# Supplementary material

# for

# Extended p-median problems for balancing service efficiency and equality

### Figure S1: The mean distance and the standard deviation from the MDELP solutions with different parameter . The horizontal axis shows the value of parameter ; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Figure S2: The mean distance and the standard deviation from the CMDELP solutions with different parameter . The horizontal axis shows the value of parameter ; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Figure S3: The mean distance and the standard deviation from the MDELP solutions with different parameter . The horizontal axis shows the value of parameter ; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Figure S4: The mean distance and the standard deviation from the CMDELP solutions with different parameter . The horizontal axis shows the value of parameter ; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Figure S5: The mean distance and the standard deviation versus the number of facilities. The horizontal axis shows the number of facilities for the MDELP; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Figure S6: The mean distance and the standard deviation versus the number of facilities. The horizontal axis shows the number of facilities for the CMDELP; the vertical axis shows the mean distance (upper line) and the standard deviation (lower line).

### Table S1: Solutions from the instance Capa1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | capa1 | 10 | ~ | ~ | 7070447.2 | opt | 51.9 | 138.9 | 59.9 | 49.4 | 0.246 |
| PMP | capa1 | 11 | ~ | ~ | 6726618.9 | opt | 166.9 | 132.2 | 56.3 | 46.2 | 0.243 |
| PMP | capa1 | 12 | ~ | ~ | 6413109.1 | opt | 41.0 | 126.0 | 53.5 | 43.9 | 0.242 |
| PMP | capa1 | 13 | ~ | ~ | 6139107.8 | opt | 34.7 | 120.6 | 51.0 | 41.6 | 0.239 |
| PMP | capa1 | 14 | ~ | ~ | 5870738.4 | opt | 12.8 | 115.4 | 48.0 | 39.2 | 0.237 |
| MDELP | capa1 | 10 | 138.9 | 0.077 | 12905305.5 | opt | 31.4 | 139.7 | 54.5 | 44.7 | 0.223 |
| MDELP | capa1 | 11 | 132.2 | 0.083 | 12683936.2 | opt | 51.5 | 133.1 | 52.2 | 42.9 | 0.224 |
| MDELP | capa1 | 12 | 126.0 | 0.088 | 12080844.5 | opt | 35.5 | 127.3 | 49.3 | 40.9 | 0.222 |
| MDELP | capa1 | 13 | 120.6 | 0.093 | 11910391.6 | opt | 74.1 | 122.1 | 48.3 | 39.9 | 0.226 |
| MDELP | capa1 | 14 | 115.4 | 0.100 | 11707370.8 | opt | 38.2 | 116.5 | 47.2 | 39.1 | 0.231 |
| MELP | capa1 | 10 | 138.9 | ~ | 75232954.6 | opt | 39.5 | 140.1 | 54.2 | 44.3 | 0.221 |
| MELP | capa1 | 11 | 132.2 | ~ | 71110635.9 | opt | 72.2 | 134.3 | 52.3 | 43.8 | 0.223 |
| MELP | capa1 | 12 | 126.0 | ~ | 63689667.4 | opt | 32.6 | 127.3 | 49.3 | 40.9 | 0.222 |
| MELP | capa1 | 13 | 120.6 | ~ | 61077315.6 | opt | 52.2 | 122.7 | 48.0 | 39.6 | 0.223 |
| MELP | capa1 | 14 | 115.4 | ~ | 57796316.2 | opt | 55.1 | 116.5 | 47.2 | 39.1 | 0.231 |
| CPMP | capa1 | 10 | ~ | ~ | 7070447.2 | opt | 1008.3 | 138.9 | 59.9 | 49.4 | 0.246 |
| CPMP | capa1 | 11 | ~ | ~ | 6726618.9 | opt | 1131.4 | 132.2 | 56.3 | 46.2 | 0.243 |
| CPMP | capa1 | 12 | ~ | ~ | 6413109.1 | opt | 842.2 | 126.0 | 53.5 | 43.9 | 0.242 |
| CPMP | capa1 | 13 | ~ | ~ | 6139107.8 | opt | 1066.2 | 120.6 | 51.0 | 41.6 | 0.239 |
| CPMP | capa1 | 14 | ~ | ~ | 5870738.4 | opt | 405.2 | 115.4 | 48.0 | 39.2 | 0.237 |
| CMDELP | capa1 | 10 | 138.9 | 0.077 | 12905305.5 | opt | 1176.2 | 139.7 | 54.5 | 44.7 | 0.223 |
| CMDELP | capa1 | 11 | 132.2 | 0.083 | 12683936.2 | opt | 898.8 | 133.1 | 52.2 | 42.9 | 0.224 |
| CMDELP | capa1 | 12 | 126.0 | 0.088 | 12080844.5 | opt | 878.7 | 127.3 | 49.3 | 40.9 | 0.222 |
| CMDELP | capa1 | 13 | 120.6 | 0.093 | 11910391.6 | opt | 711.3 | 122.1 | 48.3 | 39.9 | 0.226 |
| CMDELP | capa1 | 14 | 115.4 | 0.100 | 11707370.8 | opt | 748.5 | 116.5 | 47.2 | 39.1 | 0.231 |
| MECLP | capa1 | 10 | 138.9 | ~ | 75232954.6 | opt | 1051.2 | 140.1 | 54.2 | 44.3 | 0.221 |
| MECLP | capa1 | 11 | 132.2 | ~ | 71110635.9 | opt | 1091.1 | 134.3 | 52.3 | 43.8 | 0.223 |
| MECLP | capa1 | 12 | 126.0 | ~ | 63689667.4 | opt | 729.5 | 127.3 | 49.3 | 40.9 | 0.222 |
| MECLP | capa1 | 13 | 120.6 | ~ | 61077315.6 | opt | 808.0 | 122.7 | 48.0 | 39.6 | 0.223 |
| MECLP | capa1 | 14 | 115.4 | ~ | 57796316.2 | opt | 538.5 | 116.5 | 47.2 | 39.1 | 0.231 |

### Table S2: Solutions from the instance Capb1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | capb1 | 12 | ~ | ~ | 6436697.6 | opt | 14.6 | 125.2 | 52.5 | 43.0 | 0.239 |
| PMP | capb1 | 13 | ~ | ~ | 6191851.2 | opt | 25.2 | 120.4 | 53.8 | 44.5 | 0.256 |
| PMP | capb1 | 14 | ~ | ~ | 5964313.9 | opt | 29.3 | 116.0 | 51.9 | 42.6 | 0.256 |
| PMP | capb1 | 15 | ~ | ~ | 5749904.7 | opt | 23.2 | 111.9 | 50.7 | 41.4 | 0.258 |
| PMP | capb1 | 16 | ~ | ~ | 5555952.6 | opt | 17.8 | 108.1 | 49.5 | 40.2 | 0.260 |
| MDELP | capb1 | 12 | 125.2 | 0.091 | 12656400.5 | opt | 55.9 | 125.3 | 52.3 | 42.9 | 0.238 |
| MDELP | capb1 | 13 | 120.4 | 0.083 | 11778734.6 | opt | 73.5 | 122.0 | 50.0 | 40.8 | 0.233 |
| MDELP | capb1 | 14 | 116.0 | 0.086 | 11452663.1 | opt | 73.7 | 118.3 | 48.0 | 39.4 | 0.231 |
| MDELP | capb1 | 15 | 111.9 | 0.087 | 11011107.6 | opt | 159.4 | 113.4 | 46.0 | 37.1 | 0.230 |
| MDELP | capb1 | 16 | 108.1 | 0.088 | 10459755.8 | opt | 68.7 | 108.8 | 45.1 | 36.2 | 0.235 |
| MELP | capb1 | 12 | 125.2 | ~ | 68043641.8 | opt | 93.5 | 127.2 | 50.2 | 41.1 | 0.225 |
| MELP | capb1 | 13 | 120.4 | ~ | 65622728.7 | opt | 159.5 | 123.6 | 49.1 | 40.7 | 0.227 |
| MELP | capb1 | 14 | 116.0 | ~ | 62164188.8 | opt | 214.6 | 120.1 | 46.7 | 38.6 | 0.222 |
| MELP | capb1 | 15 | 111.9 | ~ | 59480107.2 | opt | 147.2 | 115.5 | 45.8 | 37.5 | 0.226 |
| MELP | capb1 | 16 | 108.1 | ~ | 55031390.2 | opt | 143.7 | 110.3 | 44.8 | 36.6 | 0.232 |
| CPMP | capb1 | 12 | ~ | ~ | 6445140.0 | opt | 537.6 | 125.4 | 52.8 | 43.2 | 0.240 |
| CPMP | capb1 | 13 | ~ | ~ | 6196126.1 | opt | 704.1 | 120.5 | 53.6 | 44.2 | 0.254 |
| CPMP | capb1 | 14 | ~ | ~ | 5967623.3 | opt | 856.5 | 116.1 | 52.0 | 42.7 | 0.256 |
| CPMP | capb1 | 15 | ~ | ~ | 5751877.3 | opt | 747.3 | 111.9 | 50.8 | 41.4 | 0.259 |
| CPMP | capb1 | 16 | ~ | ~ | 5555952.6 | opt | 718.7 | 108.1 | 49.5 | 40.2 | 0.260 |
| CMDELP | capb1 | 12 | 125.4 | 0.090 | 12652978.8 | opt | 1267.0 | 125.5 | 52.5 | 43.1 | 0.239 |
| CMDELP | capb1 | 13 | 120.5 | 0.084 | 11832650.7 | opt | 1384.0 | 123.1 | 49.0 | 40.3 | 0.227 |
| CMDELP | capb1 | 14 | 116.1 | 0.086 | 13987375.0 | opt | 1026.6 | 118.3 | 48.0 | 39.4 | 0.231 |
| CMDELP | capb1 | 15 | 111.9 | 0.087 | 11011107.6 | opt | 958.7 | 113.4 | 46.0 | 37.1 | 0.230 |
| CMDELP | capb1 | 16 | 108.1 | 0.088 | 10459755.8 | opt | 744.6 | 108.8 | 45.1 | 36.2 | 0.235 |
| MECLP | capb1 | 12 | 125.4 | ~ | 68358631.6 | opt | 1418.4 | 127.9 | 50.3 | 41.6 | 0.225 |
| MECLP | capb1 | 13 | 120.5 | ~ | 65481024.2 | opt | 1097.1 | 123.9 | 48.9 | 40.4 | 0.226 |
| MECLP | capb1 | 14 | 116.1 | ~ | 62050757.7 | opt | 1220.5 | 120.2 | 46.7 | 38.6 | 0.222 |
| MECLP | capb1 | 15 | 111.9 | ~ | 59480107.2 | opt | 1154.7 | 115.5 | 45.8 | 37.5 | 0.226 |
| MECLP | capb1 | 16 | 108.1 | ~ | 55031390.2 | opt | 841.6 | 110.3 | 44.8 | 36.5 | 0.231 |

### Table S3: Solutions from the instance Capc1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | capc1 | 12 | ~ | ~ | 6250683.7 | opt | 15.5 | 122.7 | 53.8 | 44.6 | 0.250 |
| PMP | capc1 | 13 | ~ | ~ | 6003669.9 | opt | 12.9 | 117.9 | 53.4 | 44.6 | 0.259 |
| PMP | capc1 | 14 | ~ | ~ | 5801256.9 | opt | 13.1 | 113.9 | 52.7 | 43.9 | 0.265 |
| PMP | capc1 | 15 | ~ | ~ | 5627996.4 | opt | 25.7 | 110.5 | 51.8 | 43.0 | 0.268 |
| PMP | capc1 | 16 | ~ | ~ | 5455463.4 | opt | 16.6 | 107.1 | 49.8 | 41.3 | 0.265 |
| MDELP | capc1 | 12 | 122.7 | 0.085 | 12100632.3 | opt | 31.3 | 123.5 | 52.4 | 43.0 | 0.243 |
| MDELP | capc1 | 13 | 117.9 | 0.083 | 11380168.9 | opt | 63.6 | 119.6 | 49.8 | 40.8 | 0.238 |
| MDELP | capc1 | 14 | 113.9 | 0.082 | 10714661.3 | opt | 24.1 | 115.4 | 48.0 | 39.4 | 0.237 |
| MDELP | capc1 | 15 | 110.5 | 0.082 | 10357256.7 | opt | 54.7 | 112.3 | 46.0 | 37.2 | 0.233 |
| MDELP | capc1 | 16 | 107.1 | 0.086 | 10098363.2 | opt | 49.4 | 108.7 | 44.8 | 36.6 | 0.235 |
| MELP | capc1 | 12 | 122.7 | ~ | 68373444.9 | opt | 55.6 | 123.5 | 52.4 | 43.0 | 0.243 |
| MELP | capc1 | 13 | 117.9 | ~ | 63727381.1 | opt | 45.8 | 119.6 | 49.8 | 40.8 | 0.238 |
| MELP | capc1 | 14 | 113.9 | ~ | 58975212.1 | opt | 30.0 | 115.5 | 48.4 | 40.0 | 0.239 |
| MELP | capc1 | 15 | 110.5 | ~ | 56508158.6 | opt | 75.6 | 112.6 | 46.0 | 37.8 | 0.233 |
| MELP | capc1 | 16 | 107.1 | ~ | 52915440.9 | opt | 40.5 | 109.8 | 43.7 | 35.6 | 0.226 |
| CPMP | capc1 | 12 | ~ | ~ | 6258882.1 | opt | 731.8 | 122.9 | 54.1 | 44.7 | 0.251 |
| CPMP | capc1 | 13 | ~ | ~ | 6003669.9 | opt | 610.7 | 117.9 | 53.4 | 44.6 | 0.259 |
| CPMP | capc1 | 14 | ~ | ~ | 5801256.9 | opt | 459.0 | 113.9 | 52.7 | 43.9 | 0.265 |
| CPMP | capc1 | 15 | ~ | ~ | 5627996.4 | opt | 682.7 | 110.5 | 51.8 | 43.0 | 0.268 |
| CPMP | capc1 | 16 | ~ | ~ | 5455463.4 | opt | 527.8 | 107.1 | 49.8 | 41.3 | 0.265 |
| CMDELP | capc1 | 12 | 122.9 | 0.084 | 12010424.8 | opt | 853.1 | 123.3 | 52.6 | 43.2 | 0.243 |
| CMDELP | capc1 | 13 | 117.9 | 0.083 | 11316441.5 | opt | 695.8 | 119.6 | 49.8 | 40.8 | 0.238 |
| CMDELP | capc1 | 14 | 113.9 | 0.082 | 10773649.5 | opt | 557.7 | 115.4 | 48.0 | 39.4 | 0.237 |
| CMDELP | capc1 | 15 | 110.5 | 0.082 | 10357256.7 | opt | 720.0 | 112.3 | 46.0 | 37.2 | 0.233 |
| CMDELP | capc1 | 16 | 107.1 | 0.086 | 10098363.2 | opt | 677.5 | 108.7 | 44.8 | 36.6 | 0.235 |
| MECLP | capc1 | 12 | 122.9 | ~ | 68115396.8 | opt | 1173.0 | 123.5 | 52.4 | 43.0 | 0.243 |
| MECLP | capc1 | 13 | 117.9 | ~ | 63727381.1 | opt | 1121.3 | 119.6 | 49.8 | 40.8 | 0.238 |
| MECLP | capc1 | 14 | 113.9 | ~ | 58975212.1 | opt | 574.8 | 115.5 | 48.4 | 40.0 | 0.239 |
| MECLP | capc1 | 15 | 110.5 | ~ | 56508158.6 | opt | 663.3 | 112.6 | 46.0 | 37.8 | 0.233 |
| MECLP | capc1 | 16 | 107.1 | ~ | 52915440.9 | opt | 510.7 | 109.8 | 43.7 | 35.6 | 0.226 |

### Table S4: Solutions from the instance i300\_1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i300\_1 | 10 | ~ | ~ | 6596.6 | opt | 8.7 | 1.152 | 0.559 | 0.449 | 0.273 |
| PMP | i300\_1 | 20 | ~ | ~ | 4413.7 | opt | 9.7 | 0.771 | 0.368 | 0.302 | 0.271 |
| PMP | i300\_1 | 30 | ~ | ~ | 3525.1 | opt | 7.5 | 0.616 | 0.319 | 0.254 | 0.291 |
| PMP | i300\_1 | 40 | ~ | ~ | 2983.0 | opt | 9.7 | 0.521 | 0.254 | 0.209 | 0.277 |
| PMP | i300\_1 | 50 | ~ | ~ | 2643.0 | opt | 6.7 | 0.462 | 0.228 | 0.190 | 0.280 |
| MDELP | i300\_1 | 10 | 1.15 | 7.3 | 11599.8 | opt | 19.5 | 1.182 | 0.469 | 0.388 | 0.225 |
| MDELP | i300\_1 | 20 | 0.77 | 11.3 | 7885.8 | opt | 12.0 | 0.797 | 0.304 | 0.247 | 0.216 |
| MDELP | i300\_1 | 30 | 0.61 | 12.1 | 6069.8 | opt | 8.9 | 0.629 | 0.254 | 0.206 | 0.230 |
| MDELP | i300\_1 | 40 | 0.52 | 16.1 | 5460.3 | opt | 14.1 | 0.542 | 0.213 | 0.173 | 0.223 |
| MDELP | i300\_1 | 50 | 0.46 | 17.7 | 4701.0 | opt | 7.0 | 0.474 | 0.193 | 0.160 | 0.231 |
| MELP | i300\_1 | 10 | 1.15 | ~ | 661.7 | opt | 38.1 | 1.182 | 0.469 | 0.388 | 0.225 |
| MELP | i300\_1 | 20 | 0.77 | ~ | 290.0 | opt | 14.8 | 0.805 | 0.292 | 0.234 | 0.205 |
| MELP | i300\_1 | 30 | 0.61 | ~ | 199.7 | opt | 30.3 | 0.657 | 0.235 | 0.187 | 0.201 |
| MELP | i300\_1 | 40 | 0.52 | ~ | 144.2 | opt | 14.1 | 0.552 | 0.203 | 0.164 | 0.209 |
| MELP | i300\_1 | 50 | 0.46 | ~ | 111.6 | opt | 20.7 | 0.479 | 0.189 | 0.156 | 0.224 |
| CPMP | i300\_1 | 36 | ~ | ~ | 3909.7 | 0.94% | 7201.0 | 0.683 | 0.340 | 0.272 | 0.281 |
| CPMP | i300\_1 | 38 | ~ | ~ | 3624.4 | opt | 5467.6 | 0.633 | 0.319 | 0.256 | 0.284 |
| CPMP | i300\_1 | 40 | ~ | ~ | 3416.2 | opt | 150.8 | 0.597 | 0.308 | 0.247 | 0.291 |
| CPMP | i300\_1 | 42 | ~ | ~ | 3278.7 | opt | 53.6 | 0.573 | 0.298 | 0.241 | 0.294 |
| CPMP | i300\_1 | 44 | ~ | ~ | 3166.9 | opt | 45.9 | 0.553 | 0.285 | 0.232 | 0.292 |
| CMDELP | i300\_1 | 36 | 0.68 | 11.8 | 7565.6 | 2.27% | 7201.0 | 0.702 | 0.299 | 0.234 | 0.239 |
| CMDELP | i300\_1 | 38 | 0.63 | 12.4 | 6702.5 | opt | 439.4 | 0.651 | 0.272 | 0.218 | 0.237 |
| CMDELP | i300\_1 | 40 | 0.59 | 12.5 | 6383.6 | opt | 208.3 | 0.615 | 0.269 | 0.222 | 0.249 |
| CMDELP | i300\_1 | 42 | 0.57 | 12.9 | 6048.6 | opt | 249.0 | 0.593 | 0.256 | 0.213 | 0.247 |
| CMDELP | i300\_1 | 44 | 0.55 | 13.6 | 5881.5 | opt | 107.8 | 0.566 | 0.251 | 0.207 | 0.253 |
| CMELP | i300\_1 | 36 | 0.68 | ~ | 299.0 | 5.54% | 7211.4 | 0.706 | 0.297 | 0.238 | 0.239 |
| CMELP | i300\_1 | 38 | 0.63 | ~ | 238.7 | opt | 431.1 | 0.655 | 0.270 | 0.217 | 0.234 |
| CMELP | i300\_1 | 40 | 0.59 | ~ | 229.0 | opt | 428.6 | 0.616 | 0.269 | 0.221 | 0.249 |
| CMELP | i300\_1 | 42 | 0.57 | ~ | 202.5 | opt | 414.6 | 0.608 | 0.245 | 0.202 | 0.230 |
| CMELP | i300\_1 | 44 | 0.55 | ~ | 187.6 | opt | 146.4 | 0.587 | 0.234 | 0.191 | 0.226 |

### Table S5: Solutions from the instance i300\_6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i300\_6 | 10 | ~ | ~ | 6684.2 | opt | 8.5 | 1.107 | 0.497 | 0.407 | 0.256 |
| PMP | i300\_6 | 20 | ~ | ~ | 4490.5 | opt | 7.7 | 0.744 | 0.353 | 0.296 | 0.270 |
| PMP | i300\_6 | 30 | ~ | ~ | 3493.0 | opt | 6.8 | 0.579 | 0.292 | 0.240 | 0.286 |
| PMP | i300\_6 | 40 | ~ | ~ | 2975.2 | opt | 7.1 | 0.493 | 0.261 | 0.213 | 0.297 |
| PMP | i300\_6 | 50 | ~ | ~ | 2615.3 | opt | 6.7 | 0.433 | 0.221 | 0.178 | 0.285 |
| MDELP | i300\_6 | 10 | 1.10 | 8.9 | 12556.4 | opt | 10.2 | 1.132 | 0.435 | 0.353 | 0.219 |
| MDELP | i300\_6 | 20 | 0.74 | 11.9 | 8665.6 | opt | 8.0 | 0.761 | 0.325 | 0.275 | 0.245 |
| MDELP | i300\_6 | 30 | 0.57 | 13.6 | 6651.6 | opt | 8.6 | 0.601 | 0.243 | 0.198 | 0.231 |
| MDELP | i300\_6 | 40 | 0.49 | 14.5 | 5533.6 | opt | 7.9 | 0.522 | 0.210 | 0.173 | 0.228 |
| MDELP | i300\_6 | 50 | 0.43 | 17.6 | 5015.4 | opt | 9.5 | 0.447 | 0.189 | 0.156 | 0.241 |
| MELP | i300\_6 | 10 | 1.1 | ~ | 642.7 | opt | 36.1 | 1.134 | 0.435 | 0.352 | 0.218 |
| MELP | i300\_6 | 20 | 0.74 | ~ | 335.6 | opt | 30.2 | 0.778 | 0.310 | 0.259 | 0.228 |
| MELP | i300\_6 | 30 | 0.57 | ~ | 221.4 | opt | 11.0 | 0.613 | 0.233 | 0.186 | 0.215 |
| MELP | i300\_6 | 40 | 0.49 | ~ | 164.1 | opt | 26.4 | 0.522 | 0.210 | 0.173 | 0.228 |
| MELP | i300\_6 | 50 | 0.43 | ~ | 127.8 | opt | 10.7 | 0.462 | 0.178 | 0.147 | 0.219 |
| CPMP | i300\_6 | 22 | ~ | ~ | 4491.6 | opt | 47.3 | 0.744 | 0.354 | 0.291 | 0.270 |
| CPMP | i300\_6 | 24 | ~ | ~ | 4232.6 | opt | 30.4 | 0.701 | 0.341 | 0.279 | 0.275 |
| CPMP | i300\_6 | 26 | ~ | ~ | 4002.5 | opt | 52.5 | 0.663 | 0.325 | 0.267 | 0.279 |
| CPMP | i300\_6 | 28 | ~ | ~ | 3821.3 | opt | 77.3 | 0.633 | 0.324 | 0.263 | 0.289 |
| CPMP | i300\_6 | 30 | ~ | ~ | 3671.5 | opt | 41.6 | 0.608 | 0.307 | 0.250 | 0.285 |
| CMDELP | i300\_6 | 22 | 0.74 | 11.8 | 8992.6 | opt | 104.1 | 0.763 | 0.329 | 0.275 | 0.247 |
| CMDELP | i300\_6 | 24 | 0.70 | 12.0 | 8357.9 | opt | 137.0 | 0.717 | 0.313 | 0.259 | 0.249 |
| CMDELP | i300\_6 | 26 | 0.66 | 12.5 | 7845.3 | opt | 75.8 | 0.675 | 0.300 | 0.244 | 0.253 |
| CMDELP | i300\_6 | 28 | 0.63 | 12.0 | 7138.4 | opt | 53.9 | 0.644 | 0.284 | 0.231 | 0.251 |
| CMDELP | i300\_6 | 30 | 0.60 | 12.9 | 6858.4 | opt | 49.8 | 0.618 | 0.267 | 0.219 | 0.247 |
| CMELP | i300\_6 | 22 | 0.74 | ~ | 369.2 | opt | 160.6 | 0.773 | 0.320 | 0.267 | 0.237 |
| CMELP | i300\_6 | 24 | 0.70 | ~ | 333.7 | opt | 152.9 | 0.724 | 0.307 | 0.253 | 0.242 |
| CMELP | i300\_6 | 26 | 0.66 | ~ | 299.3 | opt | 146.2 | 0.686 | 0.292 | 0.235 | 0.241 |
| CMELP | i300\_6 | 28 | 0.63 | ~ | 266.5 | opt | 118.4 | 0.668 | 0.268 | 0.215 | 0.227 |
| CMELP | i300\_6 | 30 | 0.60 | ~ | 239.7 | opt | 72.5 | 0.629 | 0.258 | 0.207 | 0.233 |

### Table S6: Solutions from the instance i3001500\_1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i3001500\_1 | 10 | ~ | ~ | 347899.8 | opt | 76.2 | 12.163 | 5.224 | 4.206 | 0.243 |
| PMP | i3001500\_1 | 20 | ~ | ~ | 238254.3 | opt | 52.1 | 8.330 | 3.513 | 2.900 | 0.241 |
| PMP | i3001500\_1 | 30 | ~ | ~ | 194664.3 | opt | 76.4 | 6.806 | 2.860 | 2.307 | 0.239 |
| PMP | i3001500\_1 | 40 | ~ | ~ | 169842.5 | opt | 108.4 | 5.938 | 2.541 | 2.067 | 0.243 |
| PMP | i3001500\_1 | 50 | ~ | ~ | 151867.8 | opt | 73.5 | 5.310 | 2.328 | 1.901 | 0.250 |
| MDELP | i3001500\_1 | 10 | 12.16 | 0.8 | 596242.9 | opt | 270.8 | 12.416 | 4.570 | 3.744 | 0.210 |
| MDELP | i3001500\_1 | 20 | 8.32 | 1.3 | 451113.5 | opt | 1447.5 | 8.482 | 3.333 | 2.742 | 0.224 |
| MDELP | i3001500\_1 | 30 | 6.80 | 1.6 | 359226.6 | opt | 422.6 | 6.864 | 2.658 | 2.165 | 0.220 |
| MDELP | i3001500\_1 | 40 | 5.93 | 1.8 | 308053.3 | opt | 221.4 | 6.001 | 2.313 | 1.904 | 0.220 |
| MDELP | i3001500\_1 | 50 | 5.30 | 1.9 | 276205.4 | opt | 332.0 | 5.414 | 2.067 | 1.687 | 0.217 |
| MELP | i3001500\_1 | 10 | 12.16 | ~ | 301407.0 | opt | 208.6 | 12.416 | 4.570 | 3.744 | 0.210 |
| MELP | i3001500\_1 | 20 | 8.32 | ~ | 160020.6 | opt | 1238.1 | 8.516 | 3.292 | 2.699 | 0.220 |
| MELP | i3001500\_1 | 30 | 6.8 | ~ | 100921.3 | opt | 506.8 | 6.934 | 2.645 | 2.145 | 0.217 |
| MELP | i3001500\_1 | 40 | 5.93 | ~ | 75610.4 | opt | 475.9 | 6.018 | 2.299 | 1.882 | 0.218 |
| MELP | i3001500\_1 | 50 | 5.3 | ~ | 63503.3 | opt | 195.5 | 5.468 | 2.024 | 1.652 | 0.211 |
| CPMP | i3001500\_1 | 100 | ~ | ~ | 111856.8 | opt | 228.0 | 3.911 | 1.799 | 1.463 | 0.261 |
| CPMP | i3001500\_1 | 105 | ~ | ~ | 109576.7 | opt | 176.5 | 3.831 | 1.776 | 1.445 | 0.263 |
| CPMP | i3001500\_1 | 110 | ~ | ~ | 107492.9 | opt | 133.2 | 3.758 | 1.757 | 1.430 | 0.265 |
| CPMP | i3001500\_1 | 115 | ~ | ~ | 105550.9 | opt | 120.8 | 3.690 | 1.729 | 1.400 | 0.265 |
| CPMP | i3001500\_1 | 120 | ~ | ~ | 103849.7 | opt | 95.3 | 3.631 | 1.693 | 1.367 | 0.264 |
| CMDELP | i3001500\_1 | 100 | 3.91 | 2.4 | 217689.3 | opt | 176.7 | 3.989 | 1.670 | 1.358 | 0.238 |
| CMDELP | i3001500\_1 | 105 | 3.83 | 2.4 | 212084.5 | opt | 152.3 | 3.891 | 1.654 | 1.344 | 0.241 |
| CMDELP | i3001500\_1 | 110 | 3.75 | 2.4 | 207429.7 | opt | 103.4 | 3.807 | 1.633 | 1.318 | 0.243 |
| CMDELP | i3001500\_1 | 115 | 3.69 | 2.4 | 201307.3 | opt | 90.2 | 3.736 | 1.606 | 1.296 | 0.243 |
| CMDELP | i3001500\_1 | 120 | 3.63 | 2.5 | 201697.4 | opt | 76.8 | 3.690 | 1.575 | 1.269 | 0.241 |
| CMELP | i3001500\_1 | 100 | 3.91 | ~ | 43102.5 | opt | 236.1 | 4.005 | 1.656 | 1.346 | 0.235 |
| CMELP | i3001500\_1 | 105 | 3.83 | ~ | 41907.6 | opt | 130.6 | 3.910 | 1.637 | 1.327 | 0.237 |
| CMELP | i3001500\_1 | 110 | 3.75 | ~ | 40896.4 | opt | 205.8 | 3.857 | 1.597 | 1.285 | 0.234 |
| CMELP | i3001500\_1 | 115 | 3.69 | ~ | 39141.8 | opt | 118.7 | 3.774 | 1.574 | 1.268 | 0.236 |
| CMELP | i3001500\_1 | 120 | 3.63 | ~ | 38403.6 | opt | 105.8 | 3.721 | 1.551 | 1.242 | 0.235 |

### Table S7: Solutions from the instance i3001500\_6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i3001500\_6 | 10 | ~ | ~ | 358628.0 | opt | 78.0 | 12.134 | 4.823 | 3.945 | 0.227 |
| PMP | i3001500\_6 | 20 | ~ | ~ | 248351.0 | opt | 78.8 | 8.403 | 3.571 | 2.946 | 0.243 |
| PMP | i3001500\_6 | 30 | ~ | ~ | 201462.3 | opt | 60.4 | 6.817 | 3.029 | 2.474 | 0.253 |
| PMP | i3001500\_6 | 40 | ~ | ~ | 175256.3 | opt | 60.6 | 5.930 | 2.540 | 2.093 | 0.245 |
| PMP | i3001500\_6 | 50 | ~ | ~ | 157304.0 | opt | 69.3 | 5.322 | 2.346 | 1.924 | 0.251 |
| MDELP | i3001500\_6 | 10 | 12.13 | 1.0 | 670089.4 | opt | 817.1 | 12.156 | 4.720 | 3.883 | 0.222 |
| MDELP | i3001500\_6 | 20 | 8.40 | 1.3 | 471953.7 | opt | 837.3 | 8.555 | 3.373 | 2.786 | 0.225 |
| MDELP | i3001500\_6 | 30 | 6.81 | 1.4 | 369852.1 | opt | 591.4 | 6.916 | 2.816 | 2.333 | 0.233 |
| MDELP | i3001500\_6 | 40 | 5.92 | 1.8 | 330593.1 | opt | 561.8 | 6.014 | 2.374 | 1.953 | 0.225 |
| MDELP | i3001500\_6 | 50 | 5.32 | 1.9 | 293936.5 | opt | 326.0 | 5.425 | 2.142 | 1.752 | 0.225 |
| MELP | i3001500\_6 | 10 | 12.13 | ~ | 308755.2 | opt | 717.3 | 12.233 | 4.608 | 3.786 | 0.215 |
| MELP | i3001500\_6 | 20 | 8.4 | ~ | 168537.6 | opt | 705.9 | 8.555 | 3.373 | 2.786 | 0.225 |
| MELP | i3001500\_6 | 30 | 6.81 | ~ | 116556.2 | opt | 409.3 | 7.022 | 2.735 | 2.242 | 0.222 |
| MELP | i3001500\_6 | 40 | 5.92 | ~ | 84911.7 | opt | 464.5 | 6.014 | 2.374 | 1.953 | 0.225 |
| MELP | i3001500\_6 | 50 | 5.32 | ~ | 70010.4 | opt | 403.3 | 5.456 | 2.105 | 1.716 | 0.220 |
| CPMP | i3001500\_6 | 50 | ~ | ~ | 159125.0 | opt | 3934.4 | 5.384 | 2.440 | 1.992 | 0.258 |
| CPMP | i3001500\_6 | 53 | ~ | ~ | 154635.2 | opt | 2110.9 | 5.232 | 2.330 | 1.907 | 0.254 |
| CPMP | i3001500\_6 | 56 | ~ | ~ | 150513.7 | opt | 3220.1 | 5.093 | 2.279 | 1.865 | 0.255 |
| CPMP | i3001500\_6 | 59 | ~ | ~ | 146532.5 | opt | 1893.0 | 4.958 | 2.245 | 1.827 | 0.257 |
| CPMP | i3001500\_6 | 62 | ~ | ~ | 143012.1 | opt | 2535.0 | 4.839 | 2.192 | 1.787 | 0.258 |
| CMDELP | i3001500\_6 | 50 | 5.38 | 1.8 | 299391.7 | opt | 1611.4 | 5.512 | 2.208 | 1.358 | 0.229 |
| CMDELP | i3001500\_6 | 53 | 5.23 | 1.9 | 290629.7 | opt | 1903.7 | 5.330 | 2.178 | 1.347 | 0.234 |
| CMDELP | i3001500\_6 | 56 | 5.09 | 2.0 | 291828.3 | opt | 3565.9 | 5.200 | 2.117 | 1.343 | 0.233 |
| CMDELP | i3001500\_6 | 59 | 4.96 | 2.0 | 281882.6 | opt | 2234.3 | 5.043 | 2.065 | 1.342 | 0.234 |
| CMDELP | i3001500\_6 | 62 | 4.84 | 2.0 | 270590.3 | opt | 2777.0 | 4.910 | 2.018 | 1.332 | 0.235 |
| CMELP | i3001500\_6 | 50 | 5.38 | ~ | 75780.8 | opt | 2726.3 | 5.563 | 2.166 | 1.781 | 0.222 |
| CMELP | i3001500\_6 | 53 | 5.23 | ~ | 72654.4 | opt | 4729.5 | 5.383 | 2.148 | 1.771 | 0.228 |
| CMELP | i3001500\_6 | 56 | 5.09 | ~ | 69072.6 | opt | 2976.3 | 5.204 | 2.114 | 1.745 | 0.232 |
| CMELP | i3001500\_6 | 59 | 4.96 | ~ | 65354.4 | opt | 1241.6 | 5.047 | 2.063 | 1.694 | 0.233 |
| CMELP | i3001500\_6 | 62 | 4.84 | ~ | 62512.9 | opt | 1066.8 | 4.931 | 2.006 | 1.637 | 0.232 |

### Table S8: Solutions from the instance i500\_1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i500\_1 | 10 | ~ | ~ | 11029.3 | opt | 25.8 | 1.138 | 0.513 | 0.416 | 0.257 |
| PMP | i500\_1 | 20 | ~ | ~ | 7614.5 | opt | 27.8 | 0.785 | 0.394 | 0.324 | 0.287 |
| PMP | i500\_1 | 30 | ~ | ~ | 5937.0 | opt | 21.1 | 0.612 | 0.312 | 0.256 | 0.288 |
| PMP | i500\_1 | 40 | ~ | ~ | 5029.1 | opt | 21.2 | 0.519 | 0.273 | 0.222 | 0.297 |
| PMP | i500\_1 | 50 | ~ | ~ | 4393.8 | opt | 20.3 | 0.453 | 0.244 | 0.195 | 0.301 |
| MDELP | i500\_1 | 10 | 1.13 | 8.6 | 21102.2 | opt | 37.1 | 1.149 | 0.488 | 0.406 | 0.243 |
| MDELP | i500\_1 | 20 | 0.78 | 10.1 | 13562.7 | opt | 64.2 | 0.815 | 0.320 | 0.260 | 0.223 |
| MDELP | i500\_1 | 30 | 0.61 | 12.6 | 10957.2 | opt | 39.4 | 0.633 | 0.269 | 0.225 | 0.243 |
| MDELP | i500\_1 | 40 | 0.51 | 13.8 | 9397.3 | opt | 38.1 | 0.542 | 0.221 | 0.183 | 0.233 |
| MDELP | i500\_1 | 50 | 0.45 | 15.2 | 8013.6 | opt | 25.5 | 0.469 | 0.198 | 0.161 | 0.239 |
| MELP | i500\_1 | 10 | 1.13 | ~ | 1158.0 | opt | 67.0 | 1.149 | 0.488 | 0.406 | 0.243 |
| MELP | i500\_1 | 20 | 0.78 | ~ | 558.8 | opt | 66.9 | 0.823 | 0.317 | 0.260 | 0.218 |
| MELP | i500\_1 | 30 | 0.61 | ~ | 374.1 | opt | 45.7 | 0.650 | 0.250 | 0.206 | 0.219 |
| MELP | i500\_1 | 40 | 0.51 | ~ | 299.6 | opt | 61.7 | 0.543 | 0.221 | 0.182 | 0.232 |
| MELP | i500\_1 | 50 | 0.45 | ~ | 226.6 | opt | 35.8 | 0.476 | 0.195 | 0.158 | 0.232 |
| CPMP | i500\_1 | 70 | ~ | ~ | 4357.7 | 1.04% | 7200.9 | 0.449 | 0.247 | 0.200 | 0.305 |
| CPMP | i500\_1 | 73 | ~ | ~ | 4190.1 | 0.40% | 7200.8 | 0.432 | 0.238 | 0.189 | 0.305 |
| CPMP | i500\_1 | 76 | ~ | ~ | 4047.6 | opt | 5772.4 | 0.417 | 0.224 | 0.178 | 0.296 |
| CPMP | i500\_1 | 79 | ~ | ~ | 3921.4 | opt | 1415.7 | 0.404 | 0.222 | 0.178 | 0.303 |
| CPMP | i500\_1 | 82 | ~ | ~ | 3811.1 | opt | 426.9 | 0.393 | 0.217 | 0.175 | 0.306 |
| CMDELP | i500\_1 | 70 | 0.44 | 14.7 | 8496.7 | 5.83% | 7201.9 | 0.471 | 0.204 | 0.169 | 0.246 |
| CMDELP | i500\_1 | 73 | 0.43 | 15.2 | 7854.2 | 3.25% | 7201.1 | 0.452 | 0.196 | 0.162 | 0.247 |
| CMDELP | i500\_1 | 76 | 0.41 | 16.5 | 7863.4 | 2.37% | 7201.3 | 0.434 | 0.189 | 0.156 | 0.247 |
| CMDELP | i500\_1 | 79 | 0.40 | 16.4 | 7412.3 | 1.45% | 7201.2 | 0.423 | 0.182 | 0.150 | 0.245 |
| CMDELP | i500\_1 | 82 | 0.39 | 16.6 | 7147.2 | 0.70% | 7200.7 | 0.412 | 0.177 | 0.145 | 0.244 |
| CMELP | i500\_1 | 70 | 0.44 | ~ | 264.7 | 11.01% | 7219.7 | 0.476 | 0.203 | 0.166 | 0.242 |
| CMELP | i500\_1 | 73 | 0.43 | ~ | 224.2 | 5.33% | 7225.8 | 0.456 | 0.191 | 0.159 | 0.238 |
| CMELP | i500\_1 | 76 | 0.41 | ~ | 217.4 | 3.02% | 7223.5 | 0.440 | 0.185 | 0.152 | 0.240 |
| CMELP | i500\_1 | 79 | 0.40 | ~ | 199.6 | 2.20% | 7222.1 | 0.429 | 0.178 | 0.146 | 0.236 |
| CMELP | i500\_1 | 82 | 0.39 | ~ | 188.1 | 1.52% | 7220.2 | 0.417 | 0.173 | 0.143 | 0.237 |

### Table S9: Solutions from the instance i500\_6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i500\_6 | 10 | ~ | ~ | 11936.5 | opt | 45.5 | 1.166 | 0.521 | 0.442 | 0.257 |
| PMP | i500\_6 | 20 | ~ | ~ | 8189.5 | opt | 39.4 | 0.800 | 0.386 | 0.311 | 0.273 |
| PMP | i500\_6 | 30 | ~ | ~ | 6445.8 | opt | 32.6 | 0.630 | 0.304 | 0.249 | 0.274 |
| PMP | i500\_6 | 40 | ~ | ~ | 5421.8 | opt | 21.0 | 0.530 | 0.270 | 0.223 | 0.290 |
| PMP | i500\_6 | 50 | ~ | ~ | 4755.3 | opt | 21.1 | 0.465 | 0.234 | 0.189 | 0.285 |
| MDELP | i500\_6 | 10 | 1.16 | 8.5 | 21242.3 | opt | 34.6 | 1.203 | 0.423 | 0.346 | 0.201 |
| MDELP | i500\_6 | 20 | 0.80 | 10.7 | 14065.2 | opt | 60.8 | 0.822 | 0.312 | 0.256 | 0.216 |
| MDELP | i500\_6 | 30 | 0.62 | 13.6 | 11976.2 | opt | 192.7 | 0.641 | 0.265 | 0.219 | 0.236 |
| MDELP | i500\_6 | 40 | 0.52 | 14.4 | 10061.7 | opt | 55.9 | 0.553 | 0.219 | 0.180 | 0.225 |
| MDELP | i500\_6 | 50 | 0.46 | 16.9 | 9051.5 | opt | 58.5 | 0.480 | 0.204 | 0.167 | 0.242 |
| MELP | i500\_6 | 10 | 1.16 | ~ | 1051.0 | opt | 51.7 | 1.203 | 0.423 | 0.346 | 0.201 |
| MELP | i500\_6 | 20 | 0.8 | ~ | 527.8 | opt | 45.0 | 0.822 | 0.312 | 0.256 | 0.216 |
| MELP | i500\_6 | 30 | 0.62 | ~ | 396.2 | opt | 45.9 | 0.645 | 0.263 | 0.216 | 0.233 |
| MELP | i500\_6 | 40 | 0.52 | ~ | 304.4 | opt | 67.8 | 0.555 | 0.217 | 0.177 | 0.222 |
| MELP | i500\_6 | 50 | 0.46 | ~ | 237.6 | opt | 43.0 | 0.493 | 0.189 | 0.151 | 0.216 |
| CPMP | i500\_6 | 36 | ~ | ~ | 6055.5 | opt | 697.0 | 0.592 | 0.307 | 0.256 | 0.296 |
| CPMP | i500\_6 | 38 | ~ | ~ | 5827.5 | opt | 441.0 | 0.569 | 0.298 | 0.249 | 0.298 |
| CPMP | i500\_6 | 40 | ~ | ~ | 5625.9 | opt | 217.3 | 0.550 | 0.291 | 0.242 | 0.301 |
| CPMP | i500\_6 | 42 | ~ | ~ | 5448.8 | opt | 117.0 | 0.532 | 0.281 | 0.234 | 0.300 |
| CPMP | i500\_6 | 44 | ~ | ~ | 5285.1 | opt | 192.0 | 0.516 | 0.270 | 0.222 | 0.297 |
| CMDELP | i500\_6 | 36 | 0.59 | 12.5 | 11050.8 | opt | 816.9 | 0.607 | 0.262 | 0.217 | 0.247 |
| CMDELP | i500\_6 | 38 | 0.56 | 12.8 | 10901.0 | opt | 911.1 | 0.589 | 0.250 | 0.206 | 0.242 |
| CMDELP | i500\_6 | 40 | 0.54 | 12.9 | 10472.9 | opt | 830.7 | 0.571 | 0.241 | 0.200 | 0.241 |
| CMDELP | i500\_6 | 42 | 0.53 | 13.4 | 9993.8 | opt | 513.4 | 0.556 | 0.231 | 0.190 | 0.236 |
| CMDELP | i500\_6 | 44 | 0.51 | 14.1 | 9902.7 | opt | 260.2 | 0.532 | 0.229 | 0.187 | 0.245 |
| CMELP | i500\_6 | 36 | 0.59 | ~ | 381.7 | opt | 984.9 | 0.614 | 0.254 | 0.210 | 0.237 |
| CMELP | i500\_6 | 38 | 0.56 | ~ | 380.6 | opt | 1601.3 | 0.589 | 0.250 | 0.206 | 0.242 |
| CMELP | i500\_6 | 40 | 0.54 | ~ | 358.7 | opt | 680.7 | 0.571 | 0.241 | 0.200 | 0.241 |
| CMELP | i500\_6 | 42 | 0.53 | ~ | 320.6 | opt | 632.3 | 0.557 | 0.231 | 0.190 | 0.237 |
| CMELP | i500\_6 | 44 | 0.51 | ~ | 311.1 | opt | 254.7 | 0.542 | 0.223 | 0.183 | 0.234 |

### Table S10: Solutions from the instance i700\_1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i700\_1 | 10 | ~ | ~ | 16017.3 | opt | 130.3 | 1.184 | 0.515 | 0.417 | 0.247 |
| PMP | i700\_1 | 20 | ~ | ~ | 10778.7 | opt | 56.2 | 0.797 | 0.368 | 0.305 | 0.265 |
| PMP | i700\_1 | 30 | ~ | ~ | 8597.8 | opt | 62.7 | 0.636 | 0.316 | 0.260 | 0.283 |
| PMP | i700\_1 | 40 | ~ | ~ | 7295.3 | opt | 43.2 | 0.539 | 0.274 | 0.222 | 0.288 |
| PMP | i700\_1 | 50 | ~ | ~ | 6423.5 | opt | 55.3 | 0.475 | 0.238 | 0.193 | 0.283 |
| MDELP | i700\_1 | 10 | 1.18 | 8.9 | 29148.3 | opt | 385.2 | 1.215 | 0.447 | 0.373 | 0.210 |
| MDELP | i700\_1 | 20 | 0.79 | 11.7 | 19556.2 | opt | 507.8 | 0.823 | 0.308 | 0.248 | 0.212 |
| MDELP | i700\_1 | 30 | 0.63 | 12.7 | 15342.1 | opt | 255.7 | 0.657 | 0.256 | 0.209 | 0.221 |
| MDELP | i700\_1 | 40 | 0.53 | 14.3 | 13184.0 | opt | 217.8 | 0.554 | 0.225 | 0.185 | 0.232 |
| MDELP | i700\_1 | 50 | 0.47 | 16.7 | 11731.7 | opt | 144.8 | 0.492 | 0.197 | 0.161 | 0.228 |
| MELP | i700\_1 | 10 | 1.18 | ~ | 1428.9 | opt | 91.9 | 1.215 | 0.447 | 0.373 | 0.210 |
| MELP | i700\_1 | 20 | 0.79 | ~ | 719.1 | opt | 130.3 | 0.829 | 0.302 | 0.244 | 0.207 |
| MELP | i700\_1 | 30 | 0.63 | ~ | 500.6 | opt | 298.2 | 0.671 | 0.246 | 0.198 | 0.207 |
| MELP | i700\_1 | 40 | 0.53 | ~ | 389.4 | opt | 166.6 | 0.564 | 0.217 | 0.178 | 0.219 |
| MELP | i700\_1 | 50 | 0.47 | ~ | 303.2 | opt | 202.5 | 0.494 | 0.195 | 0.160 | 0.225 |
| CPMP | i700\_1 | 95 | ~ | ~ | 5266.9 | 1.15% | 7201.7 | 0.389 | 0.209 | 0.173 | 0.303 |
| CPMP | i700\_1 | 100 | ~ | ~ | 5038.2 | 0.45% | 7201.2 | 0.373 | 0.196 | 0.162 | 0.297 |
| CPMP | i700\_1 | 105 | ~ | ~ | 4850.4 | opt | 1831.3 | 0.359 | 0.186 | 0.156 | 0.296 |
| CPMP | i700\_1 | 110 | ~ | ~ | 4695.5 | opt | 1288.6 | 0.347 | 0.183 | 0.154 | 0.300 |
| CPMP | i700\_1 | 115 | ~ | ~ | 4562.0 | opt | 1103.4 | 0.337 | 0.175 | 0.145 | 0.295 |
| CMDELP | i700\_1 | 95 | 0.38 | 17.8 | 10223.1 | 5.51% | 7201.1 | 0.408 | 0.176 | 0.146 | 0.246 |
| CMDELP | i700\_1 | 100 | 0.37 | 19.4 | 9712.8 | 4.16% | 7201.5 | 0.388 | 0.171 | 0.143 | 0.252 |
| CMDELP | i700\_1 | 105 | 0.35 | 20.6 | 9522.6 | 0.49% | 7201.9 | 0.372 | 0.162 | 0.134 | 0.248 |
| CMDELP | i700\_1 | 110 | 0.34 | 20.7 | 9071.1 | 0.59% | 7200.9 | 0.361 | 0.157 | 0.129 | 0.247 |
| CMDELP | i700\_1 | 115 | 0.33 | 21.9 | 8954.1 | 0.76% | 7201.6 | 0.353 | 0.152 | 0.126 | 0.245 |
| CMELP | i700\_1 | 95 | 0.38 | ~ | 260.3 | 9.92% | 7228.4 | 0.409 | 0.174 | 0.144 | 0.243 |
| CMELP | i700\_1 | 100 | 0.37 | ~ | 224.3 | 6.73% | 7237.8 | 0.392 | 0.166 | 0.138 | 0.242 |
| CMELP | i700\_1 | 105 | 0.35 | ~ | 217.5 | 3.07% | 7264.8 | 0.374 | 0.159 | 0.132 | 0.243 |
| CMELP | i700\_1 | 110 | 0.34 | ~ | 200.3 | 1.70% | 7234.3 | 0.366 | 0.152 | 0.125 | 0.236 |
| CMELP | i700\_1 | 115 | 0.33 | ~ | 189.7 | 2.07% | 7242.9 | 0.358 | 0.147 | 0.121 | 0.233 |

### Table S11: Solutions from the instance i700\_6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i700\_6 | 10 | ~ | ~ | 15872.9 | opt | 131.0 | 1.169 | 0.484 | 0.400 | 0.237 |
| PMP | i700\_6 | 20 | ~ | ~ | 10977.6 | opt | 89.6 | 0.808 | 0.380 | 0.314 | 0.268 |
| PMP | i700\_6 | 30 | ~ | ~ | 8669.8 | opt | 46.9 | 0.639 | 0.295 | 0.243 | 0.264 |
| PMP | i700\_6 | 40 | ~ | ~ | 7393.7 | opt | 46.1 | 0.545 | 0.269 | 0.223 | 0.282 |
| PMP | i700\_6 | 50 | ~ | ~ | 6497.1 | opt | 49.2 | 0.478 | 0.246 | 0.199 | 0.290 |
| MDELP | i700\_6 | 10 | 1.16 | 9.9 | 29997.4 | opt | 132.2 | 1.178 | 0.457 | 0.379 | 0.221 |
| MDELP | i700\_6 | 20 | 0.80 | 11.2 | 19642.2 | opt | 248.9 | 0.829 | 0.323 | 0.263 | 0.221 |
| MDELP | i700\_6 | 30 | 0.63 | 14.6 | 16132.7 | opt | 74.4 | 0.656 | 0.259 | 0.212 | 0.225 |
| MDELP | i700\_6 | 40 | 0.54 | 15.0 | 13226.7 | opt | 162.3 | 0.562 | 0.222 | 0.182 | 0.224 |
| MDELP | i700\_6 | 50 | 0.47 | 15.8 | 11674.7 | opt | 76.6 | 0.495 | 0.196 | 0.158 | 0.225 |
| MELP | i700\_6 | 10 | 1.16 | ~ | 1414.0 | opt | 122.6 | 1.178 | 0.457 | 0.379 | 0.221 |
| MELP | i700\_6 | 20 | 0.80 | ~ | 745.4 | opt | 651.9 | 0.833 | 0.321 | 0.261 | 0.219 |
| MELP | i700\_6 | 30 | 0.63 | ~ | 494.7 | opt | 195.8 | 0.657 | 0.258 | 0.211 | 0.223 |
| MELP | i700\_6 | 40 | 0.54 | ~ | 369.8 | opt | 184.4 | 0.568 | 0.217 | 0.176 | 0.215 |
| MELP | i700\_6 | 50 | 0.47 | ~ | 312.6 | opt | 140.3 | 0.502 | 0.193 | 0.157 | 0.218 |
| CPMP | i700\_6 | 50 | ~ | ~ | 6955.9 | 0.43% | 7201.2 | 0.512 | 0.242 | 0.198 | 0.269 |
| CPMP | i700\_6 | 53 | ~ | ~ | 6676.4 | opt | 5255.0 | 0.492 | 0.234 | 0.191 | 0.271 |
| CPMP | i700\_6 | 56 | ~ | ~ | 6448.1 | opt | 2506.8 | 0.475 | 0.229 | 0.187 | 0.273 |
| CPMP | i700\_6 | 59 | ~ | ~ | 6248.4 | opt | 2539.3 | 0.460 | 0.226 | 0.184 | 0.278 |
| CPMP | i700\_6 | 62 | ~ | ~ | 6076.0 | opt | 1295.5 | 0.447 | 0.223 | 0.181 | 0.282 |
| CMDELP | i700\_6 | 50 | 0.51 | 17.5 | 13447.7 | 0.54% | 7201.0 | 0.531 | 0.215 | 0.176 | 0.231 |
| CMDELP | i700\_6 | 53 | 0.49 | 17.8 | 12910.8 | 0.65% | 7201.1 | 0.506 | 0.210 | 0.172 | 0.237 |
| CMDELP | i700\_6 | 56 | 0.47 | 18.1 | 12312.8 | opt | 2017.4 | 0.488 | 0.201 | 0.164 | 0.234 |
| CMDELP | i700\_6 | 59 | 0.46 | 18.0 | 11560.8 | opt | 1760.9 | 0.478 | 0.192 | 0.158 | 0.229 |
| CMDELP | i700\_6 | 62 | 0.44 | 18.0 | 11412.2 | opt | 3578.1 | 0.462 | 0.188 | 0.155 | 0.232 |
| CMELP | i700\_6 | 50 | 0.51 | ~ | 356.5 | 1.13% | 7271.6 | 0.532 | 0.214 | 0.175 | 0.229 |
| CMELP | i700\_6 | 53 | 0.49 | ~ | 336.2 | 3.19% | 7231.7 | 0.517 | 0.204 | 0.167 | 0.224 |
| CMELP | i700\_6 | 56 | 0.47 | ~ | 313.7 | opt | 3147.8 | 0.491 | 0.198 | 0.163 | 0.230 |
| CMELP | i700\_6 | 59 | 0.46 | ~ | 281.8 | opt | 2973.5 | 0.480 | 0.191 | 0.157 | 0.227 |
| CMELP | i700\_6 | 62 | 0.44 | ~ | 284.0 | 0.94% | 7228.7 | 0.467 | 0.184 | 0.153 | 0.225 |

### Table S12: Solutions from the instance i1000\_1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i1000\_1 | 10 | ~ | ~ | 22574.9 | opt | 759.8 | 1.195 | 0.478 | 0.391 | 0.228 |
| PMP | i1000\_1 | 20 | ~ | ~ | 15449.4 | opt | 237.1 | 0.818 | 0.368 | 0.298 | 0.256 |
| PMP | i1000\_1 | 30 | ~ | ~ | 12237.4 | opt | 161.2 | 0.648 | 0.291 | 0.237 | 0.255 |
| PMP | i1000\_1 | 40 | ~ | ~ | 10462.2 | opt | 214.8 | 0.554 | 0.256 | 0.210 | 0.263 |
| PMP | i1000\_1 | 50 | ~ | ~ | 9212.9 | opt | 262.4 | 0.488 | 0.231 | 0.190 | 0.269 |
| MDELP | i1000\_1 | 10 | 1.19 | 10.4 | 42263.6 | opt | 313.7 | 1.207 | 0.449 | 0.370 | 0.212 |
| MDELP | i1000\_1 | 20 | 0.81 | 12.0 | 28129.4 | opt | 3607.7 | 0.844 | 0.309 | 0.258 | 0.208 |
| MDELP | i1000\_1 | 30 | 0.64 | 15.3 | 23042.7 | opt | 957.6 | 0.671 | 0.248 | 0.203 | 0.210 |
| MDELP | i1000\_1 | 40 | 0.55 | 16.9 | 18671.4 | opt | 688.4 | 0.571 | 0.215 | 0.176 | 0.213 |
| MDELP | i1000\_1 | 50 | 0.48 | 18.3 | 17004.5 | opt | 1958.2 | 0.505 | 0.191 | 0.156 | 0.215 |
| MELP | i1000\_1 | 10 | 1.19 | ~ | 1870.7 | opt | 236.6 | 1.207 | 0.449 | 0.370 | 0.212 |
| MELP | i1000\_1 | 20 | 0.81 | ~ | 1014.4 | opt | 1569.7 | 0.845 | 0.307 | 0.248 | 0.206 |
| MELP | i1000\_1 | 30 | 0.64 | ~ | 677.5 | opt | 1091.1 | 0.671 | 0.248 | 0.203 | 0.210 |
| MELP | i1000\_1 | 40 | 0.55 | ~ | 464.6 | opt | 501.9 | 0.574 | 0.212 | 0.174 | 0.209 |
| MELP | i1000\_1 | 50 | 0.48 | ~ | 407.1 | opt | 1280.4 | 0.508 | 0.189 | 0.153 | 0.211 |
| CPMP | i1000\_1 | 140 | ~ | ~ | 5876.1 | 1.16% | 7204.7 | 0.311 | 0.161 | 0.135 | 0.289 |
| CPMP | i1000\_1 | 145 | ~ | ~ | 5709.3 | 0.94% | 7200.5 | 0.302 | 0.160 | 0.126 | 0.295 |
| CPMP | i1000\_1 | 150 | ~ | ~ | 5557.0 | 0.61% | 7201.7 | 0.294 | 0.157 | 0.122 | 0.297 |
| CPMP | i1000\_1 | 155 | ~ | ~ | 5418.3 | 0.09% | 7203.5 | 0.287 | 0.153 | 0.122 | 0.298 |
| CPMP | i1000\_1 | 160 | ~ | ~ | 5301.6 | opt | 4337.4 | 0.287 | 0.153 | 0.121 | 0.298 |
| CMDELP | i1000\_1 | 140 | 0.31 | 24.1 | 10981.5 | 5.42% | 7203.6 | 0.322 | 0.136 | 0.110 | 0.238 |
| CMDELP | i1000\_1 | 145 | 0.30 | 23.6 | 10414.8 | 3.87% | 7207.2 | 0.313 | 0.132 | 0.104 | 0.237 |
| CMDELP | i1000\_1 | 150 | 0.29 | 23.9 | 10193.7 | 2.13% | 7202.3 | 0.305 | 0.128 | 0.100 | 0.234 |
| CMDELP | i1000\_1 | 155 | 0.28 | 24.4 | 10104.4 | 1.15% | 7201.8 | 0.298 | 0.126 | 0.100 | 0.237 |
| CMDELP | i1000\_1 | 160 | 0.28 | 24.4 | 9537.3 | 1.12% | 7201.5 | 0.292 | 0.123 | 0.098 | 0.236 |
| CMELP | i1000\_1 | 140 | 0.31 | ~ | 198.8 | 10.03% | 7256.9 | 0.328 | 0.131 | 0.105 | 0.225 |
| CMELP | i1000\_1 | 145 | 0.30 | ~ | 193.3 | 10.18% | 7265.5 | 0.321 | 0.126 | 0.099 | 0.219 |
| CMELP | i1000\_1 | 150 | 0.29 | ~ | 184.5 | 5.19% | 7271.9 | 0.310 | 0.124 | 0.097 | 0.225 |
| CMELP | i1000\_1 | 155 | 0.28 | ~ | 181.9 | 2.69% | 7264.5 | 0.303 | 0.122 | 0.096 | 0.226 |
| CMELP | i1000\_1 | 160 | 0.28 | ~ | 163.0 | 3.20% | 7303.5 | 0.298 | 0.118 | 0.093 | 0.223 |

### Table S13: Solutions from the instance i1000\_6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | i1000\_6 | 10 | ~ | ~ | 23651.4 | opt | 263.3 | 1.191 | 0.512 | 0.419 | 0.245 |
| PMP | i1000\_6 | 20 | ~ | ~ | 16093.6 | opt | 255.6 | 0.810 | 0.366 | 0.305 | 0.259 |
| PMP | i1000\_6 | 30 | ~ | ~ | 12915.4 | opt | 224.4 | 0.650 | 0.304 | 0.245 | 0.264 |
| PMP | i1000\_6 | 40 | ~ | ~ | 10877.1 | opt | 262.9 | 0.548 | 0.255 | 0.211 | 0.265 |
| PMP | i1000\_6 | 50 | ~ | ~ | 9519.1 | opt | 169.3 | 0.479 | 0.234 | 0.193 | 0.278 |
| MDELP | i1000\_6 | 10 | 1.19 | 9.0 | 41581.4 | opt | 455.0 | 1.199 | 0.458 | 0.376 | 0.217 |
| MDELP | i1000\_6 | 20 | 0.81 | 12.1 | 29417.7 | opt | 3383.3 | 0.826 | 0.327 | 0.266 | 0.225 |
| MDELP | i1000\_6 | 30 | 0.65 | 14.1 | 22496.3 | opt | 1622.3 | 0.666 | 0.257 | 0.211 | 0.219 |
| MDELP | i1000\_6 | 40 | 0.54 | 16.8 | 20263.1 | opt | 226.1 | 0.561 | 0.220 | 0.183 | 0.224 |
| MDELP | i1000\_6 | 50 | 0.47 | 17.5 | 17768.2 | opt | 325.2 | 0.491 | 0.201 | 0.164 | 0.233 |
| MELP | i1000\_6 | 10 | 1.19 | ~ | 1971.9 | opt | 492.4 | 1.207 | 0.449 | 0.368 | 0.212 |
| MELP | i1000\_6 | 20 | 0.81 | ~ | 1074.7 | opt | 3690.7 | 0.838 | 0.318 | 0.261 | 0.216 |
| MELP | i1000\_6 | 30 | 0.65 | ~ | 655.5 | opt | 839.5 | 0.669 | 0.256 | 0.209 | 0.216 |
| MELP | i1000\_6 | 40 | 0.54 | ~ | 540.0 | opt | 474.4 | 0.564 | 0.217 | 0.179 | 0.219 |
| MELP | i1000\_6 | 50 | 0.47 | ~ | 454.9 | opt | 511.5 | 0.499 | 0.193 | 0.158 | 0.220 |
| CPMP | i1000\_6 | 72 | ~ | ~ | 8203.3 | 0.58% | 7204.4 | 0.413 | 0.208 | 0.166 | 0.283 |
| CPMP | i1000\_6 | 76 | ~ | ~ | 7875.4 | 0.20% | 7202.2 | 0.396 | 0.199 | 0.159 | 0.282 |
| CPMP | i1000\_6 | 80 | ~ | ~ | 7613.9 | opt | 4898.4 | 0.383 | 0.190 | 0.153 | 0.280 |
| CPMP | i1000\_6 | 84 | ~ | ~ | 7386.2 | opt | 2940.0 | 0.372 | 0.184 | 0.148 | 0.279 |
| CPMP | i1000\_6 | 88 | ~ | ~ | 7178.1 | opt | 4061.9 | 0.361 | 0.179 | 0.143 | 0.278 |
| CMDELP | i1000\_6 | 72 | 0.41 | 19.1 | 15848.7 | 6.14% | 7200.6 | 0.427 | 0.182 | 0.150 | 0.243 |
| CMDELP | i1000\_6 | 76 | 0.40 | 20.0 | 14682.9 | 3.89% | 7201.2 | 0.409 | 0.174 | 0.146 | 0.242 |
| CMDELP | i1000\_6 | 80 | 0.38 | 21.1 | 14600.6 | 3.45% | 7201.3 | 0.395 | 0.167 | 0.134 | 0.241 |
| CMDELP | i1000\_6 | 84 | 0.37 | 21.9 | 13864.0 | 1.32% | 7202.2 | 0.381 | 0.160 | 0.130 | 0.239 |
| CMDELP | i1000\_6 | 88 | 0.36 | 22.6 | 13366.6 | opt | 4863.6 | 0.370 | 0.154 | 0.125 | 0.236 |
| CMELP | i1000\_6 | 72 | 0.41 | ~ | 421.3 | 20.62% | 7320.7 | 0.444 | 0.180 | 0.148 | 0.231 |
| CMELP | i1000\_6 | 76 | 0.40 | ~ | 316.9 | 5.18% | 7270.9 | 0.413 | 0.169 | 0.136 | 0.232 |
| CMELP | i1000\_6 | 80 | 0.38 | ~ | 316.8 | 5.44% | 7365.5 | 0.399 | 0.163 | 0.131 | 0.231 |
| CMELP | i1000\_6 | 84 | 0.37 | ~ | 286.7 | 3.92% | 7256.7 | 0.388 | 0.155 | 0.125 | 0.227 |
| CMELP | i1000\_6 | 88 | 0.36 | ~ | 263.3 | 1.04% | 7411.0 | 0.377 | 0.148 | 0.120 | 0.222 |

### Table S14: Solutions from the instance GY

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | GY | 22 | ~ | ~ | 1567390.8 | opt | 29.9 | 1.912 | 1.384 | 1.113 | 0.407 |
| PMP | GY | 24 | ~ | ~ | 1493475.9 | opt | 21.2 | 1.822 | 1.355 | 1.088 | 0.417 |
| PMP | GY | 26 | ~ | ~ | 1427280.8 | opt | 34.6 | 1.741 | 1.341 | 1.093 | 0.431 |
| PMP | GY | 28 | ~ | ~ | 1368159.6 | opt | 27.7 | 1.669 | 1.319 | 1.085 | 0.442 |
| PMP | GY | 30 | ~ | ~ | 1315066.7 | opt | 27.8 | 1.604 | 1.250 | 1.045 | 0.441 |
| MDELP | GY | 22 | 1.912 | 2.0 | 3033435.1 | opt | 22.9 | 1.999 | 1.210 | 0.977 | 0.343 |
| MDELP | GY | 24 | 1.822 | 2.0 | 2868516.6 | opt | 23.1 | 1.922 | 1.159 | 0.943 | 0.343 |
| MDELP | GY | 26 | 1.741 | 1.9 | 2675030.6 | opt | 22.4 | 1.839 | 1.127 | 0.916 | 0.348 |
| MDELP | GY | 28 | 1.669 | 1.9 | 2565966.4 | opt | 42.3 | 1.786 | 1.074 | 0.893 | 0.342 |
| MDELP | GY | 30 | 1.604 | 2.1 | 2567714.0 | opt | 32.6 | 1.675 | 1.112 | 0.929 | 0.379 |
| MELP | GY | 22 | 1.912 | ~ | 679029.1 | opt | 6.8 | 2.134 | 1.095 | 0.844 | 0.287 |
| MELP | GY | 24 | 1.822 | ~ | 642119.7 | opt | 55.4 | 1.944 | 1.149 | 0.931 | 0.335 |
| MELP | GY | 26 | 1.741 | ~ | 614147.9 | opt | 62.7 | 1.841 | 1.125 | 0.918 | 0.347 |
| MELP | GY | 28 | 1.669 | ~ | 577288.6 | opt | 45.0 | 1.798 | 1.078 | 0.879 | 0.341 |
| MELP | GY | 30 | 1.604 | ~ | 544852.2 | opt | 24.1 | 1.794 | 0.988 | 0.793 | 0.312 |
| CPMP | GY | 22 | ~ | ~ | 1670208.4 | opt | 2380.0 | 2.037 | 1.615 | 1.302 | 0.439 |
| CPMP | GY | 24 | ~ | ~ | 1537200.6 | opt | 658.0 | 1.875 | 1.480 | 1.228 | 0.445 |
| CPMP | GY | 26 | ~ | ~ | 1459800.1 | opt | 887.0 | 1.781 | 1.441 | 1.174 | 0.454 |
| CPMP | GY | 28 | ~ | ~ | 1389821.2 | opt | 225.4 | 1.695 | 1.382 | 1.133 | 0.456 |
| CPMP | GY | 30 | ~ | ~ | 1333953.7 | opt | 142.7 | 1.627 | 1.337 | 1.100 | 0.459 |
| CMDELP | GY | 22 | 2.037 | 1.6 | 3219160.3 | opt | 5605.4 | 2.111 | 1.402 | 1.132 | 0.375 |
| CMDELP | GY | 24 | 1.875 | 1.7 | 3007883.6 | opt | 2180.8 | 1.973 | 1.317 | 1.082 | 0.380 |
| CMDELP | GY | 26 | 1.781 | 1.8 | 2864941.0 | opt | 638.9 | 1.858 | 1.267 | 1.040 | 0.387 |
| CMDELP | GY | 28 | 1.695 | 1.8 | 2722588.7 | opt | 287.2 | 1.757 | 1.235 | 1.013 | 0.399 |
| CMDELP | GY | 30 | 1.627 | 1.9 | 2652549.6 | opt | 367.3 | 1.703 | 1.188 | 0.982 | 0.396 |
| CMELP | GY | 22 | 2.037 | ~ | 908204.5 | 0.96% | 7201.2 | 2.318 | 1.224 | 0.942 | 0.293 |
| CMELP | GY | 24 | 1.875 | ~ | 805152.0 | 1.59% | 7201.6 | 2.084 | 1.196 | 0.958 | 0.324 |
| CMELP | GY | 26 | 1.781 | ~ | 738429.7 | 1.65% | 7203.3 | 2.016 | 1.119 | 0.888 | 0.312 |
| CMELP | GY | 28 | 1.695 | ~ | 695903.0 | opt | 6541.0 | 1.909 | 1.115 | 0.917 | 0.331 |
| CMELP | GY | 30 | 1.627 | ~ | 650760.6 | opt | 3543.2 | 1.894 | 1.032 | 0.817 | 0.308 |

### Table S15: Solutions from the instance ZY

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | ZY | 10 | ~ | ~ | 1655.2 | opt | 4.7 | 0.427 | 0.217 | 0.169 | 0.285 |
| PMP | ZY | 11 | ~ | ~ | 1594.5 | opt | 4.8 | 0.412 | 0.217 | 0.167 | 0.294 |
| PMP | ZY | 12 | ~ | ~ | 1540.1 | opt | 7.1 | 0.398 | 0.207 | 0.160 | 0.291 |
| PMP | ZY | 13 | ~ | ~ | 1487.9 | opt | 9.0 | 0.384 | 0.203 | 0.155 | 0.294 |
| PMP | ZY | 14 | ~ | ~ | 1436.9 | opt | 12.0 | 0.371 | 0.192 | 0.147 | 0.287 |
| MDELP | ZY | 10 | 0.427 | 18.1 | 3148.4 | opt | 17.6 | 0.432 | 0.206 | 0.161 | 0.267 |
| MDELP | ZY | 11 | 0.412 | 17.5 | 2825.4 | opt | 5.1 | 0.425 | 0.182 | 0.140 | 0.238 |
| MDELP | ZY | 12 | 0.398 | 18.5 | 2743.1 | opt | 9.5 | 0.413 | 0.174 | 0.132 | 0.232 |
| MDELP | ZY | 13 | 0.384 | 18.7 | 2605.7 | opt | 7.6 | 0.400 | 0.167 | 0.128 | 0.230 |
| MDELP | ZY | 14 | 0.371 | 20.1 | 2536.8 | opt | 6.6 | 0.383 | 0.162 | 0.126 | 0.236 |
| MELP | ZY | 10 | 0.427 | ~ | 81.4 | opt | 9.9 | 0.432 | 0.206 | 0.161 | 0.267 |
| MELP | ZY | 11 | 0.412 | ~ | 67.4 | opt | 5.9 | 0.425 | 0.182 | 0.140 | 0.238 |
| MELP | ZY | 12 | 0.398 | ~ | 61.8 | opt | 8.6 | 0.413 | 0.174 | 0.132 | 0.232 |
| MELP | ZY | 13 | 0.384 | ~ | 56.2 | opt | 5.1 | 0.402 | 0.166 | 0.128 | 0.228 |
| MELP | ZY | 14 | 0.371 | ~ | 52.3 | opt | 8.0 | 0.384 | 0.161 | 0.125 | 0.233 |
| CPMP | ZY | 10 | ~ | ~ | 1686.8 | opt | 97.4 | 0.436 | 0.221 | 0.171 | 0.284 |
| CPMP | ZY | 11 | ~ | ~ | 1598.2 | opt | 59.3 | 0.413 | 0.218 | 0.168 | 0.295 |
| CPMP | ZY | 12 | ~ | ~ | 1541.7 | opt | 48.6 | 0.398 | 0.208 | 0.160 | 0.292 |
| CPMP | ZY | 13 | ~ | ~ | 1487.9 | opt | 46.8 | 0.384 | 0.203 | 0.155 | 0.294 |
| CPMP | ZY | 14 | ~ | ~ | 1436.9 | opt | 34.7 | 0.371 | 0.192 | 0.147 | 0.287 |
| CMDELP | ZY | 10 | 0.436 | 17.8 | 3277.8 | opt | 215.4 | 0.446 | 0.211 | 0.165 | 0.265 |
| CMDELP | ZY | 11 | 0.413 | 17.4 | 2865.5 | opt | 97.3 | 0.427 | 0.184 | 0.142 | 0.240 |
| CMDELP | ZY | 12 | 0.398 | 18.4 | 2770.2 | opt | 83.9 | 0.414 | 0.175 | 0.132 | 0.234 |
| CMDELP | ZY | 13 | 0.384 | 18.7 | 2617.1 | opt | 52.2 | 0.401 | 0.167 | 0.129 | 0.231 |
| CMDELP | ZY | 14 | 0.371 | 20.1 | 2546.3 | opt | 38.8 | 0.382 | 0.163 | 0.122 | 0.233 |
| CMELP | ZY | 10 | 0.436 | ~ | 87.1 | opt | 166.8 | 0.446 | 0.211 | 0.165 | 0.265 |
| CMELP | ZY | 11 | 0.413 | ~ | 69.7 | opt | 69.0 | 0.427 | 0.184 | 0.142 | 0.240 |
| CMELP | ZY | 12 | 0.398 | ~ | 63.4 | opt | 67.5 | 0.414 | 0.175 | 0.133 | 0.234 |
| CMELP | ZY | 13 | 0.384 | ~ | 57.0 | opt | 52.2 | 0.401 | 0.167 | 0.129 | 0.231 |
| CMELP | ZY | 14 | 0.371 | ~ | 52.9 | opt | 43.8 | 0.387 | 0.162 | 0.124 | 0.231 |

### Table S16: Solutions from the instance KF

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | KF | 18 | ~ | ~ | 589019.6 | opt | 63.9 | 0.824 | 0.461 | 0.361 | 0.308 |
| PMP | KF | 20 | ~ | ~ | 562264.5 | opt | 70.8 | 0.787 | 0.434 | 0.338 | 0.303 |
| PMP | KF | 22 | ~ | ~ | 538545.4 | opt | 104.0 | 0.754 | 0.417 | 0.321 | 0.302 |
| PMP | KF | 24 | ~ | ~ | 517626.7 | opt | 126.1 | 0.725 | 0.403 | 0.310 | 0.304 |
| PMP | KF | 26 | ~ | ~ | 498859.5 | opt | 102.8 | 0.698 | 0.396 | 0.303 | 0.307 |
| MDELP | KF | 18 | 0.824 | 7.8 | 1172066.8 | opt | 351.7 | 0.858 | 0.405 | 0.328 | 0.266 |
| MDELP | KF | 20 | 0.787 | 8.4 | 1126444.3 | opt | 472.7 | 0.821 | 0.381 | 0.304 | 0.260 |
| MDELP | KF | 22 | 0.754 | 8.7 | 1067318.9 | opt | 237.3 | 0.781 | 0.367 | 0.290 | 0.262 |
| MDELP | KF | 24 | 0.725 | 8.9 | 1023839.7 | opt | 493.3 | 0.749 | 0.355 | 0.280 | 0.264 |
| MDELP | KF | 26 | 0.698 | 8.9 | 979802.4 | opt | 1306.6 | 0.731 | 0.340 | 0.271 | 0.261 |
| MELP | KF | 18 | 0.824 | ~ | 71448.7 | opt | 336.1 | 0.871 | 0.398 | 0.322 | 0.258 |
| MELP | KF | 20 | 0.787 | ~ | 64237.1 | opt | 1597.4 | 0.821 | 0.381 | 0.304 | 0.260 |
| MELP | KF | 22 | 0.754 | ~ | 57743.1 | opt | 401.1 | 0.793 | 0.360 | 0.285 | 0.254 |
| MELP | KF | 24 | 0.725 | ~ | 53935.1 | opt | 541.7 | 0.769 | 0.345 | 0.274 | 0.251 |
| MELP | KF | 26 | 0.698 | ~ | 50919.2 | opt | 2042.2 | 0.752 | 0.329 | 0.264 | 0.246 |
| CPMP | KF | 18 | ~ | ~ | 589019.6 | opt | 1743.9 | 0.824 | 0.461 | 0.361 | 0.308 |
| CPMP | KF | 20 | ~ | ~ | 562264.5 | opt | 2343.4 | 0.787 | 0.434 | 0.338 | 0.303 |
| CPMP | KF | 22 | ~ | ~ | 538545.4 | opt | 1815.2 | 0.754 | 0.417 | 0.321 | 0.296 |
| CPMP | KF | 24 | ~ | ~ | 517626.7 | opt | 2187.6 | 0.725 | 0.403 | 0.310 | 0.303 |
| CPMP | KF | 26 | ~ | ~ | 498859.5 | opt | 2911.1 | 0.698 | 0.396 | 0.303 | 0.307 |
| CMDELP | KF | 18 | 0.820 | 10.0 | 1346720.0 | opt | 3185.2 | 0.845 | 0.413 | 0.331 | 0.274 |
| CMDELP | KF | 20 | 0.790 | 10.0 | 1222288.4 | opt | 4622.2 | 0.822 | 0.381 | 0.304 | 0.260 |
| CMDELP | KF | 22 | 0.750 | 10.0 | 1154739.1 | opt | 2750.0 | 0.780 | 0.368 | 0.290 | 0.263 |
| CMDELP | KF | 24 | 0.730 | 10.0 | 1073426.7 | opt | 2565.6 | 0.749 | 0.355 | 0.280 | 0.264 |
| CMDELP | KF | 26 | 0.700 | 10.0 | 1031951.9 | opt | 4913.9 | 0.731 | 0.340 | 0.271 | 0.261 |
| CMELP | KF | 18 | 0.820 | ~ | 73175.4 | opt | 4204.6 | 0.873 | 0.399 | 0.323 | 0.258 |
| CMELP | KF | 20 | 0.790 | ~ | 63531.8 | opt | 4251.3 | 0.822 | 0.381 | 0.304 | 0.247 |
| CMELP | KF | 22 | 0.750 | ~ | 59112.5 | opt | 2989.6 | 0.794 | 0.361 | 0.286 | 0.254 |
| CMELP | KF | 24 | 0.730 | ~ | 53254.9 | opt | 4501.7 | 0.770 | 0.345 | 0.275 | 0.252 |
| CMELP | KF | 26 | 0.700 | ~ | 50459.0 | opt | 2920.3 | 0.752 | 0.329 | 0.264 | 0.246 |

### Table S17: Solutions from the instance ZZ

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Problem | Inst. | P |  |  | Objective | Gap | Time | Mean | SD | Mad | Gini |
| PMP | ZZ | 48 | ~ | ~ | 3457717.6 | ~ | 615.7 | 0.819 | 0.420 | 0.326 | 0.283 |
| PMP | ZZ | 52 | ~ | ~ | 3335783.4 | ~ | 526.6 | 0.790 | 0.415 | 0.318 | 0.284 |
| PMP | ZZ | 56 | ~ | ~ | 3231183.1 | ~ | 474.5 | 0.765 | 0.403 | 0.308 | 0.287 |
| PMP | ZZ | 60 | ~ | ~ | 3124620.2 | ~ | 667.4 | 0.740 | 0.385 | 0.294 | 0.283 |
| PMP | ZZ | 64 | ~ | ~ | 3032341.2 | ~ | 1028.4 | 0.718 | 0.376 | 0.293 | 0.285 |
| MDELP | ZZ | 48 | 0.819 | 9.3 | 6697982.9 | ~ | 1001.3 | 0.839 | 0.373 | 0.302 | 0.251 |
| MDELP | ZZ | 52 | 0.790 | 9.2 | 6381031.2 | ~ | 771.5 | 0.815 | 0.361 | 0.292 | 0.250 |
| MDELP | ZZ | 56 | 0.765 | 9.4 | 5992260.2 | ~ | 754.7 | 0.789 | 0.340 | 0.271 | 0.242 |
| MDELP | ZZ | 60 | 0.740 | 10.0 | 5897516.8 | ~ | 804.7 | 0.772 | 0.325 | 0.260 | 0.237 |
| MDELP | ZZ | 64 | 0.718 | 10.1 | 5650278.0 | ~ | 1136.8 | 0.741 | 0.320 | 0.255 | 0.244 |
| MELP | ZZ | 48 | 0.819 | ~ | 325283.5 | ~ | 588.6 | 0.851 | 0.365 | 0.296 | 0.243 |
| MELP | ZZ | 52 | 0.790 | ~ | 310763.3 | ~ | 514.3 | 0.827 | 0.349 | 0.282 | 0.239 |
| MELP | ZZ | 56 | 0.765 | ~ | 282470.7 | ~ | 933.2 | 0.795 | 0.337 | 0.269 | 0.239 |
| MELP | ZZ | 60 | 0.740 | ~ | 258928.6 | ~ | 1008.1 | 0.769 | 0.325 | 0.260 | 0.238 |
| MELP | ZZ | 64 | 0.718 | ~ | 243616.0 | ~ | 1115.7 | 0.748 | 0.313 | 0.249 | 0.235 |
| CPMP | ZZ | 48 | ~ | ~ | 3640336.9 | ~ | 4617.5 | 0.862 | 0.546 | 0.408 | 0.333 |
| CPMP | ZZ | 52 | ~ | ~ | 3443420.1 | ~ | 1833.9 | 0.815 | 0.452 | 0.355 | 0.305 |
| CPMP | ZZ | 56 | ~ | ~ | 3288316.7 | ~ | 3543.1 | 0.778 | 0.418 | 0.325 | 0.295 |
| CPMP | ZZ | 60 | ~ | ~ | 3153313.4 | ~ | 1515.4 | 0.747 | 0.401 | 0.312 | 0.295 |
| CPMP | ZZ | 64 | ~ | ~ | 3059409.7 | ~ | 1534.6 | 0.724 | 0.388 | 0.303 | 0.295 |
| CMDELP | ZZ | 48 | 0.862 | 5.8 | 7973447.3 | ~ | 7399.1 | 0.873 | 0.510 | 0.379 | 0.309 |
| CMDELP | ZZ | 52 | 0.815 | 8.0 | 7017243.0 | ~ | 4574.8 | 0.828 | 0.415 | 0.329 | 0.279 |
| CMDELP | ZZ | 56 | 0.778 | 8.9 | 6555152.0 | ~ | 6056.7 | 0.789 | 0.382 | 0.302 | 0.271 |
| CMDELP | ZZ | 60 | 0.747 | 9.3 | 6371246.3 | ~ | 3455.4 | 0.767 | 0.365 | 0.289 | 0.266 |
| CMDELP | ZZ | 64 | 0.724 | 9.6 | 6048518.9 | ~ | 3230.8 | 0.737 | 0.353 | 0.281 | 0.269 |
| CMELP | ZZ | 48 | 0.862 | ~ | 702660.8 | ~ | 8295.0 | 0.899 | 0.489 | 0.365 | 0.292 |
| CMELP | ZZ | 52 | 0.815 | ~ | 451594.2 | ~ | 4247.8 | 0.840 | 0.411 | 0.321 | 0.270 |
| CMELP | ZZ | 56 | 0.778 | ~ | 354079.8 | ~ | 4599.6 | 0.805 | 0.369 | 0.293 | 0.257 |
| CMELP | ZZ | 60 | 0.747 | ~ | 332435.7 | ~ | 6241.8 | 0.776 | 0.356 | 0.279 | 0.256 |
| CMELP | ZZ | 64 | 0.724 | ~ | 303376.8 | ~ | 3714.1 | 0.750 | 0.345 | 0.273 | 0.257 |