

```
WENIGERKRUMM 1
nodes 84 edges 3486
all starting node nearest neighbour heuristic found best tour with length
847.4341649025257 for starting node Node[id=26, point=Point[x=400.0,
y=0.0]]
time to find init solution 0 seconds
found init solution
Path
400.0 0.0 390.0 0.0
390.0 0.0 380.0 0.0
380.0 0.0 370.0 0.0
370.0 0.0 360.0 0.0
360.0 0.0 350.0 0.0
350.0 0.0 340.0 0.0
340.0 0.0 330.0 0.0
330.0 0.0 320.0 0.0
320.0 0.0 310.0 0.0
310.0 0.0 300.0 0.0
300.0 0.0 290.0 0.0
290.0 0.0 280.0 0.0
280.0 0.0 270.0 0.0
270.0 0.0 260.0 0.0
260.0 0.0 250.0 0.0
250.0 0.0 240.0 0.0
240.0 0.0 230.0 0.0
230.0 0.0 220.0 0.0
220.0 0.0 210.0 0.0
210.0 0.0 200.0 0.0
200.0 0.0 190.0 0.0
190.0 0.0 180.0 0.0
180.0 0.0 170.0 0.0
170.0 0.0 160.0 0.0
160.0 0.0 150.0 0.0
150.0 0.0 140.0 0.0
140.0 0.0 130.0 0.0
130.0 0.0 120.0 0.0
120.0 0.0 110.0 0.0
110.0 0.0 100.0 0.0
100.0 0.0 90.0 0.0
90.0 0.0 80.0 0.0
80.0 0.0 70.0 0.0
70.0 0.0 60.0 0.0
60.0 0.0 50.0 0.0
50.0 0.0 40.0 0.0
40.0 0.0 30.0 0.0
30.0 0.0 20.0 0.0
20.0 0.0 10.0 0.0
10.0 0.0 0.0 0.0
0.0 0.0 -5.0 15.0
-5.0 15.0 0.0 30.0
0.0 30.0 10.0 30.0
10.0 30.0 20.0 30.0
20.0 30.0 30.0 30.0
30.0 30.0 40.0 30.0
40.0 30.0 50.0 30.0
50.0 30.0 60.0 30.0
60.0 30.0 70.0 30.0
70.0 30.0 80.0 30.0
80.0 30.0 90.0 30.0
90.0 30.0 100.0 30.0
```

100.0	30.0	110.0	30.0
110.0	30.0	120.0	30.0
120.0	30.0	130.0	30.0
130.0	30.0	140.0	30.0
140.0	30.0	150.0	30.0
150.0	30.0	160.0	30.0
160.0	30.0	170.0	30.0
170.0	30.0	180.0	30.0
180.0	30.0	190.0	30.0
190.0	30.0	200.0	30.0
200.0	30.0	210.0	30.0
210.0	30.0	220.0	30.0
220.0	30.0	230.0	30.0
230.0	30.0	240.0	30.0
240.0	30.0	250.0	30.0
250.0	30.0	260.0	30.0
260.0	30.0	270.0	30.0
270.0	30.0	280.0	30.0
280.0	30.0	290.0	30.0
290.0	30.0	300.0	30.0
300.0	30.0	310.0	30.0
310.0	30.0	320.0	30.0
320.0	30.0	330.0	30.0
330.0	30.0	340.0	30.0
340.0	30.0	350.0	30.0
350.0	30.0	360.0	30.0
360.0	30.0	370.0	30.0
370.0	30.0	380.0	30.0
380.0	30.0	390.0	30.0
390.0	30.0	400.0	30.0
400.0	30.0	405.0	15.0

eval naive 847.4341649025257

eval optimized 1627.4341649025255

improvement achieved by post optimization algorithm -779.9999999999998

Path 26-18-33-70-5-56-9-34-63-55-53-39-54-15-28-51-35-79-38-37-0-4-25-13-66-1-21-83-10-74-6-40-27-72-43-81-14-36-62-75-20-47-31-19-42-73-7-16-44-46-3-30-24-12-65-64-45-41-78-76-58-67-11-2-22-29-32-49-17-23-57-48-77-60-80-68-82-69-61-8-71-59-52-5

Path

400.0	0.0	390.0	0.0
390.0	0.0	380.0	0.0
380.0	0.0	370.0	0.0
370.0	0.0	360.0	0.0
360.0	0.0	350.0	0.0
350.0	0.0	340.0	0.0
340.0	0.0	330.0	0.0
330.0	0.0	320.0	0.0
320.0	0.0	310.0	0.0
310.0	0.0	300.0	0.0
300.0	0.0	290.0	0.0
290.0	0.0	280.0	0.0
280.0	0.0	270.0	0.0
270.0	0.0	260.0	0.0
260.0	0.0	250.0	0.0
250.0	0.0	240.0	0.0
240.0	0.0	230.0	0.0
230.0	0.0	220.0	0.0
220.0	0.0	210.0	0.0
210.0	0.0	200.0	0.0

200.0	0.0	190.0	0.0
190.0	0.0	180.0	0.0
180.0	0.0	170.0	0.0
170.0	0.0	160.0	0.0
160.0	0.0	150.0	0.0
150.0	0.0	140.0	0.0
140.0	0.0	130.0	0.0
130.0	0.0	120.0	0.0
120.0	0.0	110.0	0.0
110.0	0.0	100.0	0.0
100.0	0.0	90.0	0.0
90.0	0.0	80.0	0.0
80.0	0.0	70.0	0.0
70.0	0.0	60.0	0.0
60.0	0.0	50.0	0.0
50.0	0.0	40.0	0.0
40.0	0.0	30.0	0.0
30.0	0.0	20.0	0.0
20.0	0.0	10.0	0.0
10.0	0.0	0.0	0.0
0.0	0.0	-5.0	15.0
-5.0	15.0	0.0	30.0
0.0	30.0	10.0	30.0
10.0	30.0	20.0	30.0
20.0	30.0	30.0	30.0
30.0	30.0	40.0	30.0
40.0	30.0	50.0	30.0
50.0	30.0	60.0	30.0
60.0	30.0	70.0	30.0
70.0	30.0	80.0	30.0
80.0	30.0	90.0	30.0
90.0	30.0	100.0	30.0
100.0	30.0	110.0	30.0
110.0	30.0	120.0	30.0
120.0	30.0	130.0	30.0
130.0	30.0	140.0	30.0
140.0	30.0	150.0	30.0
150.0	30.0	160.0	30.0
160.0	30.0	170.0	30.0
170.0	30.0	180.0	30.0
180.0	30.0	190.0	30.0
190.0	30.0	200.0	30.0
200.0	30.0	210.0	30.0
210.0	30.0	220.0	30.0
220.0	30.0	230.0	30.0
230.0	30.0	240.0	30.0
240.0	30.0	250.0	30.0
250.0	30.0	260.0	30.0
260.0	30.0	270.0	30.0
270.0	30.0	280.0	30.0
280.0	30.0	290.0	30.0
290.0	30.0	300.0	30.0
300.0	30.0	310.0	30.0
310.0	30.0	320.0	30.0
320.0	30.0	330.0	30.0
330.0	30.0	340.0	30.0
340.0	30.0	350.0	30.0
350.0	30.0	360.0	30.0
360.0	30.0	370.0	30.0
370.0	30.0	380.0	30.0

380.0	30.0	390.0	30.0
390.0	30.0	400.0	30.0
400.0	30.0	405.0	15.0

WENIGERKRUMM 2

nodes 60 edges 1770

all starting node nearest neighbour heuristic found best tour with length
2183.6622668054965 for starting node Node[id=24,

point=Point[x=173.205081, y=-100.0]]

time to find init solution 0 seconds

found init solution

Path

173.205081 -100.0 190.211303 -61.803399
190.211303 -61.803399 198.904379 -20.905693
198.904379 -20.905693 198.904379 20.905693
198.904379 20.905693 190.211303 61.803399
190.211303 61.803399 173.205081 100.0
173.205081 100.0 148.628965 133.826121
148.628965 133.826121 117.55705 161.803399
117.55705 161.803399 81.347329 182.709092
81.347329 182.709092 41.582338 195.62952
41.582338 195.62952 0.0 200.0
0.0 200.0 -41.582338 195.62952
-41.582338 195.62952 -81.347329 182.709092
-81.347329 182.709092 -117.55705 161.803399
-117.55705 161.803399 -148.628965 133.826121
-148.628965 133.826121 -173.205081 100.0
-173.205081 100.0 -190.211303 61.803399
-190.211303 61.803399 -198.904379 20.905693
-198.904379 20.905693 -198.904379 -20.905693
-198.904379 -20.905693 -190.211303 -61.803399
-190.211303 -61.803399 -173.205081 -100.0
-173.205081 -100.0 -148.628965 -133.826121
-148.628965 -133.826121 -117.55705 -161.803399
-117.55705 -161.803399 -81.347329 -182.709092
-81.347329 -182.709092 -41.582338 -195.62952
-41.582338 -195.62952 0.0 -200.0
0.0 -200.0 41.582338 -195.62952
41.582338 -195.62952 81.347329 -182.709092
81.347329 -182.709092 117.55705 -161.803399
117.55705 -161.803399 148.628965 -133.826121
148.628965 -133.826121 129.903811 -75.0
129.903811 -75.0 142.658477 -46.352549
142.658477 -46.352549 149.178284 -15.679269
149.178284 -15.679269 149.178284 15.679269
149.178284 15.679269 142.658477 46.352549
142.658477 46.352549 129.903811 75.0
129.903811 75.0 111.471724 100.369591
111.471724 100.369591 88.167788 121.352549
88.167788 121.352549 61.010496 137.031819
61.010496 137.031819 31.186754 146.72214
31.186754 146.72214 0.0 150.0
0.0 150.0 -31.186754 146.72214
-31.186754 146.72214 -61.010496 137.031819
-61.010496 137.031819 -88.167788 121.352549
-88.167788 121.352549 -111.471724 100.369591
-111.471724 100.369591 -129.903811 75.0
-129.903811 75.0 -142.658477 46.352549
-142.658477 46.352549 -149.178284 15.679269
-149.178284 15.679269 -149.178284 -15.679269
-149.178284 -15.679269 -142.658477 -46.352549
-142.658477 -46.352549 -129.903811 -75.0
-129.903811 -75.0 -111.471724 -100.369591
-111.471724 -100.369591 -88.167788 -121.352549

-88.167788 -121.352549 -61.010496 -137.031819
-61.010496 -137.031819 -31.186754 -146.72214
-31.186754 -146.72214 0.0 -150.0
0.0 -150.0 31.186754 -146.72214
31.186754 -146.72214 61.010496 -137.031819
61.010496 -137.031819 88.167788 -121.352549
88.167788 -121.352549 111.471724 -100.369591

eval naive 2183.6622668054965

eval optimized 2183.6622668054965

improvement achieved by post optimization algorithm 0.0

Path 24-55-59-15-9-46-10-41-0-57-37-11-22-12-19-45-48-54-25-51-7-21-3-35-
4-13-44-1-49-47-56-40-5-36-29-18-38-34-30-31-16-17-43-52-14-23-27-20-42-
39-8-6-26-50-53-58-33-32-2-2

Path

173.205081 -100.0 190.211303 -61.803399
190.211303 -61.803399 198.904379 -20.905693
198.904379 -20.905693 198.904379 20.905693
198.904379 20.905693 190.211303 61.803399
190.211303 61.803399 173.205081 100.0
173.205081 100.0 148.628965 133.826121
148.628965 133.826121 117.55705 161.803399
117.55705 161.803399 81.347329 182.709092
81.347329 182.709092 41.582338 195.62952
41.582338 195.62952 0.0 200.0
0.0 200.0 -41.582338 195.62952
-41.582338 195.62952 -81.347329 182.709092
-81.347329 182.709092 -117.55705 161.803399
-117.55705 161.803399 -148.628965 133.826121
-148.628965 133.826121 -173.205081 100.0
-173.205081 100.0 -190.211303 61.803399
-190.211303 61.803399 -198.904379 20.905693
-198.904379 20.905693 -198.904379 -20.905693
-198.904379 -20.905693 -190.211303 -61.803399
-190.211303 -61.803399 -173.205081 -100.0
-173.205081 -100.0 -148.628965 -133.826121
-148.628965 -133.826121 -117.55705 -161.803399
-117.55705 -161.803399 -81.347329 -182.709092
-81.347329 -182.709092 -41.582338 -195.62952
-41.582338 -195.62952 0.0 -200.0
0.0 -200.0 41.582338 -195.62952
41.582338 -195.62952 81.347329 -182.709092
81.347329 -182.709092 117.55705 -161.803399
117.55705 -161.803399 148.628965 -133.826121
148.628965 -133.826121 129.903811 -75.0
129.903811 -75.0 142.658477 -46.352549
142.658477 -46.352549 149.178284 -15.679269
149.178284 -15.679269 149.178284 15.679269
149.178284 15.679269 142.658477 46.352549
142.658477 46.352549 129.903811 75.0
129.903811 75.0 111.471724 100.369591
111.471724 100.369591 88.167788 121.352549
88.167788 121.352549 61.010496 137.031819
61.010496 137.031819 31.186754 146.72214
31.186754 146.72214 0.0 150.0
0.0 150.0 -31.186754 146.72214
-31.186754 146.72214 -61.010496 137.031819
-61.010496 137.031819 -88.167788 121.352549
-88.167788 121.352549 -111.471724 100.369591
-111.471724 100.369591 -129.903811 75.0

-129.903811 75.0 -142.658477 46.352549
-142.658477 46.352549 -149.178284 15.679269
-149.178284 15.679269 -149.178284 -15.679269
-149.178284 -15.679269 -142.658477 -46.352549
-142.658477 -46.352549 -129.903811 -75.0
-129.903811 -75.0 -111.471724 -100.369591
-111.471724 -100.369591 -88.167788 -121.352549
-88.167788 -121.352549 -61.010496 -137.031819
-61.010496 -137.031819 -31.186754 -146.72214
-31.186754 -146.72214 0.0 -150.0
0.0 -150.0 31.186754 -146.72214
31.186754 -146.72214 61.010496 -137.031819
61.010496 -137.031819 88.167788 -121.352549
88.167788 -121.352549 111.471724 -100.369591

WENIGERKRUMM 3
nodes 120 edges 7140
all starting node nearest neighbour heuristic found best tour with length
2001.318764396512 for starting node Node[id=78, point=Point[x=169.282032,
y=60.0]]
time to find init solution 0 seconds
found init solution
Path
169.282032 60.0 159.451586 53.530449
159.451586 53.530449 159.451586 46.469551
159.451586 46.469551 169.282032 40.0
169.282032 40.0 176.084521 24.72136
176.084521 24.72136 179.561752 8.362277
179.561752 8.362277 179.561752 -8.362277
179.561752 -8.362277 176.084521 -24.72136
176.084521 -24.72136 169.282032 -40.0
169.282032 -40.0 159.451586 -53.530449
159.451586 -53.530449 147.02282 -64.72136
147.02282 -64.72136 132.538931 -73.083637
132.538931 -73.083637 116.632935 -78.251808
116.632935 -78.251808 100.0 -80.0
100.0 -80.0 83.367065 -78.251808
83.367065 -78.251808 67.461069 -73.083637
67.461069 -73.083637 52.97718 -64.72136
52.97718 -64.72136 47.02282 -64.72136
47.02282 -64.72136 40.548414 -53.530449
40.548414 -53.530449 30.717968 -40.0
30.717968 -40.0 23.915479 -24.72136
23.915479 -24.72136 20.438248 -8.362277
20.438248 -8.362277 20.438248 8.362277
20.438248 8.362277 16.632935 21.748192
16.632935 21.748192 23.915479 24.72136
23.915479 24.72136 32.538931 26.916363
32.538931 26.916363 30.717968 40.0
30.717968 40.0 40.548414 46.469551
40.548414 46.469551 40.548414 53.530449
40.548414 53.530449 30.717968 60.0
30.717968 60.0 32.538931 73.083637
32.538931 73.083637 23.915479 75.27864
23.915479 75.27864 16.632935 78.251808
16.632935 78.251808 20.438248 91.637723
20.438248 91.637723 20.438248 108.362277
20.438248 108.362277 23.915479 124.72136
23.915479 124.72136 30.717968 140.0
30.717968 140.0 40.548414 153.530449
40.548414 153.530449 47.02282 164.72136
47.02282 164.72136 52.97718 164.72136
52.97718 164.72136 59.451586 153.530449
59.451586 153.530449 69.282032 140.0
69.282032 140.0 76.084521 124.72136
76.084521 124.72136 79.561752 108.362277
79.561752 108.362277 79.561752 91.637723
79.561752 91.637723 83.367065 78.251808
83.367065 78.251808 76.084521 75.27864
76.084521 75.27864 67.461069 73.083637
67.461069 73.083637 69.282032 60.0
69.282032 60.0 59.451586 53.530449
59.451586 53.530449 59.451586 46.469551
59.451586 46.469551 69.282032 40.0
69.282032 40.0 67.461069 26.916363

67.461069 26.916363 76.084521 24.72136
76.084521 24.72136 83.367065 21.748192
83.367065 21.748192 79.561752 8.362277
79.561752 8.362277 79.561752 -8.362277
79.561752 -8.362277 76.084521 -24.72136
76.084521 -24.72136 69.282032 -40.0
69.282032 -40.0 59.451586 -53.530449
59.451586 -53.530449 32.538931 -73.083637
32.538931 -73.083637 16.632935 -78.251808
16.632935 -78.251808 0.0 -80.0
0.0 -80.0 -16.632935 -78.251808
-16.632935 -78.251808 -32.538931 -73.083637
-32.538931 -73.083637 -47.02282 -64.72136
-47.02282 -64.72136 -59.451586 -53.530449
-59.451586 -53.530449 -69.282032 -40.0
-69.282032 -40.0 -76.084521 -24.72136
-76.084521 -24.72136 -79.561752 -8.362277
-79.561752 -8.362277 -79.561752 8.362277
-79.561752 8.362277 -76.084521 24.72136
-76.084521 24.72136 -69.282032 40.0
-69.282032 40.0 -59.451586 46.469551
-59.451586 46.469551 -59.451586 53.530449
-59.451586 53.530449 -69.282032 60.0
-69.282032 60.0 -76.084521 75.27864
-76.084521 75.27864 -79.561752 91.637723
-79.561752 91.637723 -79.561752 108.362277
-79.561752 108.362277 -76.084521 124.72136
-76.084521 124.72136 -69.282032 140.0
-69.282032 140.0 -59.451586 153.530449
-59.451586 153.530449 -47.02282 164.72136
-47.02282 164.72136 -32.538931 173.083637
-32.538931 173.083637 -16.632935 178.251808
-16.632935 178.251808 0.0 180.0
0.0 180.0 16.632935 178.251808
16.632935 178.251808 32.538931 173.083637
32.538931 173.083637 67.461069 173.083637
67.461069 173.083637 83.367065 178.251808
83.367065 178.251808 100.0 180.0
100.0 180.0 116.632935 178.251808
116.632935 178.251808 132.538931 173.083637
132.538931 173.083637 147.02282 164.72136
147.02282 164.72136 159.451586 153.530449
159.451586 153.530449 169.282032 140.0
169.282032 140.0 176.084521 124.72136
176.084521 124.72136 179.561752 108.362277
179.561752 108.362277 179.561752 91.637723
179.561752 91.637723 176.084521 75.27864
176.084521 75.27864 147.02282 64.72136
147.02282 64.72136 132.538931 73.083637
132.538931 73.083637 116.632935 78.251808
116.632935 78.251808 100.0 80.0
100.0 80.0 52.97718 64.72136
52.97718 64.72136 47.02282 64.72136
47.02282 64.72136 47.02282 35.27864
47.02282 35.27864 0.0 20.0
0.0 20.0 -16.632935 21.748192
-16.632935 21.748192 -32.538931 26.916363
-32.538931 26.916363 -47.02282 35.27864
-47.02282 35.27864 -47.02282 64.72136
-47.02282 64.72136 -32.538931 73.083637

-32.538931 73.083637 -16.632935 78.251808
-16.632935 78.251808 0.0 80.0
0.0 80.0 52.97718 35.27864
52.97718 35.27864 100.0 20.0
100.0 20.0 116.632935 21.748192
116.632935 21.748192 132.538931 26.916363
132.538931 26.916363 147.02282 35.27864

eval naive 2001.318764396512

eval optimized 2269.2195922254655

improvement achieved by post optimization algorithm -267.9008278289534

Path 78-27-102-42-14-110-1-97-53-46-58-59-108-107-22-39-91-79-99-119-12-
40-68-23-16-73-103-71-11-52-43-76-94-29-55-62-77-69-111-47-84-88-116-112-
28-13-5-61-83-44-10-21-60-26-51-9-65-115-75-41-63-2-33-37-45-96-117-49-
74-25-20-109-105-35-17-93-98-101-7-89-80-30-66-104-90-18-106-6-50-87-56-
24-118-57-34-0-3-85-82-114-70-8-64-95-54-100-86-36-72-48-19-92-4-81-31-
38-67-15-113-3

Path

169.282032 60.0 159.451586 53.530449
159.451586 53.530449 159.451586 46.469551
159.451586 46.469551 169.282032 40.0
169.282032 40.0 176.084521 24.72136
176.084521 24.72136 179.561752 8.362277
179.561752 8.362277 179.561752 -8.362277
179.561752 -8.362277 176.084521 -24.72136
176.084521 -24.72136 169.282032 -40.0
169.282032 -40.0 159.451586 -53.530449
159.451586 -53.530449 147.02282 -64.72136
147.02282 -64.72136 132.538931 -73.083637
132.538931 -73.083637 116.632935 -78.251808
116.632935 -78.251808 100.0 -80.0
100.0 -80.0 83.367065 -78.251808
83.367065 -78.251808 67.461069 -73.083637
67.461069 -73.083637 52.97718 -64.72136
52.97718 -64.72136 47.02282 -64.72136
47.02282 -64.72136 40.548414 -53.530449
40.548414 -53.530449 30.717968 -40.0
30.717968 -40.0 23.915479 -24.72136
23.915479 -24.72136 20.438248 -8.362277
20.438248 -8.362277 20.438248 8.362277
20.438248 8.362277 16.632935 21.748192
16.632935 21.748192 23.915479 24.72136
23.915479 24.72136 32.538931 26.916363
32.538931 26.916363 30.717968 40.0
30.717968 40.0 40.548414 46.469551
40.548414 46.469551 40.548414 53.530449
40.548414 53.530449 30.717968 60.0
30.717968 60.0 32.538931 73.083637
32.538931 73.083637 23.915479 75.27864
23.915479 75.27864 16.632935 78.251808
16.632935 78.251808 20.438248 91.637723
20.438248 91.637723 20.438248 108.362277
20.438248 108.362277 23.915479 124.72136
23.915479 124.72136 30.717968 140.0
30.717968 140.0 40.548414 153.530449
40.548414 153.530449 47.02282 164.72136
47.02282 164.72136 52.97718 164.72136
52.97718 164.72136 59.451586 153.530449
59.451586 153.530449 69.282032 140.0
69.282032 140.0 76.084521 124.72136

76.084521 124.72136 79.561752 108.362277
79.561752 108.362277 79.561752 91.637723
79.561752 91.637723 83.367065 78.251808
83.367065 78.251808 76.084521 75.27864
76.084521 75.27864 67.461069 73.083637
67.461069 73.083637 69.282032 60.0
69.282032 60.0 59.451586 53.530449
59.451586 53.530449 59.451586 46.469551
59.451586 46.469551 69.282032 40.0
69.282032 40.0 67.461069 26.916363
67.461069 26.916363 76.084521 24.72136
76.084521 24.72136 83.367065 21.748192
83.367065 21.748192 79.561752 8.362277
79.561752 8.362277 79.561752 -8.362277
79.561752 -8.362277 76.084521 -24.72136
76.084521 -24.72136 69.282032 -40.0
69.282032 -40.0 59.451586 -53.530449
59.451586 -53.530449 32.538931 -73.083637
32.538931 -73.083637 16.632935 -78.251808
16.632935 -78.251808 0.0 -80.0
0.0 -80.0 -16.632935 -78.251808
-16.632935 -78.251808 -32.538931 -73.083637
-32.538931 -73.083637 -47.02282 -64.72136
-47.02282 -64.72136 -59.451586 -53.530449
-59.451586 -53.530449 -69.282032 -40.0
-69.282032 -40.0 -76.084521 -24.72136
-76.084521 -24.72136 -79.561752 -8.362277
-79.561752 -8.362277 -79.561752 8.362277
-79.561752 8.362277 -76.084521 24.72136
-76.084521 24.72136 -69.282032 40.0
-69.282032 40.0 -59.451586 46.469551
-59.451586 46.469551 -59.451586 53.530449
-59.451586 53.530449 -69.282032 60.0
-69.282032 60.0 -76.084521 75.27864
-76.084521 75.27864 -79.561752 91.637723
-79.561752 91.637723 -79.561752 108.362277
-79.561752 108.362277 -76.084521 124.72136
-76.084521 124.72136 -69.282032 140.0
-69.282032 140.0 -59.451586 153.530449
-59.451586 153.530449 -47.02282 164.72136
-47.02282 164.72136 -32.538931 173.083637
-32.538931 173.083637 -16.632935 178.251808
-16.632935 178.251808 0.0 180.0
0.0 180.0 16.632935 178.251808
16.632935 178.251808 32.538931 173.083637
32.538931 173.083637 67.461069 173.083637
67.461069 173.083637 83.367065 178.251808
83.367065 178.251808 100.0 180.0
100.0 180.0 116.632935 178.251808
116.632935 178.251808 132.538931 173.083637
132.538931 173.083637 147.02282 164.72136
147.02282 164.72136 159.451586 153.530449
159.451586 153.530449 169.282032 140.0
169.282032 140.0 176.084521 124.72136
176.084521 124.72136 179.561752 108.362277
179.561752 108.362277 179.561752 91.637723
179.561752 91.637723 176.084521 75.27864
176.084521 75.27864 147.02282 64.72136
147.02282 64.72136 132.538931 73.083637
132.538931 73.083637 116.632935 78.251808

116.632935 78.251808 100.0 80.0
100.0 80.0 52.97718 64.72136
52.97718 64.72136 47.02282 64.72136
47.02282 64.72136 47.02282 35.27864
47.02282 35.27864 0.0 20.0
0.0 20.0 -16.632935 21.748192
-16.632935 21.748192 -32.538931 26.916363
-32.538931 26.916363 -47.02282 35.27864
-47.02282 35.27864 -47.02282 64.72136
-47.02282 64.72136 -32.538931 73.083637
-32.538931 73.083637 -16.632935 78.251808
-16.632935 78.251808 0.0 80.0
0.0 80.0 52.97718 35.27864
52.97718 35.27864 100.0 20.0
100.0 20.0 116.632935 21.748192
116.632935 21.748192 132.538931 26.916363
132.538931 26.916363 147.02282 35.27864

WENIGERKRUMM 4

nodes 25 edges 300

time to find init solution 0 seconds

found init solution

Path

20.212169 156.013261 33.379688 100.161238
33.379688 100.161238 28.913721 58.69988
28.913721 58.69988 51.00814 5.769601
51.00814 5.769601 42.137753 -60.319863
42.137753 -60.319863 -82.864121 -104.1736
-82.864121 -104.1736 -98.760442 -81.770618
-98.760442 -81.770618 -137.317503 -20.146939
-137.317503 -20.146939 -191.716829 -28.360492
-191.716829 -28.360492 -221.149792 -32.862538
-221.149792 -32.862538 -239.848226 8.671399
-239.848226 8.671399 -239.414022 40.427118
-239.414022 40.427118 -240.369194 57.426131
-240.369194 57.426131 -219.148505 103.685337
-219.148505 103.685337 -107.988514 185.173669
-107.988514 185.173669 139.446709 0.233238
139.446709 0.233238 153.130159 -20.36091
153.130159 -20.36091 144.832862 -43.476284
144.832862 -43.476284 -16.72313 -12.689542
-16.72313 -12.689542 -20.971208 -5.637107
-20.971208 -5.637107 -154.088455 115.022553
-154.088455 115.022553 -119.026308 168.453598
-119.026308 168.453598 101.498782 33.484198
101.498782 33.484198 94.789917 -67.087689
94.789917 -67.087689 -129.104485 -155.04164

eval naive 2197.965650598992

eval optimized 1736.980701656645

improvement achieved by post optimization algorithm 460.98494894234705

Path 0-13-4-15-1-18-14-12-23-6-11-22-17-7-19-16-24-10-5-20-8-2-9-21-

Path

20.212169 156.013261 28.913721 58.69988
28.913721 58.69988 101.498782 33.484198
101.498782 33.484198 94.789917 -67.087689
94.789917 -67.087689 -82.864121 -104.1736
-82.864121 -104.1736 -98.760442 -81.770618
-98.760442 -81.770618 -137.317503 -20.146939
-137.317503 -20.146939 -191.716829 -28.360492
-191.716829 -28.360492 -221.149792 -32.862538
-221.149792 -32.862538 -239.848226 8.671399
-239.848226 8.671399 -239.414022 40.427118
-239.414022 40.427118 -240.369194 57.426131
-240.369194 57.426131 -219.148505 103.685337
-219.148505 103.685337 -154.088455 115.022553
-154.088455 115.022553 -119.026308 168.453598
-119.026308 168.453598 -107.988514 185.173669
-107.988514 185.173669 33.379688 100.161238
33.379688 100.161238 -20.971208 -5.637107
-20.971208 -5.637107 -16.72313 -12.689542
-16.72313 -12.689542 51.00814 5.769601
51.00814 5.769601 139.446709 0.233238
139.446709 0.233238 153.130159 -20.36091
153.130159 -20.36091 144.832862 -43.476284
144.832862 -43.476284 42.137753 -60.319863
42.137753 -60.319863 -129.104485 -155.04164

WENIGERKRUMM 5

nodes 60 edges 1770

time to find init solution 61 seconds

naiv path

Path 0-7-38-33-47-45-48-20-21-55-16-59-37-22-58-32-9-29-35-4-2-28-14-18-46-36-53-15-27-40-56-41-34-19-24-11-49-51-44-25-23-43-1-54-50-3-13-6-12-10-42-30-5-8-17-31-52-26-39-5

Path

-281.67899 -187.717923 62.366656 50.713913
62.366656 50.713913 27.706327 169.284192
27.706327 169.284192 -30.991436 186.807059
-30.991436 186.807059 -177.685937 158.265884
-177.685937 158.265884 -251.656688 -195.189953
-251.656688 -195.189953 -260.477802 -196.955535
-260.477802 -196.955535 -278.409792 -111.914073
-278.409792 -111.914073 141.513053 2.821137
141.513053 2.821137 283.989938 -101.866465
283.989938 -101.866465 263.236651 -144.293091
263.236651 -144.293091 -41.263039 -144.118212
-41.263039 -144.118212 -104.781549 158.212048
-104.781549 158.212048 -49.447381 173.210759
-49.447381 173.210759 36.599805 147.88535
36.599805 147.88535 116.702667 132.021991
116.702667 132.021991 162.493244 -84.574019
162.493244 -84.574019 30.366828 -167.573232
30.366828 -167.573232 -202.218443 -178.735864
-202.218443 -178.735864 -280.008136 11.657786
-280.008136 11.657786 -258.868593 166.669198
-258.868593 166.669198 47.040512 141.206562
47.040512 141.206562 142.765554 -118.682439
142.765554 -118.682439 90.584569 -164.218416
90.584569 -164.218416 -235.099412 47.810306
-235.099412 47.810306 -223.039999 171.558368
-223.039999 171.558368 38.65473 188.608557
38.65473 188.608557 51.417675 146.417721
51.417675 146.417721 106.03343 69.754891
106.03343 69.754891 -57.266232 -115.737582
-57.266232 -115.737582 -247.341131 -160.277639
-247.341131 -160.277639 -286.024059 -55.955204
-286.024059 -55.955204 -70.183535 73.738342
-70.183535 73.738342 -86.45758 105.836348
-86.45758 105.836348 -82.17351 119.465553
-82.17351 119.465553 209.544977 94.267052
209.544977 94.267052 253.534863 38.014987
253.534863 38.014987 26.451074 -192.813352
26.451074 -192.813352 -116.831788 -191.380552
-116.831788 -191.380552 -136.787038 79.501703
-136.787038 79.501703 -68.446198 137.178953
-68.446198 137.178953 92.639946 22.21603
92.639946 22.21603 239.63955 79.491132
239.63955 79.491132 244.228552 119.192512
244.228552 119.192512 -44.669924 170.088013
-44.669924 170.088013 -81.384378 32.368323
-81.384378 32.368323 -74.639411 25.542881
-74.639411 25.542881 -31.548604 -55.223912
-31.548604 -55.223912 -58.684205 -76.988884
-58.684205 -76.988884 -147.023475 -166.22013
-147.023475 -166.22013 -214.362324 -193.26519
-214.362324 -193.26519 -234.711279 -162.774591
-234.711279 -162.774591 -284.547616 -60.154961

-284.547616 -60.154961 -95.621797 77.468533
-95.621797 77.468533 -8.936916 13.543851
-8.936916 13.543851 25.098172 35.205544
25.098172 35.205544 45.123674 31.740242
45.123674 31.740242 63.541591 55.140221
63.541591 55.140221 171.595574 135.520994
171.595574 135.520994 267.845908 127.627482

eval naive 9277.77985102936

eval optimized 3381.157719454162

improvement achieved by post optimization algorithm 5896.622131575197

Path 0-48-45-42-35-46-25-8-3-13-6-12-40-59-29-14-9-21-43-27-11-1-49-55-
16-18-51-44-10-30-56-20-5-41-4-2-36-47-37-22-50-33-53-15-28-58-38-23-24-
19-34-17-31-52-7-26-32-39-54-5

Path

-281.67899 -187.717923 -260.477802 -196.955535
-260.477802 -196.955535 -251.656688 -195.189953
-251.656688 -195.189953 -214.362324 -193.26519
-214.362324 -193.26519 -202.218443 -178.735864
-202.218443 -178.735864 -235.099412 47.810306
-235.099412 47.810306 -136.787038 79.501703
-136.787038 79.501703 -95.621797 77.468533
-95.621797 77.468533 -81.384378 32.368323
-81.384378 32.368323 -74.639411 25.542881
-74.639411 25.542881 -31.548604 -55.223912
-31.548604 -55.223912 -58.684205 -76.988884
-58.684205 -76.988884 -57.266232 -115.737582
-57.266232 -115.737582 -41.263039 -144.118212
-41.263039 -144.118212 30.366828 -167.573232
30.366828 -167.573232 142.765554 -118.682439
142.765554 -118.682439 162.493244 -84.574019
162.493244 -84.574019 141.513053 2.821137
141.513053 2.821137 92.639946 22.21603
92.639946 22.21603 106.03343 69.754891
106.03343 69.754891 209.544977 94.267052
209.544977 94.267052 239.63955 79.491132
239.63955 79.491132 253.534863 38.014987
253.534863 38.014987 283.989938 -101.866465
283.989938 -101.866465 263.236651 -144.293091
263.236651 -144.293091 90.584569 -164.218416
90.584569 -164.218416 26.451074 -192.813352
26.451074 -192.813352 -116.831788 -191.380552
-116.831788 -191.380552 -147.023475 -166.22013
-147.023475 -166.22013 -234.711279 -162.774591
-234.711279 -162.774591 -247.341131 -160.277639
-247.341131 -160.277639 -278.409792 -111.914073
-278.409792 -111.914073 -284.547616 -60.154961
-284.547616 -60.154961 -286.024059 -55.955204
-286.024059 -55.955204 -280.008136 11.657786
-280.008136 11.657786 -258.868593 166.669198
-258.868593 166.669198 -223.039999 171.558368
-223.039999 171.558368 -177.685937 158.265884
-177.685937 158.265884 -104.781549 158.212048
-104.781549 158.212048 -49.447381 173.210759
-49.447381 173.210759 -44.669924 170.088013
-44.669924 170.088013 -30.991436 186.807059
-30.991436 186.807059 38.65473 188.608557
38.65473 188.608557 51.417675 146.417721
51.417675 146.417721 47.040512 141.206562
47.040512 141.206562 36.599805 147.88535

36.599805 147.88535 27.706327 169.284192
27.706327 169.284192 -68.446198 137.178953
-68.446198 137.178953 -82.17351 119.465553
-82.17351 119.465553 -86.45758 105.836348
-86.45758 105.836348 -70.183535 73.738342
-70.183535 73.738342 -8.936916 13.543851
-8.936916 13.543851 25.098172 35.205544
25.098172 35.205544 45.123674 31.740242
45.123674 31.740242 62.366656 50.713913
62.366656 50.713913 63.541591 55.140221
63.541591 55.140221 116.702667 132.021991
116.702667 132.021991 171.595574 135.520994
171.595574 135.520994 244.228552 119.192512
244.228552 119.192512 267.845908 127.627482

WENIGERKRUMM 6

nodes 80 edges 3160

all starting node nearest neighbour heuristic found best tour with length
4362.616434557695 for starting node Node[id=10, point=Point[x=-55.091518,
y=198.826966]]

time to find init solution 2 seconds

found init solution

Path

-55.091518 198.826966 -89.453831 162.237392
-89.453831 162.237392 -100.569041 140.808607
-100.569041 140.808607 -97.391662 124.120512
-97.391662 124.120512 -102.699992 95.632069
-102.699992 95.632069 -139.74158 57.93668
-139.74158 57.93668 -175.118239 77.842636
-175.118239 77.842636 -194.986965 101.363745
-194.986965 101.363745 -167.994506 138.195365
-167.994506 138.195365 21.067444 122.164599
21.067444 122.164599 20.21829 88.031173
20.21829 88.031173 56.716498 66.959624
56.716498 66.959624 58.019653 49.937906
58.019653 49.937906 58.71662 32.83593
58.71662 32.83593 40.327635 19.216022
40.327635 19.216022 14.005617 -14.015334
14.005617 -14.015334 -4.590656 -40.067226
-4.590656 -40.067226 -31.745416 -69.20796
-31.745416 -69.20796 -51.343758 -57.654823
-51.343758 -57.654823 -72.565291 -24.28182
-72.565291 -24.28182 -90.16019 -25.200829
-90.16019 -25.200829 -126.569816 -30.645224
-126.569816 -30.645224 -144.887799 -73.49541
-144.887799 -73.49541 -189.988471 -98.043874
-189.988471 -98.043874 -191.216327 -162.689024
-191.216327 -162.689024 -187.485329 -177.031237
-187.485329 -177.031237 21.176627 -165.421555
21.176627 -165.421555 46.674278 -193.090008
46.674278 -193.090008 152.102728 -193.381252
152.102728 -193.381252 157.588994 -144.200765
157.588994 -144.200765 143.114152 -135.866707
143.114152 -135.866707 134.692592 -102.152826
134.692592 -102.152826 150.526118 -88.230057
150.526118 -88.230057 155.405344 -56.437901
155.405344 -56.437901 138.136997 -31.348808
138.136997 -31.348808 112.833346 -38.057607
112.833346 -38.057607 76.647124 -7.289705
76.647124 -7.289705 81.740403 10.276251
81.740403 10.276251 102.909291 60.107868
102.909291 60.107868 100.006932 76.579303
100.006932 76.579303 121.661135 85.267672
121.661135 85.267672 120.906436 131.79881
120.906436 131.79881 132.794476 135.681392
132.794476 135.681392 154.870684 140.32766
154.870684 140.32766 175.677917 98.929343
175.677917 98.929343 172.836936 59.184233
172.836936 59.184233 121.392544 56.694081
121.392544 56.694081 83.005905 64.646774
83.005905 64.646774 64.559003 82.567627
64.559003 82.567627 73.689751 110.224271
73.689751 110.224271 85.04383 108.946389
85.04383 108.946389 96.781707 141.370805
96.781707 141.370805 246.621634 101.705861

246.621634 101.705861 255.134924 115.594915
255.134924 115.594915 277.821597 104.262606
277.821597 104.262606 289.298882 56.051342
289.298882 56.051342 245.415055 44.794067
245.415055 44.794067 231.944823 82.961057
231.944823 82.961057 228.929427 82.624982
228.929427 82.624982 151.432196 121.427337
151.432196 121.427337 102.223372 174.201904
102.223372 174.201904 49.091876 150.678826
49.091876 150.678826 92.25582 -93.514104
92.25582 -93.514104 187.669263 -122.655771
187.669263 -122.655771 210.186432 -127.403563
210.186432 -127.403563 221.028639 -139.435079
221.028639 -139.435079 216.82592 -152.024123
216.82592 -152.024123 -19.310012 -131.810965
-19.310012 -131.810965 -18.507391 -22.90527
-18.507391 -22.90527 155.341949 -20.252779
155.341949 -20.252779 238.583388 -133.143524
238.583388 -133.143524 245.020791 -167.448848
245.020791 -167.448848 242.810288 -182.054289
242.810288 -182.054289 202.34698 -189.069699
202.34698 -189.069699 64.943433 -119.784474
64.943433 -119.784474 19.765322 -99.2364
19.765322 -99.2364 -107.196865 -77.792599
-107.196865 -77.792599 -154.225945 -135.522059
-154.225945 -135.522059 -288.744132 -173.349893
-288.744132 -173.349893 -293.833463 -165.440105

eval naive 4362.616434557695

eval optimized 3740.816749985773

improvement achieved by post optimization algorithm 621.7996845719222

Path 10-1-74-58-23-54-28-45-40-20-21-78-13-26-51-18-0-3-16-14-65-59-43-
22-17-5-57-29-75-63-8-53-47-55-73-52-24-6-76-44-25-30-38-36-41-35-32-42-
34-66-11-71-37-19-12-79-56-31-67-62-15-46-33-9-39-64-50-48-27-72-61-7-2-
60-70-49-4-77-68-6

Path

-55.091518 198.826966 -89.453831 162.237392
-89.453831 162.237392 -100.569041 140.808607
-100.569041 140.808607 -167.994506 138.195365
-167.994506 138.195365 -194.986965 101.363745
-194.986965 101.363745 -175.118239 77.842636
-175.118239 77.842636 -139.74158 57.93668
-139.74158 57.93668 -102.699992 95.632069
-102.699992 95.632069 -97.391662 124.120512
-97.391662 124.120512 21.067444 122.164599
21.067444 122.164599 49.091876 150.678826
49.091876 150.678826 102.223372 174.201904
102.223372 174.201904 154.870684 140.32766
154.870684 140.32766 151.432196 121.427337
151.432196 121.427337 121.661135 85.267672
121.661135 85.267672 100.006932 76.579303
100.006932 76.579303 102.909291 60.107868
102.909291 60.107868 121.392544 56.694081
121.392544 56.694081 138.136997 -31.348808
138.136997 -31.348808 112.833346 -38.057607
112.833346 -38.057607 76.647124 -7.289705
76.647124 -7.289705 81.740403 10.276251
81.740403 10.276251 83.005905 64.646774
83.005905 64.646774 85.04383 108.946389
85.04383 108.946389 73.689751 110.224271

73.689751 110.224271 20.21829 88.031173
20.21829 88.031173 -18.507391 -22.90527
-18.507391 -22.90527 -72.565291 -24.28182
-72.565291 -24.28182 -90.16019 -25.200829
-90.16019 -25.200829 -126.569816 -30.645224
-126.569816 -30.645224 -144.887799 -73.49541
-144.887799 -73.49541 -189.988471 -98.043874
-189.988471 -98.043874 -191.216327 -162.689024
-191.216327 -162.689024 -187.485329 -177.031237
-187.485329 -177.031237 21.176627 -165.421555
21.176627 -165.421555 46.674278 -193.090008
46.674278 -193.090008 152.102728 -193.381252
152.102728 -193.381252 202.34698 -189.069699
202.34698 -189.069699 242.810288 -182.054289
242.810288 -182.054289 245.020791 -167.448848
245.020791 -167.448848 238.583388 -133.143524
238.583388 -133.143524 155.405344 -56.437901
155.405344 -56.437901 155.341949 -20.252779
155.341949 -20.252779 172.836936 59.184233
172.836936 59.184233 245.415055 44.794067
245.415055 44.794067 289.298882 56.051342
289.298882 56.051342 277.821597 104.262606
277.821597 104.262606 255.134924 115.594915
255.134924 115.594915 246.621634 101.705861
246.621634 101.705861 231.944823 82.961057
231.944823 82.961057 228.929427 82.624982
228.929427 82.624982 175.677917 98.929343
175.677917 98.929343 132.794476 135.681392
132.794476 135.681392 120.906436 131.79881
120.906436 131.79881 96.781707 141.370805
96.781707 141.370805 64.559003 82.567627
64.559003 82.567627 56.716498 66.959624
56.716498 66.959624 58.019653 49.937906
58.019653 49.937906 58.71662 32.83593
58.71662 32.83593 40.327635 19.216022
40.327635 19.216022 14.005617 -14.015334
14.005617 -14.015334 -4.590656 -40.067226
-4.590656 -40.067226 19.765322 -99.2364
19.765322 -99.2364 92.25582 -93.514104
92.25582 -93.514104 134.692592 -102.152826
134.692592 -102.152826 150.526118 -88.230057
150.526118 -88.230057 187.669263 -122.655771
187.669263 -122.655771 210.186432 -127.403563
210.186432 -127.403563 221.028639 -139.435079
221.028639 -139.435079 216.82592 -152.024123
216.82592 -152.024123 157.588994 -144.200765
157.588994 -144.200765 143.114152 -135.866707
143.114152 -135.866707 64.943433 -119.784474
64.943433 -119.784474 -19.310012 -131.810965
-19.310012 -131.810965 -31.745416 -69.20796
-31.745416 -69.20796 -51.343758 -57.654823
-51.343758 -57.654823 -107.196865 -77.792599
-107.196865 -77.792599 -154.225945 -135.522059
-154.225945 -135.522059 -288.744132 -173.349893
-288.744132 -173.349893 -293.833463 -165.440105

WENIGERKRUMM 7

nodes 100 edges 4950

all starting node nearest neighbour heuristic found best tour with length 5638.012443173076 for starting node Node[id=15, point=Point[x=126.799911, y=112.72728]]

time to find init solution 0 seconds

naiv path

Path 15-39-16-29-91-3-10-27-60-24-74-83-90-47-46-37-68-11-54-55-30-49-0-61-75-57-94-93-80-14-33-28-70-56-7-96-34-17-98-95-92-22-40-63-18-19-86-78-41-1-71-82-20-77-73-36-25-84-72-66-35-88-32-99-89-9-45-26-85-42-51-59-21-62-69-53-64-4-50-23-52-44-43-48-67-31-38-2-65-5-6-12-97-87-81-8-13-79-76-5

Path

126.799911 112.72728 120.375033 115.889661
120.375033 115.889661 100.043893 161.295125
100.043893 161.295125 95.947213 183.278211
95.947213 183.278211 130.854855 195.695082
130.854855 195.695082 170.514252 161.16985
170.514252 161.16985 169.990437 154.260412
169.990437 154.260412 162.923138 117.465744
162.923138 117.465744 158.742184 62.618834
158.742184 62.618834 178.19836 37.031984
178.19836 37.031984 189.387028 -4.465225
189.387028 -4.465225 205.717887 -24.976511
205.717887 -24.976511 224.599361 -34.798485
224.599361 -34.798485 239.616628 -21.94416
239.616628 -21.94416 276.276517 -49.448662
276.276517 -49.448662 278.105364 -93.771765
278.105364 -93.771765 275.793495 -129.415477
275.793495 -129.415477 235.827007 -143.838844
235.827007 -143.838844 217.599278 -189.258062
217.599278 -189.258062 92.29804 -146.169487
92.29804 -146.169487 59.8272 -170.713714
59.8272 -170.713714 -17.356579 -125.254131
-17.356579 -125.254131 -47.266557 -66.984045
-47.266557 -66.984045 -46.403062 -13.755804
-46.403062 -13.755804 -48.354421 9.091412
-48.354421 9.091412 -42.704691 37.679514
-42.704691 37.679514 -27.911955 48.326745
-27.911955 48.326745 -4.434919 33.164884
-4.434919 33.164884 3.152113 27.10389
3.152113 27.10389 -9.580869 -17.516639
-9.580869 -17.516639 -0.200936 -21.927663
-0.200936 -21.927663 47.011363 -30.88718
47.011363 -30.88718 55.550895 -45.089968
55.550895 -45.089968 88.818853 -42.834512
88.818853 -42.834512 118.989764 -80.203583
118.989764 -80.203583 126.904044 -80.733297
126.904044 -80.733297 172.389228 -53.13327
172.389228 -53.13327 158.552316 -19.254407
158.552316 -19.254407 141.433472 -6.023095
141.433472 -6.023095 135.781192 -13.05344
135.781192 -13.05344 68.910854 -82.123346
68.910854 -82.123346 34.959132 -106.842499
34.959132 -106.842499 -133.730932 -113.306155
-133.730932 -113.306155 -152.130365 -93.844349
-152.130365 -93.844349 -172.378071 -88.298187
-172.378071 -88.298187 -202.828627 -101.70005
-202.828627 -101.70005 -189.135201 -139.078513
-189.135201 -139.078513 -155.651746 -138.151811

-155.651746 -138.151811 -147.363185 59.608175
-147.363185 59.608175 -185.649161 90.144456
-185.649161 90.144456 -189.062172 104.285631
-189.062172 104.285631 -215.113949 120.740679
-215.113949 120.740679 -200.771246 147.741054
-200.771246 147.741054 -201.485143 155.27483
-201.485143 155.27483 -192.681053 174.522947
-192.681053 174.522947 -153.13014 187.817274
-153.13014 187.817274 -120.386562 170.589454
-120.386562 170.589454 -134.985023 132.944989
-134.985023 132.944989 -157.423365 126.800331
-157.423365 126.800331 -207.665172 81.410371
-207.665172 81.410371 -248.169463 80.132237
-248.169463 80.132237 -284.129027 107.252583
-284.129027 107.252583 -287.058297 113.599823
-287.058297 113.599823 -268.739142 143.276483
-268.739142 143.276483 -240.249363 179.334919
-240.249363 179.334919 -222.492322 169.033315
-222.492322 169.033315 -114.146166 190.615321
-114.146166 190.615321 -84.6269 148.216494
-84.6269 148.216494 -126.568914 106.964962
-126.568914 106.964962 -171.354954 25.463068
-171.354954 25.463068 -184.0927 5.737284
-184.0927 5.737284 -226.787625 2.658862
-226.787625 2.658862 -244.959501 -111.046573
-244.959501 -111.046573 -181.208895 -192.622935
-181.208895 -192.622935 106.599423 -107.433987
106.599423 -107.433987 129.024315 29.701695
129.024315 29.701695 74.8875 80.586458
74.8875 80.586458 56.389778 71.618509
56.389778 71.618509 54.551865 71.567133
54.551865 71.567133 40.897139 78.152317
40.897139 78.152317 16.573231 104.020979
16.573231 104.020979 8.64366 135.90743
8.64366 135.90743 54.766523 154.053847
54.766523 154.053847 148.108328 123.558283
148.108328 123.558283 208.592696 136.61846
208.592696 136.61846 216.691 156.31437
216.691 156.31437 217.218893 164.294928
217.218893 164.294928 34.079032 187.731112
34.079032 187.731112 -13.030259 174.698005
-13.030259 174.698005 -56.914543 92.501249
-56.914543 92.501249 -18.316063 27.75586
-18.316063 27.75586 55.434792 62.72916
55.434792 62.72916 57.555364 64.417343
57.555364 64.417343 256.475967 -46.591418
256.475967 -46.591418 296.911892 25.811569
296.911892 25.811569 271.301094 142.524086
271.301094 142.524086 221.808162 186.241012
221.808162 186.241012 53.436521 125.683201
53.436521 125.683201 -211.429137 27.770425
-211.429137 27.770425 -217.28247 -43.316616

eval naive 5638.012443173076

path length optimized 4451.743885428826

improvement of 1186.2685577442498

15-27-10-29-44-25-77-20-82-71-1-66-76-63-40-78-86-19-18-0-49-22-69-96-56-
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2-43-79-52-94-6-93-12-64-60-67-31-38-91-16-39-48-3-13-8-81-47-90-83-74-
24-53-97-4-50-23-80-70-92-7-95-98-17-34-87-46-37-68-11-54-55-30-62-21-5

126.799911 112.72728 162.923138 117.465744
162.923138 117.465744 169.990437 154.260412
169.990437 154.260412 95.947213 183.278211
95.947213 183.278211 8.64366 135.90743
8.64366 135.90743 -120.386562 170.589454
-120.386562 170.589454 -201.485143 155.27483
-201.485143 155.27483 -200.771246 147.741054
-200.771246 147.741054 -215.113949 120.740679
-215.113949 120.740679 -189.062172 104.285631
-189.062172 104.285631 -185.649161 90.144456
-185.649161 90.144456 -207.665172 81.410371
-207.665172 81.410371 -211.429137 27.770425
-211.429137 27.770425 -152.130365 -93.844349
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34.959132 -106.842499 106.599423 -107.433987
106.599423 -107.433987 126.904044 -80.733297
126.904044 -80.733297 88.818853 -42.834512
88.818853 -42.834512 47.011363 -30.88718
47.011363 -30.88718 -0.200936 -21.927663
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-48.354421 9.091412 -42.704691 37.679514
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-56.914543 92.501249 -126.568914 106.964962
-126.568914 106.964962 -134.985023 132.944989
-134.985023 132.944989 -157.423365 126.800331
-157.423365 126.800331 -147.363185 59.608175
-147.363185 59.608175 -171.354954 25.463068
-171.354954 25.463068 -184.0927 5.737284
-184.0927 5.737284 -226.787625 2.658862
-226.787625 2.658862 -248.169463 80.132237
-248.169463 80.132237 -284.129027 107.252583
-284.129027 107.252583 -287.058297 113.599823
-287.058297 113.599823 -268.739142 143.276483
-268.739142 143.276483 -240.249363 179.334919
-240.249363 179.334919 -222.492322 169.033315
-222.492322 169.033315 -192.681053 174.522947
-192.681053 174.522947 -153.13014 187.817274
-153.13014 187.817274 -114.146166 190.615321
-114.146166 190.615321 -84.6269 148.216494
-84.6269 148.216494 -13.030259 174.698005
-13.030259 174.698005 34.079032 187.731112
34.079032 187.731112 54.766523 154.053847
54.766523 154.053847 53.436521 125.683201
53.436521 125.683201 16.573231 104.020979
16.573231 104.020979 -27.911955 48.326745
-27.911955 48.326745 -18.316063 27.75586
-18.316063 27.75586 -4.434919 33.164884
-4.434919 33.164884 55.434792 62.72916

55.434792 62.72916 74.8875 80.586458
74.8875 80.586458 158.742184 62.618834
158.742184 62.618834 208.592696 136.61846
208.592696 136.61846 216.691 156.31437
216.691 156.31437 217.218893 164.294928
217.218893 164.294928 130.854855 195.695082
130.854855 195.695082 100.043893 161.295125
100.043893 161.295125 120.375033 115.889661
120.375033 115.889661 148.108328 123.558283
148.108328 123.558283 170.514252 161.16985
170.514252 161.16985 221.808162 186.241012
221.808162 186.241012 271.301094 142.524086
271.301094 142.524086 296.911892 25.811569
296.911892 25.811569 239.616628 -21.94416
239.616628 -21.94416 224.599361 -34.798485
224.599361 -34.798485 205.717887 -24.976511
205.717887 -24.976511 189.387028 -4.465225
189.387028 -4.465225 178.19836 37.031984
178.19836 37.031984 129.024315 29.701695
129.024315 29.701695 57.555364 64.417343
57.555364 64.417343 56.389778 71.618509
56.389778 71.618509 54.551865 71.567133
54.551865 71.567133 40.897139 78.152317
40.897139 78.152317 3.152113 27.10389
3.152113 27.10389 55.550895 -45.089968
55.550895 -45.089968 68.910854 -82.123346
68.910854 -82.123346 118.989764 -80.203583
118.989764 -80.203583 135.781192 -13.05344
135.781192 -13.05344 141.433472 -6.023095
141.433472 -6.023095 158.552316 -19.254407
158.552316 -19.254407 172.389228 -53.13327
172.389228 -53.13327 256.475967 -46.591418
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276.276517 -49.448662 278.105364 -93.771765
278.105364 -93.771765 275.793495 -129.415477
275.793495 -129.415477 235.827007 -143.838844
235.827007 -143.838844 217.599278 -189.258062
217.599278 -189.258062 92.29804 -146.169487
92.29804 -146.169487 59.8272 -170.713714
59.8272 -170.713714 -181.208895 -192.622935
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