ĐẠI HỌC QUỐC GIA THÀNH PHỐ HỒ CHÍ MINH

TRƯỜNG ĐẠI HỌC CÔNG NGHỆ THÔNG TIN

TRÍ TUỆ NHÂN TẠO

LỚP: CS106.O21

Solving Knapsack Problems Using Google OR Tools

Họ và tên: Trần Đình Khánh Đăng

MSSV: 22520195

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s098.kp	50	126583	126438	206338	✓
\n00100\R10000\s093.kp	100	251553	251350	402619	✓
\n00200\R10000\s029.kp	200	485019	484950	818812	✓
\n00500\R10000\s099.kp	500	1224440	1224357	1966501	✓
\n01000\R10000\s087.kp	1000	2485410	2485363	3882548	✓
\n02000\R10000\s079.kp	2000	4954470	4954461	8039939	✓
\n05000\R10000\s017.kp	5000	12255824	12255824	20192624	✓
\n10000\R10000\s079.kp	10000	24786486	24786485	40443988	✓

Bảng 1: 00Uncorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s063.kp	50	127712	127684	138679	✓
\n00100\R10000\s008.kp	100	227845	227816	255382v	✓
\n00200\R10000\s060.kp	200	470952	470873	526825	✓
\n00500\R10000\s073.kp	500	1210869	1210865	1329152	✓
\n01000\R10000\s048.kp	1000	2527171	2527160	2799626	✓
\n02000\R10000\s084.kp	2000	4946057	4946054	5489956	✓
\n05000\R10000\s082.kp	5000	12426748	12426745	13693417	✓
\n10000\R10000\s038.kp	10000	24724763	24724763	27306195	✓

Bảng 2: 01WeaklyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s099.kp	50	127788	127778	162778	✓
\n00100\R10000\s082.kp	100	250353	250353	320353	✓
\n00200\R10000\s096.kp	200	477359	477359	618359	✓
\n00500\R10000\s076.kp	500	1251696	1251696	1600696	✓
\n01000\R10000\s019.kp	1000	2387246	2383982	3091982	
\n02000\R10000\s066.kp	2000	4953825	4950668	6351668	
\n05000\R10000\s049.kp	5000	12276679	12271206	15794206	
\n10000\R10000\s050.kp	10000	24870234	24867989	31901989	

Bảng 3: 02StronglyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s090.kp	50	148037	148037	132037	✓
\n00100\R10000\s005.kp	100	295717	295717	265717	✓
\n00200\R10000\s075.kp	200	595634	594199	531199	
\n00500\R10000\s026.kp	500	1442019	1438600	1286600	
\n01000\R10000\s097.kp	1000	2979604	2977505	2663505	
\n02000\R10000\s043.kp	2000	5896631	5895014	5262014	
\n05000\R10000\s044.kp	5000	14760288	14760288	13191288	
\n10000\R10000\s058.kp	10000	29958961	29954775	26795775	

Bảng 4: 03InverseStronglyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s023.kp	50	112283	112272	147363	✓
\n00100\R10000\s091.kp	100	270311	270310	338405	✓
\n00200\R10000\s072.kp	200	498025	498018	637480	✓
\n00500\R10000\s069.kp	500	1223941	1223940	1576059	
\n01000\R10000\s092.kp	1000	2491375	2489299	3189482	
\n02000\R10000\s009.kp	2000	4947362	4942912	6349710	
\n05000\R10000\s022.kp	5000	12403220	12401146	15922031	
\n10000\R10000\s051.kp	10000	24937050	24932396	31942894	

Bảng 5: 04AlmostStronglyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s033.kp	50	120976	120976	120976	✓
\n00100\R10000\s027.kp	100	247710	247710	247710	✓
\n00200\R10000\s042.kp	200	479483	479483	479483	✓
\n00500\R10000\s085.kp	500	1209405	1209405	1209405	✓
\n01000\R10000\s074.kp	1000	2562918	2562918	2562918	✓
\n02000\R10000\s064.kp	2000	4938043	4938043	4938043	✓
\n05000\R10000\s075.kp	5000	12239988	12239988	12239988	✓
\n10000\R10000\s027.kp	10000	25002713	25002713	25002713	✓

Bảng 6: 05SubsetSum

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s035.kp	50	2476435	2401158	19003	✓
\n00100\R10000\s097.kp	100	4953150	4902553	37094	✓
\n00200\R10000\s011.kp	200	9906056	9904977	76162	✓
\n00500\R10000\s050.kp	500	24765068	24712081	184670	
\n01000\R10000\s075.kp	1000	49529343	49524098	376014	✓
\n02000\R10000\s044.kp	2000	99058739	99048604	743152	
\n05000\R10000\s040.kp	5000	247647355	247623107	1847387	
\n10000\R10000\s017.kp	10000	495296144	495246480	3708624	

Bảng 7: 06UncorrelatedWithSimilarWeights

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s079.kp	50	24744	24676	34764	✓
\n00100\R10000\s029.kp	100	133611	133192	124988	
\n00200\R10000\s030.kp	200	160182	159624	319970	
\n00500\R10000\s098.kp	500	218828	218673	1218007	
\n01000\R10000\s086.kp	1000	1346994	1346970	1272630	
\n02000\R10000\s033.kp	2000	2716700	2716364	4103260	
\n05000\R10000\s092.kp	5000	7009228	7009035	6720813	
\n10000\R10000\s066.kp	10000	8542855	8542665	8331735	

Bảng 8: 07SpannerUncorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s073.kp	50	42261	42048	110016	✓
\n00100\R10000\s021.kp	100	103256	103242	284677	
\n00200\R10000\s002.kp	200	479623	479593	87902	✓
\n00500\R10000\s075.kp	500	550401	550242	1487178	
\n01000\R10000\s086.kp	1000	941056	940986	2628389	
\n02000\R10000\s015.kp	2000	2404684	2404493	4582538	
\n05000\R10000\s071.kp	5000	5856738	5856620	15987885	
\n10000\R10000\s024.kp	10000	18992682	18992596	43809920	

Bảng 9: 08SpannerWeaklyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s031.kp	50	8324	8248	187248	✓
\n00100\R10000\s093.kp	100	185528	184926	518926	
\n00200\R10000\s064.kp	200	262115	261882	830882	
\n00500\R10000\s024.kp	500	942617	941945	2368945	
\n01000\R10000\s013.kp	1000	1141962	1141754	4715754	
\n02000\R10000\s049.kp	2000	1177782	1177620	8834620	
\n05000\R10000\s078.kp	5000	5672787	5672230	25753230	
\n10000\R10000\s050.kp	10000	9308095	9308092	42844092	

Bảng 10: 09SpannerStronglyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s017.kp	50	140598	140595	215595	✓
\n00100\R10000\s033.kp	100	229290	229290	388290	✓
\n00200\R10000\s003.kp	200	508116	508074	814074	✓
\n00500\R10000\s029.kp	500	1244010	1244007	2024007	✓
\n01000\R10000\s047.kp	1000	2510976	2510976	4051976	✓
\n02000\R10000\s036.kp	2000	4973274	4973274	8049274	
\n05000\R10000\s046.kp	5000	12302172	12300627	20104627	
\n10000\R10000\s039.kp	10000	24659922	24659922	40153922	

Bảng 11: 10MultipleStronglyCorrelated

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s065.kp	50	127589	127589	127581	✓
\n00100\R10000\s046.kp	100	223437	223437	223431	✓
\n00200\R10000\s008.kp	200	485134	485133	485106	
\n00500\R10000\s076.kp	500	1251696	1251696	1251642	✓
\n01000\R10000\s058.kp	1000	2563956	2563956	2563851	
\n02000\R10000\s030.kp	2000	4929046	4929046	4928850	
\n05000\R10000\s010.kp	5000	12429655	12429655	12429168	
\n10000\R10000\s058.kp	10000	25008466	25008465	25007493	

Bảng 12: 11ProfitCeiling

Test case	N	Capacities	Total Weight	Total Value	Optimized
\n00050\R10000\s072.kp	50	120969	120969	8064191	✓
\n00100\R10000\s000.kp	100	289961	289961	19329757	✓
\n00200\R10000\s055.kp	200	502415	502415	33492638	
\n00500\R10000\s035.kp	500	1188432	1188432	79224793	
\n01000\R10000\s053.kp	1000	2484840	2484840	165647615	
\n02000\R10000\s007.kp	2000	4864617	4864617	324291400	
\n05000\R10000\s031.kp	5000	12514519	12514519	834259070	
\n10000\R10000\s096.kp	10000	24752022	24752022	1650051367	

Bảng 13: 12Circle

Nhận xét:

- Các nhóm **00Uncorrelated, 01WeaklyCorrelated, 05SubsetSum** dễ vì có thể tìm ra lời giải tối ưu trong toàn bộ các testcase.
- Các nhóm **07SpannerUncorrelated, 08SpannerWeaklyCorrelated, 09SpannerStronglyCorrelated** khó vì chỉ có thể tìm lời giải tối ưu với số lượng đồ vật nhỏ (thường là 50 đồ vật) khi ta cài đặt giới hạn thời gian chạy là 180 giây.