

Last-mile delivery with drone and lockers - online appendix

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In this online appendix, we report the detailed results of the formulations for the TSPDL with endurance $E = 20$, $E = 40$, and $E = \infty$ on instance set $MC10_1$ as well as the results of the formulation F4 on instance sets $MC10_2$ and $MC20$.

1 | RESULTS TABLES

1.1 | Results on instance set $MC10_1$

In this section, we report the detailed results of the formulations for the TSPDL with endurance $E = 20$, $E = 40$, and $E = \infty$ on instance set $MC10_1$, which are shown in Tables 1, 2, 5, respectively. In Tables 3 and 4, we show the results for the TSPDL 'Wait' with endurance $E = 20$ and $E = 40$, respectively. The Tables present the same structure, and thus we describe it here only once. The column 'Inst.' reports the name of the instance. The columns 'Opt', '#sort', and '#lock' display, respectively, the value of the optimal solution rounded at the second decimal value, the number of sorties, and the number of customers served via locker in the optimal solution. For each formulation, we show the following columns: the percentage gap between the linear relaxation value at the root node (before the Gurobi's presolve phase) and the optimal solution ($\%gapLR = 100 \cdot (Opt - LR_{RN})/Opt$, where LR_{RN} is the value of the linear relaxation at the root node), the percentage gap between the lower bound at the root node (after the presolve phase) and the optimal solution ($\%gapRN = 100 \cdot (Opt - LB_{RN})/Opt$, where LB_{RN} is the lower bound at the root node), the number of visited nodes of the branching tree at the end of the iterations (*nodes*), and the number of seconds needed to obtain the proven optimal solution (*sec*). The best value out of the four formulations is

indicated by the bold values. For F4, we also show the percentage gap at the root node before the introduction of cuts ($\%gapRN_0 = 100 \cdot (Opt - LB_{RN0})/Opt$, where LB_{RN0} is the lower bound at the root node before the introduction of cuts and after the presolve phase), being that F4 makes use of dynamically added cuts. As can be seen from the difference between $\%gapRN$ and $\%gapRN_0$, the contribution of the cuts is significant.

TABLE 1 Comparison of the formulations solving the TSPDL with $E = 20$.

TSPDL	E=20				F1				F2				F3				F4			
	Inst.	Opt	#sort	#lock	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN ₀	%gapRN	nodes
37v1	52.25	0	0	43.89	13.92	54	0.79	43.67	2.93	84	0.85	44.31	4.30	126	0.98	44.31	28.07	5.73	104	0.76
37v2	49.95	0	0	38.52	21.16	25	0.57	37.46	11.78	46	0.65	38.07	10.07	53	0.67	38.07	28.48	8.77	13	0.57
37v3	50.43	0	0	57.46	23.20	1665	1.51	57.03	25.57	2130	14.08	57.62	24.75	1790	6.57	57.62	44.12	27.99	1962	4.40
37v4	63.23	0	0	50.05	23.90	2036	14.17	49.26	19.06	3705	19.98	49.78	17.08	2710	9.47	49.78	36.93	17.87	1963	4.35
37v5	44.41	2	0	38.15	28.13	14375	97.43	41.00	23.93	17502	232.38	41.43	25.26	16249	146.04	41.44	41.00	26.60	15646	82.28
37v6	45.29	1	0	33.47	27.23	38824	241.14	35.32	27.47	16112	134.24	35.81	27.14	27341	231.20	35.87	35.32	20.08	24700	113.00
37v7	45.77	1	0	54.77	41.45	5266	36.29	57.14	39.39	15357	200.96	57.68	38.26	9983	110.70	57.68	57.14	39.27	20324	124.01
37v8	58.57	1	0	46.91	41.25	6595	47.12	48.53	41.79	54074	552.36	48.55	42.83	18523	173.57	48.68	48.53	40.48	28973	128.63
37v9	37.03	2	0	30.84	15.91	509	3.21	33.78	16.77	5297	75.36	34.26	20.06	6224	42.81	34.26	33.78	17.24	5943	23.88
37v10	39.18	2	0	26.35	17.59	2634	12.92	27.78	19.05	6909	76.19	27.86	19.20	9596	91.30	27.86	27.78	14.50	12225	63.83
37v11	40.25	2	0	51.93	44.55	4685	26.32	53.78	39.78	15828	195.78	54.31	38.15	9035	96.46	54.51	53.78	39.73	9032	52.80
37v12	57.12	2	0	47.59	40.62	81075	325.72	48.72	41.27	60892	870.35	48.62	39.22	30251	151.33	48.73	48.72	38.02	39212	122.34
40v1	48.03	2	1	31.39	18.56	535	4.25	32.63	11.15	255	2.38	32.52	15.17	267	1.32	32.63	30.94	15.59	323	1.20
40v2	50.97	2	1	37.45	23.82	7490	51.49	38.95	16.87	2686	16.60	38.95	20.20	3485	12.72	38.95	36.63	14.98	2409	4.70
40v3	57.06	2	1	35.63	21.19	14107	105.86	36.47	20.19	3599	23.02	36.29	18.74	2936	11.11	36.47	33.83	19.10	2187	4.84
40v4	69.86	2	1	31.95	18.82	8162	58.04	31.90	15.34	2962	18.87	31.81	12.26	2736	11.76	31.93	29.04	14.97	2508	6.75
40v5	45.86	3	0	31.38	16.01	10184	85.89	34.70	17.04	8808	104.54	34.60	17.85	6472	48.80	34.70	31.76	17.49	9098	36.71
40v6	45.51	2	0	33.10	18.86	3222	25.44	36.57	19.85	2332	19.08	36.57	20.46	2309	16.54	36.57	32.84	18.09	2518	7.30
40v7	48.80	3	0	27.57	11.53	501	4.86	29.14	7.43	195	2.27	29.03	7.50	174	1.37	29.22	25.29	6.19	166	1.06
40v8	63.33	3	0	26.09	10.44	6221	41.79	26.12	9.21	3566	17.92	25.91	8.05	2093	8.02	26.12	23.05	8.24	2887	5.89
40v9	42.75	4	0	30.44	7.62	489	4.63	32.89	7.66	1065	10.27	32.81	6.31	219	2.08	32.89	28.97	8.26	1346	5.52
40v10	44.34	3	0	34.85	14.61	2521	16.61	37.84	17.46	1529	10.45	37.88	14.61	951	4.41	37.88	32.76	17.87	1157	2.44
40v11	48.73	4	0	29.86	8.40	107	1.67	30.12	6.81	211	1.54	30.11	6.67	136	1.19	30.12	26.21	5.70	435	1.71
40v12	61.53	4	0	24.76	10.70	850	3.37	24.52	5.99	204	1.75	24.43	7.61	98	0.93	24.52	20.80	5.99	92	0.92
43v1	61.00	1	3	36.89	10.89	192	1.00	37.12	4.73	36	0.50	37.18	5.50	66	0.36	37.18	13.06	5.63	119	0.32
43v2	64.67	1	3	35.79	13.99	3970	19.01	35.60	11.82	1723	8.55	36.02	11.10	3160	9.80	36.02	13.53	11.21	1633	2.89
43v3	72.97	0	4	30.28	16.71	26036	161.75	29.83	9.66	3515	15.19	30.27	10.06	1871	4.62	30.31	10.49	8.31	2574	3.85
43v4	85.77	0	4	27.76	12.41	19158	89.74	26.99	6.97	3426	12.37	27.07	6.45	1932	4.82	27.25	8.93	7.14	2348	3.13
43v5	52.43	1	3	30.73	19.24	8065	48.29	35.76	20.97	8095	80.97	37.01	16.43	12197	74.75	37.01	35.59	21.38	10651	43.67
43v6	55.55	2	2	29.11	20.01	12058	64.35	32.25	19.10	18087	166.18	32.52	19.37	9052	43.79	32.55	32.25	20.65	10219	34.04
43v7	64.52	3	1	22.77	13.46	1817	7.36	24.03	11.88	5480	52.62	24.05	14.05	5996	39.32	24.17	24.03	14.32	6169	19.22
43v8	81.71	1	3	25.12	20.27	77953	804.28	25.75	15.20	37756	446.83	25.49	14.64	27966	279.01	25.75	24.90	15.27	30848	96.79
43v9	46.54	2	1	29.69	15.94	2460	13.98	31.69	15.76	5684	63.50	32.02	14.94	6815	53.09	32.02	30.54	18.60	4869	21.73
43v10	48.94	3	1	24.31	15.96	7967	62.68	25.77	14.51	7968	87.99	25.84	12.84	7495	54.46	25.84	25.77	13.86	8414	36.63
43v11	58.97	3	1	18.24	12.80	4242	32.53	18.93	11.59	4884	48.28	18.91	11.13	3951	30.24	18.93	18.93	12.60	4224	16.23
43v12	68.91	3	1	13.27	10.58	3331	31.94	13.27	9.66	1939	21.14	13.27	9.16	1195	9.04	13.27	13.27	9.73	1564	8.21

1.2 | Results on instance set MC10_2

This section contains a detailed report of the formulation F4's performance on the MC10_2 instance set. We specifically display, in Table 6, the outcomes for the TSPDL with endurance of $E = 20$, $E = 40$, and $E = \infty$ as well as the TSPDL 'Wait' with $E = 20$ and $E = 40$. The Table is organized as follows: the column 'Inst.' lists the name of the instance; the columns 'Opt', '#sort', and '#lock' display, respectively, the value of the optimal solution rounded at the second decimal value, the number of sorties and the number of customers served via locker in the optimal solution; lastly, the number of seconds needed to obtain the proven optimal solution (*sec*) is shown.

TABLE 2 Comparison of the formulations solving the TSPDL with $E = 40$.

TSPDL Inst.	E=40				F1				F2				F3				F4				
	Opt	#sort	#lock		%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN ₀	%gapRN	nodes	sec
37v1	46.38	1	0		36.79	22.87	11240	66.33	36.54	19.37	2597	27.22	37.24	19.81	3584	23.10	37.24	36.54	17.96	1868	6.91
37v2	44.07	1	0		30.32	21.92	4103	26.81	29.13	15.83	539	6.51	29.80	15.06	375	2.50	29.80	29.13	12.20	621	4.47
37v3	50.43	0	0		57.46	42.69	10929	69.23	57.03	37.53	12515	180.84	57.62	34.66	10771	95.96	57.62	57.03	37.64	14730	91.05
37v4	63.23	0	0		50.05	43.16	34350	219.01	49.26	32.64	24390	308.18	49.75	36.34	55352	568.22	49.78	49.26	36.67	15045	90.45
37v5	41.75	2	0		34.22	23.46	6185	36.56	37.25	20.93	9575	138.67	37.71	24.43	9289	85.06	37.71	37.25	18.67	10096	54.88
37v6	42.63	2	0		29.32	22.87	4510	28.85	31.28	17.07	6505	100.09	31.80	22.26	5354	48.75	31.86	31.28	22.68	5980	23.43
37v7	44.55	1	0		53.53	38.69	4029	21.74	55.97	38.44	9020	127.93	56.53	39.43	24074	277.05	56.53	55.97	38.92	17954	108.28
37v8	57.35	1	0		45.78	39.51	11362	68.60	47.44	39.26	53567	612.20	47.46	40.99	38505	338.80	47.59	47.44	38.97	67109	312.97
37v9	37.03	2	0		30.84	15.09	527	2.89	33.78	19.47	3549	34.07	34.26	19.90	6086	42.46	34.26	33.78	16.85	5696	33.62
37v10	39.18	2	0		26.35	19.09	2236	8.96	27.78	19.26	5390	70.47	27.86	17.52	9498	70.47	27.86	27.78	15.34	8893	37.75
37v11	39.66	2	0		51.22	41.50	8779	48.86	53.09	38.80	16008	249.37	53.64	37.86	8218	111.50	53.83	53.09	37.23	3685	34.86
37v12	52.46	2	0		42.94	35.35	16014	83.93	44.16	35.55	3579	61.33	44.06	36.36	13208	126.69	44.17	44.16	33.14	1225	11.85
40v1	47.10	1	0		30.05	17.75	17675	127.67	31.31	15.07	3070	28.06	31.19	17.46	2321	12.26	31.31	30.07	15.52	2865	9.88
40v2	47.42	1	0		32.77	19.31	5300	35.68	34.40	18.24	2792	19.62	34.40	19.25	2797	14.35	34.40	32.06	17.38	5072	31.21
40v3	53.48	1	0		31.32	20.84	27403	265.25	32.21	17.35	7381	105.31	32.03	17.56	3928	32.75	32.21	29.51	19.33	7607	39.80
40v4	66.28	1	0		28.37	15.50	41668	438.01	28.22	13.85	15460	224.39	28.12	14.72	8832	80.18	28.25	25.26	13.10	12110	64.74
40v5	43.75	2	0		28.07	12.86	1842	13.36	31.55	11.68	2524	21.87	31.45	11.82	1463	6.43	31.55	28.47	12.99	2386	4.92
40v6	45.08	2	0		32.46	17.96	5001	30.68	35.97	20.16	2339	18.23	35.97	19.64	2411	10.52	35.97	32.20	19.22	3724	5.95
40v7	48.80	3	0		27.57	11.53	306	3.18	29.14	10.01	525	5.66	29.03	8.49	434	3.39	29.22	25.29	5.20	276	1.38
40v8	61.60	3	0		24.02	9.08	827	6.18	24.04	5.87	1889	15.28	23.82	6.56	1239	6.03	24.04	20.89	4.94	1353	3.48
40v9	42.75	4	0		30.44	10.87	275	3.18	32.89	8.10	435	4.91	32.81	6.66	326	2.00	32.89	28.97	9.57	770	3.35
40v10	44.34	3	0		34.85	19.85	3379	18.49	37.84	17.05	1651	10.50	37.88	18.41	1195	4.61	37.88	32.76	16.93	1307	2.49
40v11	48.73	4	0		29.86	10.63	111	1.18	30.12	6.14	328	1.86	30.11	6.97	204	1.33	30.12	26.21	4.87	278	0.92
40v12	61.53	4	0		24.76	8.89	107	1.09	24.52	5.04	159	1.63	24.43	6.39	92	1.12	24.52	20.80	4.70	261	1.19
43v1	53.71	1	2		28.43	19.27	17409	90.23	28.59	10.92	2137	22.36	28.66	10.74	1865	13.03	28.66	27.75	12.13	1339	4.56
43v2	57.31	1	2		27.67	19.45	19122	99.51	27.34	16.49	6539	75.08	27.80	15.95	5809	40.80	27.80	27.21	14.19	8533	34.92
43v3	66.75	1	2		23.77	16.78	8991	67.39	23.28	10.55	4936	65.90	23.76	12.89	3471	17.79	23.80	23.28	11.97	4034	11.54
43v4	81.01	1	3		23.64	18.33	48248	387.30	22.70	13.70	22311	252.71	22.82	14.17	17516	132.57	22.98	22.70	13.14	21246	69.64
43v5	50.69	2	1		28.36	16.16	1116	6.07	33.56	16.24	9367	110.50	34.83	15.97	13471	101.82	34.83	33.38	16.01	15532	74.96
43v6	53.05	2	1		25.76	15.87	3156	15.28	29.05	15.18	9041	86.91	29.33	16.12	9254	65.32	29.36	29.05	16.91	10773	49.62
43v7	61.60	2	1		19.11	12.24	1068	6.16	20.43	10.60	3587	34.31	20.45	10.32	8218	62.78	20.58	20.43	12.35	7599	38.90
43v8	74.40	2	1		17.77	12.24	16541	141.16	18.45	12.86	25897	303.85	18.18	13.49	23495	198.98	18.45	18.45	13.38	27795	110.85
43v9	46.54	2	1		29.69	16.74	1872	9.21	31.69	17.09	6120	67.41	32.02	14.50	9901	66.78	32.02	30.54	18.64	12940	63.43
43v10	48.94	3	1		24.31	15.02	8337	45.74	25.77	12.78	12493	133.84	25.84	13.31	13596	86.08	25.84	25.77	15.03	15842	56.24
43v11	57.11	3	1		15.58	9.93	2530	15.12	16.29	9.46	3021	38.74	16.27	9.04	1832	9.10	16.29	16.29	9.29	3319	17.90
43v12	68.91	3	1		13.27	10.77	4377	33.90	13.27	9.81	6526	84.73	13.27	9.08	2983	25.91	13.27	13.27	9.83	13853	65.98

1.3 | Results on instance set MC20

This section contains a detailed report of the formulations F4's performance on the MC20 instance set with $m = 1, 2$ and 3. We display the outcomes for the TSPDL with endurance of $E = 20, E = 40$, and $E = \infty$ as well as for the TSPDL 'Wait' with endurance of $E = 20$ and $E = 40$, respectively, in Table 7. The first columns in the Table are as follows: 'Inst.' reports the instance name, and 'm' the number of available lockers. The best upper bound (UB) and the percentage gap between the UB and the lower bound (LB) at the end of iterations are then displayed for each problem ($\%gap = 100 \cdot (UB - LB)/UB$). Note that when the percentage gap is equal to 0, the UB is also the value of the optimal solution. Finally, we show the number of seconds needed to obtain the proven optimal solutions or the time limit (t.l.) of 3600 seconds if the optimality could not be proved.

TABLE 3 Comparison of the formulations solving the TSPDL 'Wait' with $E = 20$.

Wait E=20				F1				F2				F3				F4				
Inst.	Opt	#sort	#lock	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN ₀	%gapRN	nodes	sec
37v1	52.25	0	0	43.89	20.20	63	0.28	43.67	5.36	79	0.68	44.31	6.36	144	0.44	44.31	28.07	4.43	61	0.39
37v2	49.95	0	0	38.52	19.95	35	0.23	37.46	10.82	48	0.67	38.07	9.82	51	0.40	38.07	28.48	11.87	30	0.25
37v3	50.43	0	0	57.46	29.24	1941	6.64	57.03	23.63	2130	10.76	57.62	26.42	3512	8.17	57.62	44.12	28.38	3982	5.92
37v4	63.23	0	0	50.05	23.15	2243	7.25	49.26	17.89	2157	13.91	49.75	18.67	2505	7.00	49.78	36.93	18.80	2008	3.14
37v5	44.17	2	0	37.82	27.74	18541	33.84	40.68	25.29	14322	112.59	41.12	24.35	21012	146.42	41.12	40.68	24.74	17123	44.07
37v6	43.48	2	0	30.70	24.18	10281	24.22	32.62	17.86	8330	73.24	33.13	14.81	10142	46.28	33.19	32.62	18.68	9025	23.65
37v7	45.77	1	0	54.77	44.17	4411	12.66	57.14	40.46	24691	202.07	57.68	38.60	11638	68.51	57.68	57.14	40.36	20946	68.54
37v8	58.57	1	0	46.91	41.20	9777	25.59	48.53	37.57	13399	109.40	48.55	41.55	27126	132.63	48.68	48.53	36.10	33979	125.42
37v9	37.03	2	0	30.84	15.66	291	0.86	33.78	17.62	6667	44.14	34.26	16.92	6991	32.27	34.26	33.78	18.03	4921	11.71
37v10	39.18	2	0	26.35	19.25	3213	6.73	27.78	12.82	7053	52.90	27.86	13.78	9290	41.77	27.86	27.78	13.80	11067	32.07
37v11	39.66	2	0	51.22	43.68	4000	10.97	53.09	38.61	9796	80.93	53.64	38.82	4147	18.35	53.83	53.09	37.86	4635	18.53
37v12	52.46	2	0	42.94	35.35	9726	24.08	44.16	36.15	18594	217.38	44.06	31.45	3005	17.01	44.17	44.16	32.23	6211	29.47
40v1	48.03	2	1	31.39	14.75	653	2.52	32.63	15.43	221	1.31	32.52	15.38	242	0.90	32.63	30.94	11.46	371	0.86
40v2	49.30	1	1	35.34	20.54	2311	7.82	36.90	16.57	657	3.47	36.90	17.75	624	1.53	36.90	34.55	15.61	661	0.96
40v3	54.70	1	1	32.84	14.54	844	2.27	33.72	15.00	289	1.89	33.53	16.14	340	1.09	33.72	30.97	12.92	540	1.21
40v4	68.79	1	1	30.89	13.61	4700	14.58	30.84	12.35	1655	9.56	30.75	10.03	1352	5.72	30.87	27.93	6.67	1708	3.78
40v5	43.75	2	0	28.07	13.93	2449	8.45	31.55	10.13	1789	10.69	31.45	13.38	902	2.46	31.55	28.47	13.51	2173	5.27
40v6	45.51	2	0	33.10	18.76	4859	16.74	36.58	20.40	3431	27.27	36.58	20.62	2265	9.05	36.58	32.84	21.03	3688	6.98
40v7	48.80	3	0	27.57	11.44	214	1.09	29.14	7.52	193	1.21	29.03	7.44	100	0.73	29.22	25.29	6.90	127	0.63
40v8	63.27	2	0	26.02	9.96	6887	23.09	26.04	9.07	3447	23.52	25.83	9.19	4997	12.45	26.04	22.98	7.72	4645	6.39
40v9	42.75	4	0	30.44	10.79	655	2.76	32.89	9.46	449	2.97	32.81	11.43	505	2.05	32.89	28.97	9.72	431	0.82
40v10	44.34	3	0	34.85	14.61	3527	10.66	37.84	19.48	1932	8.21	37.88	14.61	1164	2.50	37.88	32.76	14.25	1368	1.69
40v11	48.73	4	0	29.86	8.40	434	1.39	30.12	7.62	204	1.02	30.11	5.23	357	0.79	30.12	26.21	6.29	643	0.67
40v12	61.53	4	0	24.76	5.38	107	0.64	24.52	5.57	151	0.77	24.43	4.11	24	0.38	24.52	20.80	5.35	151	0.54
43v1	61.00	1	3	36.89	13.44	143	0.41	37.12	6.13	37	0.23	37.18	5.20	36	0.30	37.18	13.06	5.44	38	0.21
43v2	63.89	1	3	35.00	12.85	3845	8.35	34.82	11.33	2119	8.08	35.23	10.29	1535	3.26	35.23	12.47	10.59	1920	2.42
43v3	71.69	1	1	29.03	7.15	6570	14.48	28.58	6.36	1036	2.94	29.03	7.76	762	2.13	29.07	8.89	8.01	886	1.31
43v4	84.49	1	1	26.66	10.31	4453	9.94	25.88	6.09	1411	4.98	25.97	5.61	900	2.07	26.15	7.55	5.00	1292	2.37
43v5	52.43	1	3	30.73	20.14	13675	41.52	35.76	18.49	24494	185.27	37.01	13.57	19037	83.54	37.01	35.59	18.59	18183	60.17
43v6	54.56	2	1	27.83	18.63	8928	17.43	31.02	18.16	13038	86.34	31.30	18.51	12473	48.46	31.33	31.02	17.01	16725	38.29
43v7	64.52	3	1	22.77	12.60	2651	5.05	24.03	11.66	11985	74.41	24.05	11.95	14327	66.76	24.17	24.03	12.01	12638	27.24
43v8	77.86	2	3	21.42	12.81	10523	41.52	22.08	10.77	14223	98.72	21.81	10.36	8794	35.47	22.08	21.20	11.82	12209	25.67
43v9	46.54	2	1	29.69	16.10	1856	3.04	31.69	17.23	7003	48.45	32.02	15.86	7749	27.37	32.02	30.54	18.32	8737	25.80
43v10	48.94	3	1	24.31	15.96	9188	24.48	25.77	14.59	10477	65.04	25.84	13.36	12853	50.73	25.84	25.77	14.04	16376	40.17
43v11	58.97	3	1	18.24	12.64	7621	24.97	18.93	13.63	7547	45.43	18.91	11.62	9104	35.59	18.93	18.93	12.71	6454	13.40
43v12	68.91	3	1	13.27	11.97	2253	5.32	13.27	9.93	2454	13.31	13.27	8.90	1392	5.80	13.27	13.27	9.68	1795	3.72

TABLE 4 Comparison of the formulations solving the TSPDL 'Wait' with $E = 40$.

Inst.	E=40				F1				F2				F3				F4				
	Opt	#sort	#lock		%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN ₀	%gapRN	nodes	sec
37v1	46.38	1	0		36.79	23.41	9769	25.09	36.54	19.95	2744	15.48	37.24	19.82	3501	10.53	37.24	36.54	19.60	3822	6.18
37v2	44.07	1	0		30.32	22.81	4061	10.39	29.13	12.81	477	3.06	29.80	12.86	490	1.86	29.80	29.13	11.29	443	1.10
37v3	50.43	0	0		57.46	44.42	35992	98.84	57.03	38.77	20898	162.46	57.62	39.34	14622	71.97	57.62	57.03	37.13	10855	31.96
37v4	63.23	0	0		50.05	41.49	53737	127.43	49.26	35.55	17424	163.27	49.75	37.29	20506	110.99	49.78	49.26	35.45	25890	70.97
37v5	41.75	2	0		34.22	21.07	6685	15.86	37.25	21.54	10380	80.67	37.71	20.75	14756	80.29	37.71	37.25	20.15	11145	28.29
37v6	42.63	2	0		29.32	22.69	4905	12.75	31.28	14.87	7146	57.23	31.80	15.62	3927	20.75	31.86	31.28	17.35	6377	14.01
37v7	44.55	1	0		53.53	37.74	3653	9.17	55.97	38.84	12961	109.83	56.53	38.64	28890	144.19	56.53	55.97	38.78	13698	37.95
37v8	57.35	1	0		45.78	40.79	14548	34.53	47.44	37.18	58823	442.30	47.46	39.28	27890	121.73	47.59	47.44	35.84	80932	173.77
37v9	37.03	2	0		30.84	15.49	209	0.72	33.78	18.17	6647	53.79	34.26	18.19	4344	13.00	34.26	33.78	16.95	5729	14.34
37v10	39.18	2	0		26.35	19.23	3355	6.86	27.78	19.42	7927	58.59	27.86	14.79	8670	33.88	27.86	27.78	11.44	11825	25.08
37v11	39.66	2	0		51.22	42.13	15151	43.03	53.09	36.99	7957	63.15	53.64	39.63	4835	26.05	53.83	53.09	36.20	7184	26.88
37v12	52.46	2	0		42.94	35.35	8938	23.81	44.16	35.23	15925	180.13	44.06	31.02	2289	12.49	44.17	44.16	32.93	13648	78.32
40v1	47.10	1	0		30.05	17.05	7707	28.55	31.31	15.19	3061	18.18	31.19	17.47	2784	8.66	31.31	30.07	17.31	3416	5.81
40v2	47.42	1	0		32.77	19.80	6825	23.42	34.40	18.37	7769	74.43	34.40	19.08	3516	10.75	34.40	32.06	17.10	10024	37.39
40v3	53.48	1	0		31.32	19.17	19190	83.29	32.21	18.09	5932	49.48	32.03	18.20	6442	30.47	32.21	29.51	19.04	7080	19.46
40v4	66.28	1	0		28.37	14.86	58177	320.08	28.22	14.98	20427	236.12	28.12	15.63	9610	53.84	28.25	25.26	15.56	15312	38.35
40v5	43.75	2	0		28.07	13.62	2677	9.69	31.55	11.62	2653	12.64	31.45	11.70	1331	3.64	31.55	28.47	11.91	2087	2.68
40v6	45.08	2	0		32.46	17.96	3603	11.12	35.97	20.23	3807	16.35	35.97	19.94	3316	7.84	35.97	32.20	20.12	3088	3.68
40v7	48.80	3	0		27.57	11.42	318	1.48	29.14	10.39	611	4.17	29.03	7.04	207	0.98	29.22	25.29	6.40	611	1.14
40v8	61.60	3	0		24.02	8.44	1203	4.06	24.04	4.26	2475	10.16	23.82	6.72	1374	4.03	24.04	20.89	3.99	1518	2.48
40v9	42.75	4	0		30.44	11.65	704	2.46	32.89	9.93	275	2.41	32.81	7.10	515	1.71	32.89	28.97	9.46	1279	4.72
40v10	44.34	3	0		34.85	17.46	3611	11.08	37.84	14.95	1730	7.28	37.88	19.82	1358	2.51	37.88	32.76	16.60	1659	1.79
40v11	48.73	4	0		29.86	10.80	137	0.63	30.12	9.08	204	1.04	30.11	6.76	78	0.55	30.12	26.21	6.74	811	1.12
40v12	61.53	4	0		24.76	4.64	301	0.93	24.52	6.19	370	1.18	24.43	4.15	301	0.74	24.52	20.80	5.08	246	0.47
43v1	53.71	1	2		28.43	19.35	23665	75.07	28.59	11.82	1880	11.22	28.66	12.12	1661	5.90	28.66	27.75	11.56	2768	5.24
43v2	57.31	1	2		27.67	19.50	21186	65.07	27.34	14.10	7428	58.58	27.80	13.90	4409	27.50	27.80	27.21	14.51	6600	17.83
43v3	66.75	1	2		23.77	16.49	9365	32.41	23.28	11.23	3905	25.06	23.76	12.63	3297	11.00	23.80	23.28	11.10	3698	9.48
43v4	81.00	1	2		23.63	18.40	72119	459.00	22.69	13.01	18092	133.11	22.81	15.10	20457	102.02	22.97	22.69	13.88	22862	50.06
43v5	50.69	2	1		28.36	17.07	4335	13.50	33.56	18.96	7583	51.58	34.83	19.32	9876	35.47	34.83	33.38	17.41	13193	31.53
43v6	53.05	2	1		25.76	16.03	4360	11.61	29.05	15.65	9862	64.23	29.33	14.66	10061	39.24	29.36	29.05	17.68	10871	28.47
43v7	61.60	2	1		19.11	10.20	1433	5.66	20.43	11.36	3110	16.37	20.45	10.43	4029	20.85	20.58	20.43	12.10	5163	13.67
43v8	74.40	2	1		17.77	12.63	18223	77.26	18.45	13.92	25789	226.86	18.18	13.74	21722	103.10	18.45	18.45	12.87	38278	87.92
43v9	46.54	2	1		29.69	17.17	1277	3.40	31.69	16.29	8336	58.50	32.02	18.42	11695	47.25	32.02	30.54	18.99	8675	18.57
43v10	48.94	3	1		24.31	15.48	8631	26.16	25.77	15.46	10633	78.25	25.84	14.66	16433	64.65	25.84	25.77	14.65	20398	53.54
43v11	57.11	3	1		15.58	8.58	2100	5.47	16.29	8.75	3872	20.42	16.27	8.39	2169	11.28	16.29	16.29	10.06	6940	17.59
43v12	68.91	3	1		13.27	10.02	3570	15.34	13.27	9.64	6231	45.34	13.27	9.27	3256	9.56	13.27	13.27	9.91	5886	13.40

TABLE 5 Comparison of the formulations solving the TSPDL with $E = \infty$.

TSPDL	$E=\infty$				F1				F2				F3				F4				
	Inst.	Opt	#sort	#lock	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN	nodes	sec	%gapLR	%gapRN ₀	%gapRN	nodes	sec
37v1	46.38	1	0		36.79	23.38	11088	36.64	36.54	19.81	2846	17.46	37.24	19.82	3482	10.83	37.24	36.54	20.02	4264	13.99
37v2	44.07	1	0		30.32	22.41	3673	9.83	29.13	11.05	558	3.65	29.80	9.11	1154	5.51	29.80	29.13	11.48	518	1.34
37v3	50.43	0	0		57.46	39.82	26009	57.82	57.03	37.95	12526	112.44	57.62	37.85	19776	93.04	57.62	57.03	39.26	16874	46.61
37v4	63.23	0	0		50.05	42.26	48281	116.82	49.26	36.09	44559	385.15	49.75	35.13	32311	134.67	49.78	49.26	33.34	23810	71.62
37v5	41.75	2	0		34.22	20.41	6443	15.87	37.25	21.54	10380	80.55	37.71	20.75	14756	80.53	37.71	37.25	20.15	11145	28.30
37v6	42.63	2	0		29.32	22.76	5491	14.43	31.28	14.87	7146	58.19	31.80	15.62	3927	20.8	31.86	31.28	17.35	6377	14.24
37v7	44.55	1	0		53.53	38.74	3738	10.03	55.97	38.84	12961	110.60	56.53	38.64	28890	144.59	56.53	55.97	38.78	13698	37.65
37v8	57.35	1	0		45.78	40.70	14220	35.60	47.44	39.08	76906	408.29	47.46	40.46	51168	178.54	47.59	47.44	39.47	54887	146.77
37v9	37.03	2	0		30.84	15.29	202	0.82	33.78	18.17	6647	54.44	34.26	18.19	4344	13.21	34.26	33.78	16.95	5729	14.35
37v10	39.18	2	0		26.35	18.01	2827	9.14	27.78	19.42	7927	58.94	27.86	14.79	8670	34.11	27.86	27.78	11.44	11825	24.67
37v11	39.66	2	0		51.22	43.73	5909	14.91	53.09	36.99	7957	62.89	53.64	39.63	4835	26.18	53.83	53.09	36.20	7184	26.88
37v12	52.46	2	0		42.94	35.25	6098	16.29	44.16	35.23	15925	180.75	44.06	31.02	2289	12.60	44.17	44.16	32.93	13648	77.11
40v1	47.10	1	0		30.05	17.56	10900	44.07	31.31	15.10	3046	19.47	31.19	16.78	2537	7.33	31.31	30.07	17.30	2922	4.69
40v2	47.42	1	0		32.77	19.22	8972	32.07	34.40	17.67	3163	15.93	34.40	19.29	3079	12.82	34.40	32.06	17.08	4339	6.75
40v3	53.38	1	0		31.18	18.35	27893	107.97	32.08	16.99	6542	55.54	31.89	17.00	6772	35.21	32.08	29.37	16.99	6866	16.87
40v4	66.28	1	0		28.37	15.35	65165	913.73	28.22	13.13	20276	222.74	28.12	15.41	12785	62.17	28.25	25.26	14.04	20474	63.88
40v5	43.75	2	0		28.07	13.58	1954	7.55	31.55	11.62	2653	12.69	31.45	11.70	1331	3.67	31.55	28.47	11.91	2087	2.65
40v6	45.08	2	0		32.46	18.13	3353	10.88	35.97	20.23	3807	16.49	35.97	19.94	3316	7.75	35.97	32.20	20.12	3088	3.65
40v7	48.80	3	0		27.57	11.22	270	1.29	29.14	10.39	611	4.17	29.03	7.04	207	0.97	29.22	25.29	6.40	611	1.13
40v8	61.60	3	0		24.02	8.44	1191	4.14	24.04	5.81	1900	9.46	23.82	4.41	1141	2.87	24.04	20.89	4.89	2040	2.30
40v9	42.75	4	0		30.44	10.32	178	1.26	32.89	9.93	275	2.43	32.81	7.10	515	1.71	32.89	28.97	9.46	1279	4.67
40v10	44.34	3	0		34.85	14.61	3774	13.64	37.84	14.95	1730	7.38	37.88	19.82	1358	2.49	37.88	32.76	16.60	1659	1.79
40v11	48.73	4	0		29.86	8.16	376	1.05	30.12	9.08	204	1.08	30.11	6.76	78	0.55	30.12	26.21	6.74	811	1.12
40v12	61.53	4	0		24.76	7.04	356	0.98	24.52	6.19	370	1.18	24.43	4.15	301	0.74	24.52	20.80	5.08	246	0.47
43v1	53.71	1	2		28.43	19.46	14172	35.52	28.59	15.04	1982	11.92	28.66	11.42	2222	8.16	28.66	27.75	15.50	1825	3.63
43v2	57.31	1	2		27.67	19.59	21882	75.46	27.34	16.79	5775	47.82	27.80	16.31	5742	33.22	27.80	27.21	15.17	5677	18.38
43v3	66.36	1	2		23.33	15.75	14881	54.40	22.84	10.48	3134	17.01	23.32	12.39	3365	9.79	23.36	22.84	12.77	3096	5.07
43v4	79.77	1	2		22.45	17.23	91881	405.51	21.50	14.18	15736	134.79	21.63	12.54	13139	81.94	21.78	21.50	13.69	16246	38.02
43v5	50.69	2	1		28.36	16.93	2887	6.29	33.56	18.96	7583	51.66	34.83	19.32	9876	35.51	34.83	33.38	17.41	13193	31.49
43v6	53.05	2	1		25.76	15.15	4369	10.72	29.05	15.65	9862	64.26	29.33	14.66	10061	39.4	29.36	29.05	17.68	10871	28.05
43v7	61.60	2	1		19.11	10.80	1499	5.06	20.43	11.36	3110	16.35	20.45	10.43	4029	20.99	20.58	20.43	12.10	5163	13.77
43v8	74.40	2	1		17.77	13.49	15402	58.95	18.45	13.92	25789	228.29	18.18	13.74	19458	87.74	18.45	18.45	12.87	38278	88.66
43v9	46.54	2	1		29.69	17.18	1765	2.95	31.69	16.29	8336	58.58	32.02	18.42	11695	47.55	32.02	30.54	18.99	8675	18.78
43v10	48.94	3	1		24.31	16.15	11794	35.85	25.77	15.46	10633	78.64	25.84	14.66	16433	65.31	25.84	25.77	14.65	20398	53.73
43v11	57.11	3	1		15.58	10.15	2623	7.59	16.29	8.75	3872	20.28	16.27	8.39	2169	11.32	16.29	16.29	10.06	6940	17.33
43v12	68.91	3	1		13.27	11.96	2191	5.77	13.27	9.64	6231	45.68	13.27	9.27	3256	9.6	13.27	13.27	9.91	5886	13.32

TABLE 6 Results on instance set MC10_2

Inst.	TSPDL E=20				TSPDL E=40				TSPDL E=inf				Wait E=20				Wait E=40			
	Opt	#sort	#lock	secs	Opt	#sort	#lock	secs	Opt	#sort	#lock	secs	Opt	#sort	#lock	secs	Opt	#sort	#lock	secs
37v1_2L	52.25	0	0	0.49	46.38	1	0	21.66	46.38	1	0	13.79	52.25	0	0	0.47	46.38	1	0	4.68
37v2_2L	49.95	0	0	1.20	44.07	1	0	2.23	44.07	1	0	1.38	49.95	0	0	0.48	44.07	1	0	1.06
37v3_2L	50.43	0	0	6.37	50.43	0	0	140.11	50.43	0	0	51.22	50.43	0	0	4.80	50.43	0	0	50.15
37v4_2L	63.23	0	0	7.07	63.23	0	0	458.35	63.23	0	0	88.96	63.23	0	0	8.57	63.23	0	0	300.10
37v5_2L	44.41	2	0	84.26	41.75	2	0	51.32	41.75	2	0	23.72	44.17	2	0	46.41	41.75	2	0	24.31
37v6_2L	45.29	1	0	71.23	42.63	2	0	26.29	42.63	2	0	18.99	43.48	2	0	33.97	42.63	2	0	19.33
37v7_2L	45.77	1	0	195.56	44.55	1	0	402.00	44.55	1	0	57.30	45.77	1	0	266.57	44.55	1	0	58.48
37v8_2L	58.57	1	0	249.25	57.35	1	0	651.50	57.35	1	0	243.16	58.57	1	0	72.17	57.35	1	0	169.56
37v9_2L	37.03	2	0	27.30	37.03	2	0	108.40	37.03	2	0	12.36	37.03	2	0	38.33	37.03	2	0	12.52
37v10_2L	39.18	2	0	50.01	39.18	2	0	45.13	39.18	2	0	16.42	39.18	2	0	19.52	39.18	2	0	16.37
37v11_2L	40.25	2	0	187.43	39.66	2	0	57.56	39.66	2	0	40.99	39.66	2	0	45.68	39.66	2	0	40.32
37v12_2L	57.12	2	0	147.71	52.46	2	0	486.22	52.46	2	0	43.55	52.46	2	0	90.31	52.46	2	0	43.40
40v1_2L	48.03	2	1	2.28	47.10	1	0	10.70	47.10	1	0	6.00	48.03	2	1	2.65	47.10	1	0	13.82
40v2_2L	50.97	2	1	11.94	47.42	1	0	24.30	47.42	1	0	12.68	49.30	1	1	1.06	47.42	1	0	47.91
40v3_2L	57.06	2	1	9.23	53.48	1	0	59.12	53.38	1	0	25.07	54.70	1	1	1.33	53.48	1	0	19.63
40v4_2L	69.86	2	1	9.12	66.28	1	0	150.18	66.28	1	0	78.41	68.79	1	1	6.99	66.28	1	0	58.57
40v5_2L	45.86	3	0	37.71	43.75	2	0	10.20	43.75	2	0	4.73	43.75	2	0	5.59	43.75	2	0	4.63
40v6_2L	45.51	2	0	9.67	45.08	2	0	11.08	45.08	2	0	5.92	45.51	2	0	9.59	45.08	2	0	5.87
40v7_2L	48.80	3	0	1.90	48.80	3	0	5.84	48.80	3	0	1.76	48.80	3	0	1.31	48.80	3	0	1.76
40v8_2L	63.33	3	0	6.68	61.60	3	0	9.17	61.60	3	0	8.49	63.27	2	0	22.00	61.60	3	0	3.68
40v9_2L	42.75	4	0	4.49	42.75	4	0	4.42	42.75	4	0	1.92	42.75	4	0	3.00	42.75	4	0	1.92
40v10_2L	44.34	3	0	3.85	44.34	3	0	4.46	44.34	3	0	3.69	44.34	3	0	4.21	44.34	3	0	3.70
40v11_2L	47.98	3	1	1.72	47.98	3	1	2.55	47.98	3	1	1.77	47.98	3	1	0.78	47.98	3	1	1.78
40v12_2L	60.78	3	1	1.59	60.78	3	1	1.77	60.78	3	1	0.82	60.78	3	1	0.50	60.78	3	1	0.82
43v1_2L	59.57	1	4	0.48	52.61	1	2	6.77	52.61	1	2	3.18	59.57	1	4	0.40	52.61	1	2	2.40
43v2_2L	61.15	1	4	1.83	55.17	1	2	23.93	55.17	1	2	17.29	59.98	1	4	0.98	55.17	1	2	8.31
43v3_2L	72.11	0	4	7.32	66.30	1	4	45.23	66.06	1	3	29.82	71.69	1	1	3.91	66.30	1	4	21.92
43v4_2L	84.91	0	4	9.68	80.14	1	3	179.58	79.10	1	4	82.00	84.49	1	1	3.35	79.28	1	2	67.51
43v5_2L	50.76	1	4	25.21	50.69	2	1	90.33	50.69	2	1	50.05	50.76	1	4	24.00	50.69	2	1	49.40
43v6_2L	55.36	1	4	214.87	53.05	2	1	145.54	53.05	2	1	79.38	54.56	2	1	169.93	53.05	2	1	79.26
43v7_2L	64.52	3	1	59.76	60.63	2	1	40.56	60.63	2	1	22.88	64.52	3	1	50.59	60.63	2	1	22.71
43v8_2L	81.71	1	3	600.67	73.43	2	1	170.61	73.43	2	1	105.77	77.86	2	3	83.16	73.43	2	1	104.23
43v9_2L	46.54	2	1	73.17	46.54	2	1	74.41	46.54	2	1	66.27	46.54	2	1	25.31	46.54	2	1	66.32
43v10_2L	48.72	2	2	85.04	48.72	2	2	101.32	48.72	2	2	57.85	48.72	2	2	82.91	48.72	2	2	57.80
43v11_2L	58.86	3	2	82.18	56.53	3	1	28.91	56.53	3	1	6.16	57.75	2	2	18.04	56.53	3	1	6.14
43v12_2L	68.80	3	2	24.80	68.80	3	2	84.61	68.80	3	2	40.58	68.80	3	2	16.54	68.80	3	2	40.33

TABLE 7 Results on instance set MC20

Inst.	m	TSPDL E=20			TSPDL E=40			TSPDL E=inf			Wait E=20			Wait E=40		
		UB	%gap	secs	UB	%gap	secs	UB	%gap	secs	UB	%gap	secs	UB	%gap	secs
1	1	267.05	3.71	t.l.	257.88	10.06	t.l.	201.42	9.88	t.l.	263.29	1.89	t.l.	259.54	10.68	t.l.
2	1	233.02	0.00	4.76	204.85	16.64	t.l.	186.16	10.57	t.l.	231.18	0.00	2.73	204.85	15.14	t.l.
3	1	231.72	0.00	571.87	212.45	12.21	t.l.	213.15	13.35	t.l.	226.22	0.00	164.66	212.45	12.67	t.l.
4	1	249.76	0.00	1028.39	233.63	15.85	t.l.	222.80	22.14	t.l.	242.13	0.00	103.68	231.15	15.17	t.l.
5	1	237.66	0.00	438.63	215.59	14.52	t.l.	212.45	5.64	t.l.	234.89	0.00	1396.39	234.20	18.07	t.l.
6	1	173.49	13.59	t.l.	165.83	24.35	t.l.	168.55	17.86	t.l.	173.49	13.70	t.l.	167.67	24.19	t.l.
7	1	170.05	21.38	t.l.	158.51	26.07	t.l.	159.08	22.67	t.l.	166.83	19.27	t.l.	158.51	26.57	t.l.
8	1	163.65	10.17	t.l.	155.62	20.98	t.l.	159.61	22.99	t.l.	160.23	7.84	t.l.	155.62	22.13	t.l.
9	1	158.57	18.76	t.l.	158.54	25.42	t.l.	158.54	17.70	t.l.	158.54	17.52	t.l.	158.54	26.29	t.l.
10	1	142.92	17.04	t.l.	141.24	18.59	t.l.	119.71	13.75	t.l.	142.92	16.94	t.l.	141.24	17.44	t.l.
11	1	203.29	2.48	t.l.	189.16	19.04	t.l.	168.57	14.47	t.l.	200.05	4.02	t.l.	189.15	19.32	t.l.
12	1	252.46	5.35	t.l.	243.95	12.19	t.l.	242.82	13.76	t.l.	249.20	0.00	1163.20	243.95	11.40	t.l.
13	1	244.86	9.86	t.l.	231.58	22.90	t.l.	194.75	19.22	t.l.	244.35	5.37	t.l.	236.55	19.24	t.l.
14	1	236.49	0.00	105.42	220.67	7.99	t.l.	219.63	20.88	t.l.	235.95	0.00	91.41	220.67	7.80	t.l.
15	1	251.92	0.00	1155.47	240.94	24.51	t.l.	240.94	24.79	t.l.	249.02	0.00	289.34	240.94	24.80	t.l.
16	1	114.10	9.28	t.l.	111.80	9.91	t.l.	112.76	8.87	t.l.	114.10	5.71	t.l.	113.00	6.55	t.l.
17	1	173.22	3.06	t.l.	163.88	2.76	t.l.	135.11	7.60	t.l.	171.71	1.50	t.l.	165.11	3.49	t.l.
18	1	150.19	0.00	143.58	136.29	7.60	t.l.	129.76	1.11	t.l.	150.19	0.00	142.42	138.87	8.42	t.l.
19	1	155.27	0.00	126.31	149.59	23.80	t.l.	136.13	5.85	t.l.	154.05	0.00	67.86	150.36	13.83	t.l.
20	1	146.48	9.45	t.l.	136.69	11.93	t.l.	138.46	11.07	t.l.	146.48	10.88	t.l.	136.69	10.76	t.l.
1	2	255.29	4.60	t.l.	243.46	10.16	t.l.	201.27	9.28	t.l.	250.28	0.00	2729.78	237.54	7.96	t.l.
2	2	221.35	0.00	4.24	204.93	15.01	t.l.	190.69	13.34	t.l.	219.57	0.00	2.76	204.85	14.84	t.l.
3	2	226.08	0.00	823.30	207.65	12.29	t.l.	211.73	14.47	t.l.	222.47	0.00	421.79	207.65	11.90	t.l.
4	2	249.76	0.00	1336.96	235.83	17.35	t.l.	200.80	14.21	t.l.	242.13	0.00	85.81	233.63	14.32	t.l.
5	2	237.67	0.00	197.44	214.63	11.31	t.l.	221.23	9.50	t.l.	234.89	0.00	267.11	217.21	14.39	t.l.
6	2	173.49	13.12	t.l.	165.85	21.85	t.l.	164.99	28.95	t.l.	173.49	15.19	t.l.	168.83	24.14	t.l.
7	2	170.05	22.06	t.l.	158.03	22.01	t.l.	160.30	27.96	t.l.	166.83	19.99	t.l.	161.05	24.28	t.l.
8	2	160.71	7.95	t.l.	159.61	19.81	t.l.	159.61	23.37	t.l.	160.23	8.21	t.l.	159.61	21.33	t.l.
9	2	158.57	15.61	t.l.	158.54	28.88	t.l.	158.54	26.53	t.l.	158.54	16.15	t.l.	158.54	23.12	t.l.
10	2	142.92	15.55	t.l.	141.24	18.92	t.l.	118.00	13.07	t.l.	142.92	16.57	t.l.	141.24	17.13	t.l.
11	2	202.84	5.49	t.l.	191.48	20.67	t.l.	168.76	15.29	t.l.	199.60	0.00	2076.86	189.15	21.08	t.l.
12	2	252.46	9.91	t.l.	240.31	13.02	t.l.	244.14	28.15	t.l.	250.70	4.61	t.l.	243.95	12.65	t.l.
13	2	243.61	9.83	t.l.	231.58	18.25	t.l.	192.82	20.05	t.l.	243.10	7.31	t.l.	236.55	22.01	t.l.
14	2	236.49	0.00	174.77	220.67	9.20	t.l.	215.08	18.79	t.l.	235.95	0.00	125.25	225.21	10.37	t.l.
15	2	251.92	0.00	1788.95	240.94	26.23	t.l.	240.94	27.11	t.l.	249.02	0.00	743.34	240.94	24.87	t.l.
16	2	111.71	7.78	t.l.	118.39	14.52	t.l.	110.71	9.32	t.l.	111.71	6.33	t.l.	110.31	10.83	t.l.
17	2	172.41	2.26	t.l.	163.91	2.79	t.l.	135.11	6.96	t.l.	171.25	0.56	t.l.	170.15	6.35	t.l.
18	2	150.19	0.00	665.29	136.25	10.78	t.l.	129.76	2.25	t.l.	150.19	0.00	986.18	142.18	14.76	t.l.
19	2	155.27	0.00	281.18	149.91	26.51	t.l.	150.18	28.19	t.l.	154.05	0.00	342.22	147.75	12.84	t.l.
20	2	146.48	10.11	t.l.	136.69	11.81	t.l.	130.34	5.58	t.l.	146.48	8.95	t.l.	136.69	10.60	t.l.
1	3	255.29	4.35	t.l.	244.96	10.60	t.l.	210.49	14.05	t.l.	250.28	0.00	3115.11	237.54	7.94	t.l.
2	3	221.35	0.00	7.87	204.93	16.09	t.l.	190.69	13.31	t.l.	219.57	0.00	2.72	204.85	16.95	t.l.
3	3	226.08	0.00	1123.07	207.65	13.74	t.l.	211.03	14.43	t.l.	222.47	0.00	448.59	207.65	12.63	t.l.
4	3	249.76	0.00	1728.44	233.63	17.18	t.l.	222.80	22.20	t.l.	242.13	0.00	111.54	231.15	14.50	t.l.
5	3	237.66	2.78	t.l.	214.62	14.96	t.l.	212.45	13.03	t.l.	234.51	0.00	1953.98	212.09	12.45	t.l.
6	3	173.49	11.29	t.l.	166.14	20.08	t.l.	163.12	3.99	t.l.	173.49	15.67	t.l.	166.14	17.11	t.l.
7	3	170.05	21.30	t.l.	158.51	27.03	t.l.	159.28	23.53	t.l.	166.83	22.21	t.l.	161.05	25.81	t.l.
8	3	160.71	13.73	t.l.	159.61	23.68	t.l.	159.61	22.75	t.l.	160.23	14.58	t.l.	155.62	22.04	t.l.
9	3	158.57	20.34	t.l.	158.54	28.47	t.l.	158.54	24.05	t.l.	158.54	20.40	t.l.	161.75	28.59	t.l.
10	3	142.92	14.62	t.l.	141.24	18.31	t.l.	119.71	13.52	t.l.	142.92	16.71	t.l.	141.77	17.40	t.l.
11	3	202.84	10.96	t.l.	189.05	21.24	t.l.	167.45	14.89	t.l.	199.60	7.62	t.l.	189.15	23.75	t.l.
12	3	252.46	11.11	t.l.	240.22	10.81	t.l.	242.82	25.86	t.l.	250.70	8.59	t.l.	242.78	11.65	t.l.
13	3	243.60	12.05	t.l.	236.55	22.57	t.l.	192.64	17.29	t.l.	243.10	7.83	t.l.	236.55	25.38	t.l.
14	3	236.49	0.00	171.84	220.67	10.36	t.l.	215.08	19.16	t.l.	235.95	0.00	138.73	220.67	9.34	t.l.
15	3	251.92	0.00	2362.78	240.94	26.60	t.l.	240.94	26.58	t.l.	249.02	0.00	1327.24	240.94	26.16	t.l.
16	3	111.71	9.57	t.l.	110.31	9.60	t.l.	111.51	8.89	t.l.	111.71	8.27	t.l.	110.15	7.71	t.l.
17	3	173.22	3.13	t.l.	163.07	2.29	t.l.	135.11	7.29	t.l.	171.28	1.05	t.l.	164.97	3.41	t.l.
18	3	150.19	0.00	1158.92	136.25	7.96	t.l.	129.76	1.95	t.l.	150.19	0.00	1023.31	135.77	7.87	t.l.
19	3	155.27	0.00	500.18	150.24	27.89	t.l.	138.64	16.43	t.l.	154.05	0.00	128.71	150.36	28.80	t.l.
20	3	146.48	10.72	t.l.	136.69	12.95	t.l.	130.34	7.50	t.l.	146.48	10.65	t.l.	136.69	11.35	t.l.