

# Solução do Problema scagr25 - Solver HiGHS

Análise Computacional

16 de setembro de 2025

## 1 Informações do Problema

### Informações do Problema:

- Nome: scagr25
- Número de Variáveis: 500
- Número de Restrições: 471
- Inviabilidade Primal: 0.000e+00
- Inviabilidade Dual: 0.000e+00
- Valor Primal: -1.475e+07
- Valor Dual: -1.475e+07
- Gap: -8.557e-24
- Número de Iterações: 17

## 2 Variáveis Primais e Custos Reduzidos

Tabela 1: Variáveis primais e custos reduzidos do problema scagr25

Coordenada x	Valor x	Coordenada z	Valor z
1	0.000000	1	5267.273637
2	158.000000	2	0.000000
3	158.000000	3	0.000000
4	0.000000	4	13.549500
5	158.000000	5	0.000000
6	158.000000	6	0.000000
7	1315.226667	7	0.000000
8	2504.373333	8	0.000000
9	1430.000000	9	0.000000
10	1650.400000	10	0.000000
11	0.000000	11	2.400000
12	0.000000	12	6.480000

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Coordenada x	Valor x	Coordenada z	Valor z
13	0.000000	13	9.180000
14	0.000000	14	5012.024137
15	158.000000	15	0.000000
16	158.000000	16	0.000000
17	375.200000	17	0.000000
18	277.745333	18	0.000000
19	2400.000000	19	0.000000
20	1200.000000	20	0.000000
21	0.000000	21	4367.769973
22	187.600000	22	0.000000
23	187.600000	23	0.000000
24	0.000000	24	5.164500
25	187.600000	25	0.000000
26	187.600000	26	0.000000
27	3307.783333	27	0.000000
28	2566.670000	28	0.000000
29	312.666667	29	0.000000
30	712.880000	30	0.000000
31	586.459000	31	0.000000
32	0.000000	32	5.880000
33	0.000000	33	9.780000
34	0.000000	34	4120.905473
35	187.600000	35	0.000000
36	187.600000	36	0.000000
37	420.640000	37	0.000000
38	482.426000	38	0.000000
39	2400.000000	39	0.000000
40	1200.000000	40	0.000000
41	0.000000	41	3585.274445
42	210.320000	42	0.000000
43	210.320000	43	0.000000
44	0.000000	44	1.819500
45	210.320000	45	0.000000
46	210.320000	46	0.000000
47	3183.580667	47	0.000000
48	2566.670000	48	0.000000
49	350.533333	49	0.000000
50	799.216000	50	0.000000
51	1133.799800	51	0.000000
52	0.000000	52	5.280000
53	0.000000	53	10.380000
54	0.000000	54	3341.754945
55	210.320000	55	0.000000
56	210.320000	56	0.000000
57	482.048000	57	0.000000
58	596.678933	58	0.000000
59	2400.000000	59	0.000000
60	1200.000000	60	0.000000
61	0.000000	61	2900.027356

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Coordenada x	Valor x	Coordenada z	Valor z
62	241.024000	62	0.000000
63	-0.000000	63	0.000000
64	241.024000	64	0.000000
65	241.024000	65	0.000000
66	0.000000	66	1.525500
67	3473.677733	67	0.000000
68	2566.670000	68	0.000000
69	401.706667	69	0.000000
70	457.945600	70	0.000000
71	1350.739960	71	0.000000
72	0.000000	72	4.680000
73	0.000000	73	10.980000
74	0.000000	74	2659.852856
75	241.024000	75	0.000000
76	-0.000000	76	0.000000
77	547.753600	77	0.000000
78	756.303120	78	0.000000
79	2400.000000	79	0.000000
80	1200.000000	80	0.000000
81	0.000000	81	2300.749225
82	273.876800	82	0.000000
83	-0.000000	83	0.000000
84	273.876800	84	0.000000
85	273.876800	85	0.000000
86	0.000000	86	4.870500
87	3356.502747	87	0.000000
88	2566.670000	88	0.000000
89	456.461333	89	0.000000
90	520.365920	90	0.000000
91	1945.891352	91	0.000000
92	0.000000	92	4.080000
93	0.000000	93	11.580000
94	0.000000	94	2063.919725
95	273.876800	95	0.000000
96	-0.000000	96	0.000000
97	624.451520	97	0.000000
98	935.660077	98	0.000000
99	2400.000000	99	0.000000
100	1200.000000	100	0.000000
101	0.000000	101	1775.611430
102	312.225760	102	0.000000
103	-0.000000	103	0.000000
104	312.225760	104	0.000000
105	312.225760	105	0.000000
106	0.000000	106	8.215500
107	3219.724789	107	0.000000
108	2566.670000	108	0.000000
109	520.376267	109	0.000000
110	593.228944	110	0.000000

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Coordenada x	Valor x	Coordenada z	Valor z
111	2757.018126	111	0.000000
112	0.000000	112	3.480000
113	0.000000	113	12.180000
114	0.000000	114	1542.126930
115	312.225760	115	0.000000
116	-0.000000	116	0.000000
117	710.992864	117	0.000000
118	1019.217241	118	0.000000
119	2400.000000	119	0.000000
120	1200.000000	120	0.000000
121	0.000000	121	1318.615083
122	355.496432	122	0.000000
123	-0.000000	123	0.000000
124	355.496432	124	0.000000
125	355.496432	125	0.000000
126	0.000000	126	11.560500
127	3848.403592	127	0.000000
128	1783.659134	128	0.000000
129	592.494053	129	0.000000
130	675.443221	130	0.000000
131	4847.375664	131	0.000000
132	0.000000	132	2.880000
133	0.000000	133	12.780000
134	0.000000	134	1088.475583
135	355.496432	135	0.000000
136	-0.000000	136	0.000000
137	809.920765	137	0.000000
138	1150.654707	138	0.000000
139	2400.000000	139	0.000000
140	1200.000000	140	0.000000
141	0.000000	141	914.501377
142	404.960382	142	0.000000
143	-0.000000	143	0.000000
144	404.960382	144	0.000000
145	404.960382	145	0.000000
146	0.000000	146	14.905500
147	5455.641303	147	0.000000
148	0.000000	148	0.600000
149	674.933971	149	0.000000
150	769.424727	150	0.000000
151	8569.516618	151	0.000000
152	0.000000	152	2.280000
153	0.000000	153	13.380000
154	0.000000	154	687.706877
155	404.960382	155	0.000000
156	-0.000000	156	0.000000
157	922.440967	157	0.000000
158	1514.818794	158	0.000000
159	2400.000000	159	0.000000

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Coordenada x	Valor x	Coordenada z	Valor z
160	1200.000000	160	0.000000
161	0.000000	161	572.634872
162	461.220484	162	0.000000
163	-0.000000	163	0.000000
164	461.220484	164	0.000000
165	461.220484	165	0.000000
166	0.000000	166	18.250500
167	5254.980275	167	0.000000
168	0.000000	168	1.200000
169	768.700806	169	0.000000
170	876.318919	170	0.000000
171	9760.093815	171	0.000000
172	0.000000	172	1.680000
173	0.000000	173	13.980000
174	0.000000	174	349.185372
175	461.220484	175	0.000000
176	-0.000000	176	0.000000
177	1050.669060	177	0.000000
178	1737.818301	178	0.000000
179	2400.000000	179	0.000000
180	1200.000000	180	0.000000
181	0.000000	181	249.387566
182	525.334530	182	0.000000
183	-0.000000	183	0.000000
184	525.334530	184	0.000000
185	525.334530	185	0.000000
186	0.000000	186	21.620000
187	5026.306844	187	0.000000
188	0.000000	188	1.800000
189	875.557550	189	0.000000
190	998.135607	190	0.000000
191	11116.823980	191	0.000000
192	0.000000	192	1.080000
193	0.000000	193	14.580000
194	0.000000	194	29.307566
195	525.334530	195	0.000000
196	-0.000000	196	0.000000
197	1196.688825	197	0.000000
198	1800.000000	198	0.000000
199	2400.000000	199	0.000000
200	1200.000000	200	0.000000
201	0.000000	201	24.606150
202	598.344413	202	0.000000
203	-0.000000	203	0.000000
204	598.344413	204	0.000000
205	598.344413	205	0.000000
206	0.000000	206	217.093850
207	5370.770215	207	0.000000
208	0.000000	208	2.410000

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Coordenada x	Valor x	Coordenada z	Valor z
209	997.240688	209	0.000000
210	531.989098	210	0.000000
211	12661.823693	211	0.000000
212	0.000000	212	0.470000
213	0.000000	213	15.190000
214	96.882323	214	0.000000
215	501.462089	215	0.000000
216	-0.000000	216	0.000000
217	1363.016708	217	0.000000
218	1800.000000	218	0.000000
219	2400.000000	219	0.000000
220	595.134714	220	0.000000
221	244.836218	221	0.000000
222	436.672135	222	0.000000
223	-0.000000	223	0.000000
224	681.508354	224	0.000000
225	436.672135	225	0.000000
226	0.000000	226	316.240650
227	5764.152744	227	0.000000
228	0.000000	228	81.417184
229	1135.847256	229	0.000000
230	0.000000	230	78.537184
231	13907.532517	231	0.000000
232	234.542344	232	0.000000
233	0.000000	233	94.197184
234	0.000000	234	74.540650
235	436.672135	235	0.000000
236	-0.000000	236	0.000000
237	1455.573785	237	0.000000
238	1789.367757	238	0.000000
239	2400.000000	239	0.000000
240	0.000000	240	0.470000
241	291.114757	241	0.000000
242	436.672135	242	0.000000
243	-0.000000	243	0.000000
244	727.786892	244	0.000000
245	436.672135	245	0.000000
246	0.000000	246	318.445650
247	5687.021846	247	0.000000
248	0.000000	248	82.017184
249	1212.978154	249	0.000000
250	0.000000	250	79.137184
251	14692.561782	251	0.000000
252	829.677057	252	0.000000
253	0.000000	253	94.797184
254	0.000000	254	76.745650
255	436.672135	255	0.000000
256	-0.000000	256	0.000000
257	1455.573785	257	0.000000

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Coordenada x	Valor x	Coordenada z	Valor z
258	1790.696788	258	0.000000
259	2400.000000	259	0.000000
260	0.000000	260	0.470000
261	291.114757	261	0.000000
262	436.672135	262	0.000000
263	-0.000000	263	0.000000
264	727.786892	264	0.000000
265	436.672135	265	0.000000
266	0.000000	266	320.650650
267	5687.021846	267	0.000000
268	0.000000	268	82.617184
269	1212.978154	269	0.000000
270	0.000000	270	79.737184
271	14692.561782	271	0.000000
272	829.677057	272	0.000000
273	0.000000	273	95.397184
274	0.000000	274	78.950650
275	436.672135	275	0.000000
276	-0.000000	276	0.000000
277	1455.573785	277	0.000000
278	1792.025818	278	0.000000
279	2400.000000	279	0.000000
280	0.000000	280	0.470000
281	291.114757	281	0.000000
282	436.672135	282	0.000000
283	-0.000000	283	0.000000
284	727.786892	284	0.000000
285	436.672135	285	0.000000
286	0.000000	286	322.855650
287	5687.021846	287	0.000000
288	0.000000	288	83.217184
289	1212.978154	289	0.000000
290	0.000000	290	80.337184
291	14692.561782	291	0.000000
292	829.677057	292	0.000000
293	0.000000	293	95.997184
294	0.000000	294	81.155650
295	436.672135	295	0.000000
296	-0.000000	296	0.000000
297	1455.573785	297	0.000000
298	1793.354848	298	0.000000
299	2400.000000	299	0.000000
300	0.000000	300	0.470000
301	291.114757	301	0.000000
302	436.672135	302	0.000000
303	-0.000000	303	0.000000
304	727.786892	304	0.000000
305	436.672135	305	0.000000
306	0.000000	306	325.060650

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Coordenada x	Valor x	Coordenada z	Valor z
307	5687.021846	307	0.000000
308	0.000000	308	83.817184
309	1212.978154	309	0.000000
310	0.000000	310	80.937184
311	14692.561782	311	0.000000
312	829.677057	312	0.000000
313	0.000000	313	96.597184
314	0.000000	314	83.360650
315	436.672135	315	0.000000
316	-0.000000	316	0.000000
317	1455.573785	317	0.000000
318	1794.683879	318	0.000000
319	2400.000000	319	0.000000
320	0.000000	320	0.470000
321	291.114757	321	0.000000
322	436.672135	322	0.000000
323	-0.000000	323	0.000000
324	727.786892	324	0.000000
325	436.672135	325	0.000000
326	0.000000	326	327.265650
327	5687.021846	327	0.000000
328	0.000000	328	84.417184
329	1212.978154	329	0.000000
330	0.000000	330	81.537184
331	14692.561782	331	0.000000
332	829.677057	332	0.000000
333	0.000000	333	97.197184
334	0.000000	334	85.565650
335	436.672135	335	0.000000
336	-0.000000	336	0.000000
337	1455.573785	337	0.000000
338	1796.012909	338	0.000000
339	2400.000000	339	0.000000
340	0.000000	340	0.470000
341	291.114757	341	0.000000
342	436.672135	342	0.000000
343	-0.000000	343	0.000000
344	727.786892	344	0.000000
345	436.672135	345	0.000000
346	0.000000	346	329.470650
347	5687.021846	347	0.000000
348	0.000000	348	85.017184
349	1212.978154	349	0.000000
350	0.000000	350	82.137184
351	14692.561782	351	0.000000
352	829.677057	352	0.000000
353	0.000000	353	97.797184
354	0.000000	354	87.770650
355	436.672135	355	0.000000

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Coordenada x	Valor x	Coordenada z	Valor z
356	-0.000000	356	0.000000
357	1455.573785	357	0.000000
358	1797.341939	358	0.000000
359	2400.000000	359	0.000000
360	0.000000	360	0.470000
361	291.114757	361	0.000000
362	436.672135	362	0.000000
363	-0.000000	363	0.000000
364	727.786892	364	0.000000
365	436.672135	365	0.000000
366	0.000000	366	331.675650
367	5687.021846	367	0.000000
368	0.000000	368	85.617184
369	1212.978154	369	0.000000
370	0.000000	370	82.737184
371	14692.561782	371	0.000000
372	829.677057	372	0.000000
373	0.000000	373	98.397184
374	0.000000	374	89.975650
375	436.672135	375	0.000000
376	-0.000000	376	0.000000
377	1455.573785	377	0.000000
378	1798.670970	378	0.000000
379	2400.000000	379	0.000000
380	0.000000	380	0.470000
381	291.114757	381	0.000000
382	436.672135	382	0.000000
383	-0.000000	383	0.000000
384	727.786892	384	0.000000
385	436.672135	385	0.000000
386	0.000000	386	343.377402
387	5687.021846	387	0.000000
388	0.000000	388	86.217184
389	1212.978154	389	0.000000
390	0.000000	390	83.337184
391	14692.561782	391	0.000000
392	829.677057	392	0.000000
393	0.000000	393	98.997184
394	0.000000	394	101.677402
395	436.672135	395	0.000000
396	-0.000000	396	0.000000
397	1455.573785	397	0.000000
398	1800.000000	398	0.000000
399	2400.000000	399	0.000000
400	0.000000	400	0.470000
401	71.472556	401	0.000000
402	656.314337	402	0.000000
403	-0.000000	403	0.000000
404	727.786892	404	0.000000

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Coordenada x	Valor x	Coordenada z	Valor z
405	656.314337	405	0.000000
406	0.000000	406	350.330778
407	5687.021846	407	0.000000
408	0.000000	408	90.693409
409	1212.978154	409	0.000000
410	0.000000	410	87.813409
411	15153.810404	411	0.000000
412	1246.997239	412	0.000000
413	0.000000	413	103.473409
414	0.000000	414	108.630778
415	656.314337	415	0.000000
416	-0.000000	416	0.000000
417	1455.573785	417	0.000000
418	1747.516691	418	0.000000
419	2400.000000	419	0.000000
420	0.000000	420	0.470000
421	0.000000	421	13.745619
422	727.786892	422	0.000000
423	-0.000000	423	0.000000
424	727.786892	424	0.000000
425	727.786892	425	0.000000
426	0.000000	426	352.535778
427	5687.021846	427	0.000000
428	0.000000	428	91.293409
429	1212.978154	429	0.000000
430	0.000000	430	88.413409
431	15409.331028	431	0.000000
432	1382.795095	432	0.000000
433	0.000000	433	104.073409
434	0.000000	434	124.581397
435	727.786892	435	0.000000
436	-0.000000	436	0.000000
437	1675.215986	437	0.000000
438	1569.897927	438	0.000000
439	2400.000000	439	0.000000
440	0.000000	440	0.470000
441	0.000000	441	60.359706
442	837.607993	442	0.000000
443	-0.000000	443	0.000000
444	837.607993	444	0.000000
445	837.607993	445	0.000000
446	0.000000	446	354.740778
447	5713.692735	447	0.000000
448	0.000000	448	91.893409
449	1186.307265	449	0.000000
450	0.000000	450	89.013409
451	17721.327481	451	0.000000
452	1591.455186	452	0.000000
453	0.000000	453	104.673409

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Coordenada x	Valor x	Coordenada z	Valor z
454	0.000000	454	173.400484
455	837.607993	455	0.000000
456	-0.000000	456	0.000000
457	1900.438082	457	0.000000
458	1212.685987	458	0.000000
459	2148.352733	459	0.000000
460	0.000000	460	0.470000
461	0.000000	461	28.054222
462	950.219041	462	0.000000
463	-0.000000	463	0.000000
464	950.219041	464	0.000000
465	950.219041	465	0.000000
466	0.000000	466	356.945778
467	6100.000000	467	0.000000
468	0.000000	468	92.493409
469	800.000000	469	0.000000
470	0.000000	470	89.481409
471	20109.594750	471	0.000000
472	1805.416178	472	0.000000
473	0.000000	473	105.273409
474	0.000000	474	143.300000
475	950.219041	475	0.000000
476	-0.000000	476	0.000000
477	2167.914650	477	0.000000
478	725.209079	478	0.000000
479	1207.914650	479	0.000000
480	0.000000	480	0.470000
481	0.000000	481	171.973074
482	1083.957325	482	0.000000
483	-0.000000	483	0.000000
484	1083.957325	484	0.000000
485	1083.957325	485	0.000000
486	0.000000	486	69.726926
487	6100.000000	487	0.000000
488	0.000000	488	93.093409
489	800.000000	489	0.000000
490	0.000000	490	89.949409
491	22937.380065	491	0.000000
492	2059.518918	492	0.000000
493	0.000000	493	105.873409
494	1083.957325	494	0.000000
495	0.000000	495	518.700000
496	-0.000000	496	0.000000
497	2467.759297	497	0.000000
498	0.000000	498	575.967045
499	0.000000	499	94.014508
500	0.000000	500	22.970000

### 3 Variáveis Duais (Multiplicadores de Lagrange)

Tabela 2: Variáveis duais do problema scagr25

Coordenada y	Valor y
1	-5302.273637
2	-48.549500
3	5370.223637
4	116.499500
5	12.600000
6	-0.000000
7	-9.180000
8	-0.000000
9	-0.000000
10	5459.499137
11	205.775000
12	6549.607466
13	89.500000
14	13.266667
15	16.020000
16	-4402.769973
17	-40.164500
18	4471.979973
19	109.374500
20	-0.000000
21	-0.110000
22	-0.130000
23	15.000000
24	-3.000000
25	-9.780000
26	-0.000000
27	-0.000000
28	4566.910473
29	204.305000
30	5530.724137
31	92.500000
32	13.766667
33	16.620000
34	-0.000000
35	-3620.274445
36	-36.819500
37	3689.784445
38	106.329500
39	-0.000000
40	-0.110000
41	-0.130000
42	15.000000
43	-2.400000
44	-10.380000

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Coordenada y	Valor y
45	-0.000000
46	-0.000000
47	3786.289945
48	202.835000
49	4639.605473
50	95.500000
51	14.266667
52	17.220000
53	-0.000000
54	-2935.027356
55	-35.000000
56	3004.837356
57	104.810000
58	-0.000000
59	-0.110000
60	-0.130000
61	15.000000
62	-1.800000
63	-10.980000
64	-0.000000
65	-0.000000
66	3102.917856
67	201.365000
68	3860.454945
69	98.500000
70	14.766667
71	17.820000
72	-0.000000
73	-2335.749225
74	-35.000000
75	2405.859225
76	105.110000
77	-0.000000
78	-0.110000
79	-0.130000
80	15.000000
81	-1.200000
82	-11.580000
83	-0.000000
84	-0.000000
85	2505.514725
86	199.895000
87	3178.552856
88	101.500000
89	15.266667
90	18.420000
91	-0.000000
92	-1810.611430
93	-35.000000

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Coordenada y	Valor y
94	1881.021430
95	105.410000
96	-0.000000
97	-0.110000
98	-0.130000
99	15.000000
100	-0.600000
101	-12.180000
102	-0.000000
103	-0.000000
104	1982.251930
105	198.425000
106	2582.619725
107	104.500000
108	15.766667
109	19.020000
110	-0.000000
111	-1353.615083
112	-35.000000
113	1424.325083
114	105.710000
115	-0.000000
116	-0.110000
117	-0.130000
118	15.000000
119	-0.000000
120	-12.780000
121	-0.000000
122	-0.000000
123	1527.130583
124	196.955000
125	2060.826930
126	107.500000
127	16.266667
128	19.620000
129	-0.000000
130	-949.501377
131	-35.000000
132	1020.511377
133	106.010000
134	-0.000000
135	-0.110000
136	-0.130000
137	15.000000
138	-0.000000
139	-13.380000
140	-0.000000
141	-0.000000
142	1124.891877

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Coordenada y	Valor y
143	195.485000
144	1607.175583
145	110.500000
146	16.766667
147	20.220000
148	-0.000000
149	-607.634872
150	-35.000000
151	678.944872
152	106.310000
153	-0.000000
154	-0.110000
155	-0.130000
156	15.000000
157	-0.000000
158	-13.980000
159	-0.000000
160	-0.000000
161	784.900372
162	194.015000
163	1206.406877
164	113.500000
165	17.266667
166	20.820000
167	-0.000000
168	-284.387566
169	-35.000000
170	355.997566
171	106.610000
172	-0.000000
173	-0.110000
174	-0.130000
175	15.000000
176	-0.000000
177	-14.580000
178	-0.000000
179	-0.000000
180	463.528066
181	192.520500
182	867.885372
183	116.500000
184	17.766667
185	21.420000
186	-0.000000
187	-59.606150
188	-35.000000
189	131.521150
190	106.915000
191	-0.050000
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Coordenada y	Valor y
192	-0.118333
193	-0.140000
194	15.000000
195	-0.000000
196	-15.190000
197	-0.000000
198	-0.000000
199	240.652900
200	-1.047100
201	548.007566
202	119.550000
203	18.275000
204	22.030000
205	-0.000000
206	-35.000000
207	-35.000000
208	107.150000
209	107.150000
210	-392.035918
211	-65.449320
212	-0.000000
213	15.000000
214	-0.000000
215	-94.197184
216	-0.000000
217	-0.000000
218	313.723550
219	-2.517100
220	518.700000
221	514.585918
222	84.114320
223	22.500000
224	-0.000000
225	-35.000000
226	-35.000000
227	107.150000
228	107.150000
229	-0.000000
230	-0.110000
231	-0.000000
232	15.000000
233	-0.000000
234	-94.797184
235	-0.000000
236	-0.000000
237	314.458550
238	-3.987100
239	593.240650
240	517.585918

Continúa na próxima página



Coordenada y	Valor y
241	84.614320
242	22.500000
243	-79.306021
244	-35.000000
245	-35.000000
246	107.150000
247	107.150000
248	-0.000000
249	-0.110000
250	-0.000000
251	15.000000
252	-0.000000
253	-95.397184
254	-0.000000
255	-0.000000
256	315.193550
257	-5.457100
258	595.445650
259	520.585918
260	85.114320
261	22.500000
262	-83.434893
263	-35.000000
264	-35.000000
265	107.150000
266	107.150000
267	-0.000000
268	-0.110000
269	-0.000000
270	15.000000
271	-0.000000
272	-95.997184
273	-0.000000
274	-0.000000
275	315.928550
276	-6.927100
277	597.650650
278	523.585918
279	85.614320
280	22.500000
281	-84.722264
282	-35.000000
283	-35.000000
284	107.150000
285	107.150000
286	-0.000000
287	-0.110000
288	-0.000000
289	15.000000
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Coordenada y	Valor y
290	-0.000000
291	-96.597184
292	-0.000000
293	-0.000000
294	316.663550
295	-8.397100
296	599.855650
297	526.585918
298	86.114320
299	22.500000
300	-83.168136
301	-35.000000
302	-35.000000
303	107.150000
304	107.150000
305	-0.000000
306	-0.110000
307	-0.000000
308	15.000000
309	-0.000000
310	-97.197184
311	-0.000000
312	-0.000000
313	317.398550
314	-9.867100
315	602.060650
316	529.585918
317	86.614320
318	22.500000
319	-78.772507
320	-35.000000
321	-35.000000
322	107.150000
323	107.150000
324	-0.000000
325	-0.110000
326	-0.000000
327	15.000000
328	-0.000000
329	-97.797184
330	-0.000000
331	-0.000000
332	318.133550
333	-11.337100
334	604.265650
335	532.585918
336	87.114320
337	22.500000
338	-71.535379
Continua na próxima página	

Coordenada y	Valor y
339	-35.000000
340	-35.000000
341	107.150000
342	107.150000
343	-0.000000
344	-0.110000
345	-0.000000
346	15.000000
347	-0.000000
348	-98.397184
349	-0.000000
350	-0.000000
351	318.868550
352	-12.807100
353	606.470650
354	535.585918
355	87.614320
356	22.500000
357	-61.456750
358	-35.000000
359	-35.000000
360	107.150000
361	107.150000
362	-0.000000
363	-0.110000
364	-0.000000
365	15.000000
366	-0.000000
367	-98.997184
368	-0.000000
369	-0.000000
370	319.603550
371	-23.773852
372	608.675650
373	538.585918
374	88.114320
375	22.500000
376	-48.536622
377	-35.000000
378	-35.000000
379	107.150000
380	107.150000
381	-19.381127
382	-3.340188
383	-0.000000
384	15.000000
385	-0.000000
386	-103.473409
387	-0.000000

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Coordenada y	Valor y
388	-0.000000
389	325.086926
390	-25.243852
391	620.377402
392	560.967045
393	91.844508
394	22.500000
395	-25.339101
396	-48.745619
397	-35.000000
398	120.895619
399	107.150000
400	-0.000000
401	-0.110000
402	-0.000000
403	15.000000
404	-0.000000
405	-104.073409
406	-0.000000
407	-0.000000
408	339.567545
409	-26.713852
410	627.330778
411	563.967045
412	92.344508
413	22.500000
414	-0.000000
415	-95.359706
416	-35.000000
417	167.509706
418	107.150000
419	-0.000000
420	-0.110000
421	-0.000000
422	15.000000
423	-0.000000
424	-104.673409
425	-0.000000
426	-0.000000
427	386.916632
428	-28.183852
429	643.281397
430	566.967045
431	92.844508
432	22.500000
433	-0.000000
434	-63.054222
435	-35.000000
436	135.204222
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Coordenada y	Valor y
437	107.150000
438	-0.000000
439	-0.000000
440	-0.000000
441	15.000000
442	-0.000000
443	-105.273409
444	-0.000000
445	0.132000
446	355.346148
447	-29.653852
448	692.100484
449	569.967045
450	93.234508
451	22.500000
452	-0.000000
453	-206.973074
454	-35.000000
455	279.123074
456	107.150000
457	-0.000000
458	-0.000000
459	-0.000000
460	15.000000
461	-0.000000
462	-105.873409
463	-0.000000
464	0.264000
465	500.000000
466	258.300000
467	662.000000
468	572.967045
469	93.624508
470	22.500000
471	-0.000000

## 4 Observações

- O solver HiGHS foi configurado com o método IPM (Interior Point Method).
- Este arquivo contém a solução detalhada para o problema scagr25.
- As variáveis duais representam os multiplicadores de Lagrange das restrições.
- Os custos reduzidos (z) indicam o impacto de forçar variáveis não-básicas na base.