9	6	8	9	2
12	2	1	6	6	6	8	8	6	6	1
13	1	4	8	8	6	2	6	1	2	6
14	5	6	6	7	3	4	8	5	3	3
15	6	6	6	4	1	4	6	6	6	4
16	2	6	2	7	1	6	6	8	4	2
17	5	4	5	9	8	6	7	4	7	2
18	1	6	3	2	7	8	1	3	5	5
19	8	8	6	7	5	7	4	3	8	4
20	5	3	6	4	2	7	7	4	1	4
21	8	7	5	1	7	7	8	2	4	2
22	9	9	7	6	6	7	7	6	8	7
23	5	2	6	7	1	5	9	2	9	6
24	5	3	8	2	3	2	5	9	6	5
25	8	2	6	8	9	6	8	9	7	7
26	8	8	9	6	3	9	2	9	9	5
27	9	9	7	1	4	7	8	9	4	2
28	6	4	7	9	2	2	8	9	9	8
29	3	3	3	6	3	5	6	2	5	1
30	4	1	3	2	9	4	6	3	8	7
31	7	1	8	7	2	9	3	7	1	4
32	3	3	2	3	7	8	8	2	2	2
33	6	7	1	1	2	5	7	5	2	6
34	8	7	6	8	1	7	8	2	2	6
35	5	2	5	5	2	4	3	6	6	7
36	7	5	4	3	3	9	5	7	7	9
37	5	9	5	5	1	3	2	7	7	3
38	7	1	2	3	2	3	6	7	8	4
39	6	4	7	3	2	6	2	1	9	7
40	7	6	8	9	8	9	3	7	2	2
41	6	4	8	7	2	8	8	6	4	2
42	2	3	3	9	6	6	4	8	6	2
43	4	8	2	1	9	5	3	6	9	2
44	5	9	8	5	9	6	3	2	4	3
45	7	4	6	9	2	6	9	3	2	2
46	2	6	6	3	6	4	1	7	1	7
47	5	1	1	5	9	5	2	1	7	8
48	7	5	3	3	6	5	1	4	1	5
49	2	9	9	5	3	4	6	4	4	8
50	2	9	6	2	4	1	4	4	5	5

<i>no</i>	continued name: M1a		name: M1b		name: M1c		name: M1d		name: M1e	
	width	height	width	height	width	height	width	height	width	height
51	7	3	5	4	8	2	1	5	7	3
52	4	1	5	8	1	4	7	4	6	1
53	9	7	5	4	6	1	6	8	9	9
54	2	8	7	5	2	2	5	6	5	6
55	8	6	6	4	6	5	1	5	7	7
56	2	2	1	7	6	7	3	4	3	9
57	8	5	1	6	4	7	8	5	8	2
58	2	5	8	5	4	8	1	6	5	1
59	7	4	7	5	6	2	7	8	5	8
60	3	6	4	8	9	8	8	8	7	1
61	7	7	5	4	4	9	3	8	7	5
62	7	5	9	6	2	9	6	7	9	8
63	2	4	2	4	6	4	8	7	8	3
64	5	6	2	7	6	7	8	9	4	5
65	4	1	9	6	1	3	9	5	1	6
66	9	9	1	3	3	4	4	1	1	7
67	5	4	1	6	9	7	4	8	7	2
68	5	4	2	8	7	9	4	2	2	1
69	8	3	8	6	4	4	1	6	7	1
70	5	3	7	8	9	3	7	1	4	7
71	9	3	1	2	4	6	1	4	8	4
72	7	6	7	6	4	7	7	8	9	6
73	2	7	2	1	7	7	2	2	3	5
74	8	4	2	6	7	2	1	4	1	2
75	5	9	4	3	2	3	6	1	2	9
76	6	1	4	6	7	9	9	6	3	4
77	5	2	8	8	4	5	4	1	8	3
78	8	6	5	6	2	5	3	4	9	3
79	6	2	8	9	6	4	6	8	3	2
80	8	2	2	6	7	1	2	6	3	8
81	1	7	4	3	1	1	5	9	8	8
82	3	9	2	8	1	4	5	2	8	6
83	3	4	1	4	3	7	3	8	1	2
84	2	7	6	3	2	4	4	5	2	4
85	8	7	5	3	1	7	6	1	5	2
86	6	7	3	1	7	2	9	7	9	6
87	3	2	8	2	7	6	2	5	5	9
88	1	1	3	8	6	5	7	9	5	7
89	8	8	9	8	1	5	7	6	9	9
90	2	2	7	6	5	9	6	9	8	8
91	5	1	4	8	7	5	7	3	2	4
92	2	5	3	8	7	7	6	3	3	2
93	7	7	3	3	4	4	5	7	9	7
94	5	1	5	9	2	1	3	5	7	1
95	4	2	1	1	3	8	5	9	6	8
96	7	3	5	4	2	3	7	7	7	8
97	4	3	1	3	5	1	6	5	2	7
98	6	5	9	3	4	5	8	7	4	6
99	6	2	2	2	6	7	9	2	9	9
100	5	9	1	1	4	4	6	9	1	7

name:	M2a	name:	M2b	name:	M2c	name:	M2d	name:	M2e
size:	100	size:	100	size:	100	size:	100	size:	100
item area:	24753	item area:	25283	item area:	25200	item area:	25614	item area:	24811

<i>no</i>	width	height	width	height	width	height	width	height	width	height
1	3	19	22	28	13	28	24	27	18	28
2	6	25	6	12	13	13	18	27	15	15
3	19	16	6	28	28	25	3	18	15	28
4	13	28	16	28	16	25	24	12	28	6
5	25	22	3	19	22	13	9	9	9	6
6	6	25	3	12	9	3	3	18	21	28
7	22	16	28	9	16	28	12	3	18	3
8	9	3	9	22	13	9	3	15	18	3
9	3	13	12	6	19	9	24	27	18	15
10	6	6	19	19	22	28	12	21	15	3
11	28	16	16	16	13	28	18	24	28	6
12	6	3	19	19	19	25	24	18	18	3
13	3	13	25	25	19	6	18	3	6	18
14	16	19	19	22	9	13	24	15	9	9
15	19	19	19	12	3	13	18	18	18	12
16	6	19	6	22	3	19	18	24	12	6
17	16	13	16	28	25	19	21	12	21	6
18	3	19	9	6	22	25	3	9	15	15
19	25	25	19	22	16	22	12	9	25	12
20	16	9	19	12	6	22	21	12	3	12
21	25	22	16	3	22	22	24	6	12	6
22	28	28	22	19	19	22	21	18	25	21
23	16	6	19	22	3	16	27	6	28	18
24	16	9	25	6	9	6	15	27	18	15
25	25	6	19	25	28	19	24	27	21	21
26	25	25	28	19	9	28	6	27	28	15
27	28	28	22	3	13	22	24	27	12	6
28	19	13	22	28	6	6	24	27	28	25
29	9	9	9	19	9	16	18	6	15	3
30	13	3	9	6	28	13	18	9	25	21
31	22	3	25	22	6	28	9	21	3	12
32	9	9	6	9	22	25	24	6	6	6
33	19	22	3	3	6	16	21	15	6	18
34	25	22	19	25	3	22	24	6	6	18
35	16	6	16	16	6	13	9	18	18	21
36	22	16	12	9	9	28	15	21	21	28
37	16	28	16	16	3	9	6	21	21	9
38	22	3	6	9	6	9	18	21	25	12
39	19	13	22	9	6	19	6	3	28	21
40	22	19	25	28	25	28	9	21	6	6
41	19	13	25	22	6	25	24	18	12	6
42	6	9	9	28	19	19	12	24	18	6
43	13	25	6	3	28	16	9	18	28	6
44	16	28	25	16	28	19	9	6	12	9
45	22	13	19	28	6	19	27	9	6	6
46	6	19	19	9	19	13	3	21	3	21
47	16	3	3	16	28	16	6	3	21	25
48	22	16	9	9	19	16	3	12	3	15
49	6	28	28	16	9	13	18	12	12	25
50	6	28	19	6	13	3	12	12	15	15

continued										
	name: M2a		name: M2b		name: M2c		name: M2d		name: M2e	
<i>no</i>	width	height	width	height	width	height	width	height	width	height
51	22	9	16	12	25	6	3	15	21	9
52	13	3	16	25	3	13	21	12	18	3
53	28	22	16	12	19	3	18	24	28	28
54	6	25	22	16	6	6	15	18	15	18
55	25	19	19	12	19	16	3	15	21	21
56	6	6	3	22	19	22	9	12	9	28
57	25	16	3	19	13	22	24	15	25	6
58	6	16	25	16	13	25	3	18	15	3
59	22	13	22	16	19	6	21	24	15	25
60	9	19	12	25	28	25	24	24	21	3
61	22	22	16	12	13	28	9	24	21	15
62	22	16	28	19	6	28	18	21	28	25
63	6	13	6	12	19	13	24	21	25	9
64	16	19	6	22	19	22	24	27	12	15
65	13	3	28	19	3	9	27	15	3	18
66	28	28	3	9	9	13	12	3	3	21
67	16	13	3	19	28	22	12	24	21	6
68	16	13	6	25	22	28	12	6	6	3
69	25	9	25	19	13	13	3	18	21	3
70	16	9	22	25	28	9	21	3	12	21
71	28	9	3	6	13	19	3	12	25	12
72	22	19	22	19	13	22	21	24	28	18
73	6	22	6	3	22	22	6	6	9	15
74	25	13	6	19	22	6	3	12	3	6
75	16	28	12	9	6	9	18	3	6	28
76	19	3	12	19	22	28	27	18	9	12
77	16	6	25	25	13	16	12	3	25	9
78	25	19	16	19	6	16	9	12	28	9
79	19	6	25	28	19	13	18	24	9	6
80	25	6	6	19	22	3	6	18	9	25
81	3	22	12	9	3	3	15	27	25	25
82	9	28	6	25	3	13	15	6	25	18
83	9	13	3	12	9	22	9	24	3	6
84	6	22	19	9	6	13	12	15	6	12
85	25	22	16	9	3	22	18	3	15	6
86	19	22	9	3	22	6	27	21	28	18
87	9	6	25	6	22	19	6	15	15	28
88	3	3	9	25	19	16	21	27	15	21
89	25	25	28	25	3	16	21	18	28	28
90	6	6	22	19	16	28	18	27	25	25
91	16	3	12	25	22	16	21	9	6	12
92	6	16	9	25	22	22	18	9	9	6
93	22	22	9	9	13	13	15	21	28	21
94	16	3	16	28	6	3	9	15	21	3
95	13	6	3	3	9	25	15	27	18	25
96	22	9	16	12	6	9	21	21	21	25
97	13	9	3	9	16	3	18	15	6	21
98	19	16	28	9	13	16	24	21	12	18
99	19	6	6	6	19	22	27	6	28	28
100	16	28	3	3	13	13	18	27	3	21

name:	M3a	name:	M3b	name:	M3c	name:	M3d	name:	M3e
size:	150	size:	150	size:	150	size:	150	size:	150
item area:	25703	item area:	27414	item area:	27953	item area:	27430	item area:	29530

<i>no</i>	width	height	width	height	width	height	width	height	width	height
1	3	19	16	13	25	28	22	10	7	30
2	6	26	16	26	19	28	19	3	7	3
3	19	16	16	13	3	19	29	29	7	27
4	13	29	23	16	25	13	16	19	10	20
5	26	22	20	13	9	9	22	22	13	17
6	6	26	3	23	3	19	10	29	20	27
7	22	16	3	20	13	3	25	6	30	30
8	10	3	26	16	3	16	16	3	3	7
9	3	13	23	16	25	28	16	25	20	27
10	6	6	13	26	13	22	22	3	27	27
11	29	16	16	13	19	25	22	16	13	17
12	6	3	29	20	25	19	29	25	23	17
13	3	13	7	13	19	3	25	10	10	30
14	16	19	7	23	25	16	13	16	30	23
15	19	19	29	20	19	19	3	19	20	10
16	6	19	3	10	19	25	3	22	7	7
17	16	13	3	20	22	13	22	6	20	17
18	3	19	7	26	3	9	6	3	13	10
19	26	26	26	20	13	9	22	3	17	23
20	16	10	23	26	22	13	13	22	30	23
21	26	22	3	7	25	6	25	13	30	10
22	29	29	23	20	22	19	29	19	17	10
23	16	6	7	3	28	6	10	16	30	17
24	16	10	7	20	16	28	3	6	10	17
25	26	6	13	10	25	28	6	29	20	13
26	26	26	13	20	6	28	10	13	13	7
27	29	29	26	26	25	28	25	10	10	7
28	19	13	16	20	25	28	29	10	30	23
29	10	10	26	29	19	6	10	6	27	20
30	13	3	7	20	19	9	10	25	23	10
31	22	3	13	10	9	22	25	25	23	3
32	10	10	7	26	25	6	25	19	23	27
33	19	22	3	13	22	16	3	6	13	3
34	26	22	20	10	25	6	6	13	17	3
35	16	6	16	10	9	19	16	6	27	20
36	22	16	10	3	16	22	29	19	17	20
37	16	29	26	7	6	22	16	29	20	23
38	22	3	10	26	19	22	16	22	20	23
39	19	13	29	26	6	3	29	29	23	27
40	22	19	23	20	9	22	25	25	7	13
41	19	13	13	26	25	19	6	13	13	3
42	6	10	10	26	13	25	10	6	17	10
43	13	26	10	10	9	19	29	22	3	10
44	16	29	16	29	9	6	22	3	30	17
45	22	13	3	3	28	9	19	25	20	3
46	6	19	16	13	3	22	22	25	13	30
47	16	3	3	10	6	3	6	22	27	13
48	22	16	29	10	3	13	13	19	10	10
49	6	29	7	7	19	13	29	29	7	3
50	6	29	3	3	13	13	3	22	7	10

continued										
	name: M3a		name: M3b		name: M3c		name: M3d		name: M3e	
<i>no</i>	width	height	width	height	width	height	width	height	width	height
51	22	10	13	29	3	16	16	3	27	20
52	13	3	13	13	22	13	10	13	3	10
53	29	22	29	26	19	25	6	29	7	7
54	6	26	16	26	16	19	16	10	20	7
55	26	19	23	13	3	16	22	29	20	3
56	6	6	10	3	9	13	6	3	17	23
57	26	16	16	29	25	16	22	10	13	3
58	6	16	13	10	3	19	19	25	10	23
59	22	13	20	10	22	25	25	10	27	20
60	10	19	23	29	25	25	16	29	27	30
61	22	22	13	29	9	25	25	19	20	20
62	22	16	20	26	19	22	10	25	20	20
63	6	13	20	7	25	22	13	13	7	30
64	16	19	10	13	25	28	3	19	10	3
65	13	3	3	13	28	16	13	6	10	10
66	29	29	3	20	13	3	10	29	13	27
67	16	13	26	20	13	25	6	29	10	30
68	16	13	23	26	13	6	6	25	13	23
69	26	10	16	23	3	19	29	16	7	3
70	16	10	7	23	22	3	6	19	20	13
71	29	10	23	23	3	13	19	19	13	23
72	22	19	20	23	22	25	13	3	30	10
73	6	22	3	16	6	6	25	6	30	13
74	26	13	10	7	3	13	10	10	30	20
75	16	29	29	20	19	3	22	19	7	10
76	19	3	10	29	28	19	29	19	13	17
77	16	6	13	23	13	3	25	13	10	7
78	26	19	7	7	9	13	25	22	3	3
79	19	6	10	16	19	25	6	16	23	27
80	26	6	29	13	6	19	3	3	23	27
81	3	22	7	29	16	28	22	13	3	17
82	10	29	23	26	16	6	29	16	20	30
83	10	13	7	16	9	25	22	3	10	20
84	6	22	3	23	13	16	19	3	23	27
85	26	22	7	13	19	3	22	29	30	27
86	19	22	10	29	28	22	16	22	20	10
87	10	6	3	10	6	16	10	25	27	7
88	3	3	7	10	22	28	19	19	17	23
89	26	26	7	20	22	19	10	25	13	30
90	6	6	26	29	19	28	16	22	3	13
91	16	3	7	26	22	9	13	3	3	23
92	6	16	20	20	19	9	16	19	10	7
93	22	22	29	16	16	22	13	13	10	7
94	16	3	29	20	9	16	3	10	27	23
95	13	6	7	20	16	28	19	25	3	17
96	22	10	20	13	22	22	13	29	3	20
97	13	10	29	16	19	16	13	16	30	20
98	19	16	20	16	25	22	25	13	27	13
99	19	6	10	13	28	6	22	10	13	13
100	16	29	13	3	19	28	19	16	20	27

continued										
	name: M3a		name: M3b		name: M3c		name: M3d		name: M3e	
<i>no</i>	width	height	width	height	width	height	width	height	width	height
101	22	29	26	7	19	28	19	3	30	10
102	6	13	3	13	16	16	13	10	3	20
103	6	29	20	3	16	28	29	25	3	20
104	16	29	7	7	28	6	29	19	13	30
105	3	19	20	16	9	6	19	3	20	7
106	3	13	20	23	22	28	13	10	13	13
107	29	10	13	23	19	3	16	3	20	27
108	10	22	13	26	19	3	25	10	3	3
109	13	6	20	7	19	16	25	29	13	10
110	19	19	29	26	16	3	19	6	10	27
111	16	16	13	29	28	6	10	19	27	10
112	19	19	7	29	19	3	25	10	7	20
113	26	26	20	13	6	19	10	22	17	30
114	19	22	20	23	9	9	25	10	13	13
115	19	13	3	10	19	13	6	16	13	13
116	6	22	10	13	13	6	29	19	20	27
117	16	29	29	23	22	6	3	19	13	13
118	10	6	23	29	16	16	10	6	30	17
119	19	22	13	13	25	13	6	10	13	20
120	19	13	29	10	3	13	16	29	23	3
121	16	3	13	20	13	6	3	3	7	7
122	22	19	13	23	25	22	13	10	3	10
123	19	22	23	23	28	19	16	16	17	20
124	26	6	23	7	19	16	13	29	10	3
125	19	26	7	10	22	22	19	10	20	7
126	29	19	23	29	28	16	16	13	10	27
127	22	3	13	16	13	6	29	16	13	30
128	22	29	7	16	28	25	25	25	7	3
129	10	19	20	13	16	3	25	19	17	10
130	10	6	23	3	25	22	25	10	3	20
131	26	22	3	3	3	13	29	10	23	3
132	6	10	3	13	6	6	29	22	30	13
133	3	3	10	23	6	19	6	22	30	17
134	19	26	7	13	6	19	16	6	10	10
135	16	16	3	23	19	22	3	3	17	10
136	13	10	23	7	22	28	16	25	13	23
137	16	16	23	20	22	9	6	3	27	13
138	6	10	20	16	25	13	6	25	13	23
139	22	10	3	16	28	22	25	25	23	3
140	26	29	16	29	6	6	19	10	3	23
141	26	22	23	16	13	6	25	29	27	20
142	10	29	23	23	19	6	25	10	13	17
143	6	3	13	13	28	6	16	3	3	13
144	26	16	7	3	13	9	3	3	7	13
145	19	29	10	26	6	6	13	22	30	10
146	19	10	7	10	3	22	13	6	10	7
147	3	16	16	3	22	25	10	6	13	7
148	10	10	13	16	3	16	22	6	10	7
149	29	16	20	23	13	25	3	16	7	13
150	19	6	13	13	16	16	13	25	3	17

Test Problems from the Literature

The problems cgcut1 – cgcut3 [CW77] and gcut 1 - gcut 13 and ngcut 1 - ngcut 12 [B85bc] are based on test problems known from the literature.

These test problems are 2D cutting problems, which were transformed to 2D bin packing instances according to [MV98]:

- by first ignoring the value of the item and
- secondly by generating the maximum number of items for each type (for cgcut and ngcut).

For details see corresponding Excel-file.

[B85b] Beasley J. E. Algorithms for unconstrained two-dimensional guillotine cutting. *Journal of the Operational Research Society*, vol. 36, pp. 297 - 306, 1985.

[B85c] Beasley J. E. An exact two-dimensional non-guillotine cutting tree search procedure. *Operational Research*, vol. 33, pp. 49 - 64, 1985.

[CW77] Christofides N. & Whitlock C. An algorithm for two-dimensional cutting problems. *Journal of the Operational Research Society*, vol. 25, pp. 30 - 44, 1977.

[MV98] Martello S. & Vigo S. Exact Solution of the Two-Dimensional Finite Bin Packing Problem. *Management Science*, vol. 44, pp. 388 - 399, 1998.