\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Policy 1: Equal Penalty Rule (When nodes are dropped to serve maximum bins at minimum distance)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Instance | No Of Nodes | Total Distance of All Routes (m) | Total Load Of All Routes | Number of Routes Created | Number Of Nodes Dropped | Total Demand Per Day | Total Unutilized Capacity | Effective  Vehicle Capacity | Total Vehicle Capacity |
| 15\_a1 | 15 | 1527 | 215 | 3 | 4 | 355 | 10 | 225 | 225 |
| 15\_a2 | 15 | 3288 | 203 | 3 | 4 | 337 | 22 | 225 | 225 |
| 15\_a3 | 15 | 3514 | 205 | 3 | 5 | 360 | 20 | 225 | 225 |
| 15\_a4 | 15 | 1956 | 212 | 3 | 5 | 363 | 13 | 225 | 225 |
| 15\_a5 | 15 | 3504 | 220 | 3 | 4 | 375 | 5 | 225 | 225 |
| 30\_a1 | 30 | 3708 | 435 | 3 | 8 | 732 | 15 | 450 | 450 |
| 30\_a2 | 30 | 1709 | 440 | 3 | 12 | 799 | 10 | 450 | 450 |
| 30\_a3 | 30 | 4302 | 439 | 3 | 0 | 687 | 11 | 450 | 450 |
| 30\_a4 | 30 | 2466 | 434 | 3 | 11 | 753 | 16 | 450 | 450 |
| 30\_a5 | 30 |  |  |  |  |  |  |  |  |
| 50\_a1 | 50 | 3972 | 787 | 4 | 13 | 1189 | 13 | 800 | 800 |
| 50\_a2 | 50 | 3715 | 796 | 4 | 13 | 1266 | 4 | 800 | 800 |
| 50\_a3 | 50 | 5056 | 786 | 4 | 18 | 1461 | 14 | 800 | 800 |
| 50\_a4 | 50 | 4516 | 785 | 4 | 15 | 1252 | 15 | 800 | 800 |
| 50\_a5 | 50 | 3983 | 797 | 4 | 17 | 1236 | 3 | 800 | 800 |

Policy 2: Unequal Penalty (when nodes are dropped to collect the maximum filled bins

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Instance | No Of Nodes | Total Distance of All Routes (m) | Total Load Of All Routes | Number Of Routes Created | Number Of Nodes Dropped | Total Demand Per Day | Total Unutilized Capacity | Effective  Vehicle Capacity | Total Vehicle Capacity |
| 15\_b1 | 15 | 1173 | 199 | 3 | 7 | 355 | 4 | 225 | 225 |
| 15\_b2 | 15 | 2578 | 150 | 2 | 7 | 337 | 0 | 150 | 225 |
| 15\_b3\* | 15 | 2717 | 147 | 3 | 7 | 360 | 78 | 225 | 225 |
| 15\_b4 | 15 | 1489 | 186 | 3 | 7 | 363 | 39 | 225 | 225 |
| 15\_b5 | 15 | 2859 | 138 | 3 | 8 | 393 | 87 | 225 | 225 |
| 30\_b1 | 30 | 2936 | 424 | 3 | 14 | 732 | 26 | 450 | 450 |
| 30\_b2 |  |  |  |  |  |  |  |  |  |
| 30\_b3 |  |  |  |  |  |  |  |  |  |
| 30\_b4 |  |  |  |  |  |  |  |  |  |
| 30\_b5 |  |  |  |  |  |  |  |  |  |
| 50\_b1 | 50 | 4500 | 783 | 4 | 25 | 1189 | 17 | 800 | 800 |
| 50\_b2 | 50 | 3154 | 781 | 4 | 22 | 1266 | 19 | 800 | 800 |
| 50\_b3 | 50 | 5072 | 784 | 4 | 30 | 1461 | 16 | 800 | 800 |
| 50\_b4 | 50 | 4076 | 755 | 4 | 26 | 1252 | 45 | 800 | 800 |
| 50\_b5 | 50 | 4307 | 789 | 4 | 24 | 1236 | 11 | 800 | 800 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-------------------------------------------------Equal Penalty --------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

15\_a1

--------------------------------------------------------------------------------------------------------------------------------------

Objective: 41527

Dropped nodes: 1 6 8 11

Route for vehicle 0:

0 Load(0) -> 5 Load(32) -> 4 Load(51) -> 7 Load(66) -> 0 Load(66)

Distance of the route: 372m

Load of the route: 66

Route for vehicle 1:

0 Load(0) -> 14 Load(12) -> 13 Load(46) -> 10 Load(62) -> 2 Load(74) -> 0 Load(74)

Distance of the route: 695m

Load of the route: 74

Route for vehicle 2:

0 Load(0) -> 9 Load(32) -> 3 Load(57) -> 12 Load(75) -> 0 Load(75)

Distance of the route: 460m

Load of the route: 75

Total Distance of all routes: 1527m

Total Load of all routes: 215

15\_a2

Objective: 43288

Dropped nodes: 3 4 5 9

Route for vehicle 0:

0 Load(0) -> 6 Load(22) -> 12 Load(36) -> 1 Load(53) -> 11 Load(63) -> 0 Load(63)

Distance of the route: 1227m

Load of the route: 63

Route for vehicle 1:

0 Load(0) -> 7 Load(11) -> 10 Load(31) -> 14 Load(66) -> 0 Load(66)

Distance of the route: 1187m

Load of the route: 66

Route for vehicle 2:

0 Load(0) -> 2 Load(13) -> 8 Load(41) -> 13 Load(74) -> 0 Load(74)

Distance of the route: 874m

Load of the route: 74

Total Distance of all routes: 3288m

Total Load of all routes: 203

--------------------------------------------------------------------------------------------------------------------------------------

15\_a3

-------------------------------------------------------------------------------------------------------------------------------------

Objective: 53514

Dropped nodes: 5 7 8 9 13

Route for vehicle 0:

0 Load(0) -> 11 Load(23) -> 10 Load(56) -> 3 Load(68) -> 0 Load(68)

Distance of the route: 1346m

Load of the route: 68

Route for vehicle 1:

0 Load(0) -> 6 Load(38) -> 12 Load(57) -> 14 Load(74) -> 0 Load(74)

Distance of the route: 1202m

Load of the route: 74

Route for vehicle 2:

0 Load(0) -> 4 Load(38) -> 1 Load(53) -> 2 Load(63) -> 0 Load(63)

Distance of the route: 966m

Load of the route: 63

Total Distance of all routes: 3514m

Total Load of all routes: 205

--------------------------------------------------------------------------------------------------------------------

15\_a4

-----------------------------------------------------------------------------------------------------------------

Objective: 51956

Dropped nodes: 2 6 9 10 14

Route for vehicle 0:

0 Load(0) -> 12 Load(19) -> 4 Load(57) -> 7 Load(75) -> 0 Load(75)

Distance of the route: 870m

Load of the route: 75

Route for vehicle 1:

0 Load(0) -> 8 Load(34) -> 11 Load(65) -> 0 Load(65)

Distance of the route: 332m

Load of the route: 65

Route for vehicle 2:

0 Load(0) -> 5 Load(12) -> 3 Load(43) -> 1 Load(58) -> 13 Load(72) -> 0 Load(72)

Distance of the route: 754m

Load of the route: 72

Total Distance of all routes: 1956m

Total Load of all routes: 212

---------------------------------------------------------------------------------------------------------------------------------

15\_a5

------------------------------------------------------------------------------------------------------------------------

Objective: 43504

Dropped nodes: 4 6 8 11

Route for vehicle 0:

0 Load(0) -> 9 Load(38) -> 2 Load(50) -> 14 Load(71) -> 13 Load(71) -> 0 Load(71)

Distance of the route: 1160m

Load of the route: 71

Route for vehicle 1:

0 Load(0) -> 10 Load(16) -> 3 Load(46) -> 7 Load(74) -> 0 Load(74)

Distance of the route: 1262m

Load of the route: 74

Route for vehicle 2:

0 Load(0) -> 1 Load(20) -> 5 Load(65) -> 12 Load(75) -> 0 Load(75)

Distance of the route: 1082m

Load of the route: 75

Total Distance of all routes: 3504m

Total Load of all routes: 220

-------------------------------------------------------------------------------------------------------------------------------------

30\_a1

-----------------------------------------------------------------------------------------------------------------------------------

Objective: 83708

Dropped nodes: 1 2 4 5 6 10 25 28

Route for vehicle 0:

0 Load(0) -> 24 Load(14) -> 29 Load(35) -> 26 Load(51) -> 20 Load(65) -> 7 Load(77) -> 21 Load(106) -> 8 Load(143) -> 27 Load(147) -> 0 Load(147)

Distance of the route: 1290m

Load of the route: 147

Route for vehicle 1:

0 Load(0) -> 12 Load(27) -> 18 Load(56) -> 19 Load(74) -> 14 Load(99) -> 9 Load(123) -> 17 Load(133) -> 15 Load(147) -> 0 Load(147)

Distance of the route: 1396m

Load of the route: 147

Route for vehicle 2:

0 Load(0) -> 13 Load(18) -> 22 Load(52) -> 23 Load(81) -> 3 Load(93) -> 16 Load(130) -> 11 Load(141) -> 0 Load(141)

Distance of the route: 1022m

Load of the route: 141

Total Distance of all routes: 3708m

Total Load of all routes: 435

--------------------------------------------------------------------------------------------------------------------------------

30\_a2

-----------------------------------------------------------------------------------------------------------------------------------

Objective: 121709

Dropped nodes: 1 8 9 10 12 14 15 18 22 26 28 29

Route for vehicle 0:

0 Load(0) -> 3 Load(22) -> 20 Load(40) -> 19 Load(78) -> 2 Load(105) -> 6 Load(145) -> 0 Load(145)

Distance of the route: 650m

Load of the route: 145

Route for vehicle 1:

0 Load(0) -> 16 Load(26) -> 21 Load(47) -> 23 Load(81) -> 25 Load(100) -> 5 Load(118) -> 7 Load(149) -> 0 Load(149)

Distance of the route: 634m

Load of the route: 149

Route for vehicle 2:

0 Load(0) -> 11 Load(18) -> 27 Load(58) -> 13 Load(89) -> 17 Load(118) -> 24 Load(133) -> 4 Load(146) -> 0 Load(146)

Distance of the route: 425m

Load of the route: 146

Total Distance of all routes: 1709m

Total Load of all routes: 440

-------------------------------------------------------------------------------------------------------------------------------------

30\_a3

--------------------------------------------------------------------------------------------------------------------------------------Objective: 94302

Dropped nodes: 3 4 5 6 10 19 24 25 28

Route for vehicle 0:

0 Load(0) -> 27 Load(26) -> 16 Load(47) -> 21 Load(66) -> 1 Load(89) -> 23 Load(123) -> 17 Load(140) -> 26 Load(150) -> 0 Load(150)

Distance of the route: 1740m

Load of the route: 150

Route for vehicle 1:

0 Load(0) -> 22 Load(18) -> 13 Load(39) -> 9 Load(75) -> 8 Load(87) -> 29 Load(100) -> 14 Load(118) -> 2 Load(137) -> 12 Load(147) -> 0 Load(147)

Distance of the route: 1587m

Load of the route: 147

Route for vehicle 2:

0 Load(0) -> 7 Load(23) -> 20 Load(54) -> 11 Load(75) -> 18 Load(104) -> 15 Load(142) -> 0 Load(142)

Distance of the route: 975m

Load of the route: 142

Total Distance of all routes: 4302m

Total Load of all routes: 439

--------------------------------------------------------------------------------------------------------------------------------------

--------------------------------------------------------------------------------------------------------------------------------------

50\_a1.py

--------------------------------------------------------------

Objective: 133972

Dropped nodes: 4 6 8 10 12 14 17 18 19 20 28 46 48

Route for vehicle 0:

0 Load(0) -> 42 Load(8) -> 43 Load(14) -> 23 Load(38) -> 2 Load(79) -> 30 Load(100) -> 35 Load(115) -> 13 Load(148) -> 5 Load(187) -> 39 Load(199) -> 0 Load(199)

Distance of the route: 1394m

Load of the route: 199

Route for vehicle 1:

0 Load(0) -> 11 Load(36) -> 40 Load(46) -> 31 Load(66) -> 3 Load(111) -> 38 Load(123) -> 7 Load(160) -> 33 Load(176) -> 27 Load(198) -> 0 Load(198)

Distance of the route: 1066m

Load of the route: 198

Route for vehicle 2:

0 Load(0) -> 22 Load(25) -> 15 Load(56) -> 21 Load(82) -> 32 Load(98) -> 25 Load(121) -> 37 Load(135) -> 41 Load(145) -> 47 Load(159) -> 16 Load(190) -> 0 Load(190)

Distance of the route: 817m

Load of the route: 190

Route for vehicle 3:

0 Load(0) -> 29 Load(22) -> 9 Load(59) -> 49 Load(74) -> 26 Load(96) -> 1 Load(139) -> 45 Load(142) -> 34 Load(157) -> 24 Load(180) -> 44 Load(185) -> 36 Load(200) -> 0

Load(200)

Distance of the route: 695m

Load of the route: 200

Total Distance of all routes: 3972m

Total Load of all routes: 787

Policy 2

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

15\_b1

---------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 40, 2: 12, 3: 25, 4: 19, 5: 32, 6: 38, 7: 15, 8: 34, 9: 32, 10: 16, 11: 28, 12: 18, 13: 34, 14: 12}

[40, 38, 34, 34, 32, 32, 28, 25, 19, 18, 16, 15, 12, 12, 0]

Mandatory Nodes To Be Picked

[40, 38, 34, 34, 32, 32, 15, 0]

Node id Which must be dropped [2, 3, 4, 10, 11, 12, 14]

Mandatory Nodes By Id [0, 1, 5, 6, 7, 8, 9, 13]

Dropped Nodes [2, 3, 4, 10, 11, 12, 14]

{0: 0, 1: 40, 5: 32, 6: 38, 7: 15, 8: 34, 9: 32, 13: 34}

cccc [0, 1, 5, 6, 7, 8, 9, 13]

Objective: 11173

Route for vehicle 0:

0 Load(0) -> 13 Load(34) -> 5 Load(66) -> 0 Load(66)

Distance of the route: 278m

Load of the route: 66

Route for vehicle 1:

0 Load(0) -> 8 Load(34) -> 7 Load(49) -> 14 Load(61) -> 0 Load(61)

Distance of the route: 458m

Load of the route: 61

Route for vehicle 2:

0 Load(0) -> 9 Load(32) -> 1 Load(72) -> 0 Load(72)

Distance of the route: 437m

Load of the route: 72

Total Distance of all routes: 1173m

Total Load of all routes: 199

--------------------------------------------------------------------------------------------------------------------------------------15\_b2

------------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 17, 2: 13, 3: 19, 4: 38, 5: 40, 6: 22, 7: 11, 8: 28, 9: 37, 10: 20, 11: 10, 12: 14, 13: 33, 14: 35}

[40, 38, 37, 35, 33, 28, 22, 20, 19, 17, 14, 13, 11, 10, 0]

Mandatory Nodes To Be Picked

[40, 38, 37, 35, 33, 28, 14, 0]

Node id Which must be dropped

[1, 2, 3, 6, 7, 10, 11]

Dropped Nodes [1, 2, 3, 6, 7, 10, 11]

{0: 0, 4: 38, 5: 40, 8: 28, 9: 37, 12: 14, 13: 33, 14: 35}

Objective: 2578

Route for vehicle 0:

0 Load(0) -> 0 Load(0)

Distance of the route: 0m

Load of the route: 0

Route for vehicle 1:

0 Load(0) -> 5 Load(40) -> 14 Load(75) -> 0 Load(75)

Distance of the route: 1141m

Load of the route: 75

Route for vehicle 2:

0 Load(0) -> 4 Load(38) -> 9 Load(75) -> 0 Load(75)

Distance of the route: 1437m

Load of the route: 75

Total Distance of all routes: 2578m

Total Load of all routes: 150

-------------------------------------------------------------------------------------------------------------------------------------

15\_b3

------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 15, 2: 10, 3: 12, 4: 38, 5: 32, 6: 38, 7: 27, 8: 34, 9: 25, 10: 33, 11: 23, 12: 19, 13: 37, 14: 17}

[38, 38, 37, 34, 33, 32, 27, 25, 23, 19, 17, 15, 12, 10, 0]

Mandatory Nodes To Be Picked

[38, 38, 37, 34, 33, 32, 12, 0]

Node id Which must be dropped

[1, 2, 7, 9, 11, 12, 14]

Dropped Nodes [1, 2, 7, 9, 11, 12, 14]

{0: 0, 3: 12, 4: 38, 5: 32, 6: 38, 8: 34, 10: 33, 13: 37}

Objective: 2717

Route for vehicle 0:

0 Load(0) -> 13 Load(37) -> 8 Load(71) -> 0 Load(71)

Distance of the route: 1511m

Load of the route: 71

Route for vehicle 1:

0 Load(0) -> 6 Load(38) -> 0 Load(38)

Distance of the route: 606m

Load of the route: 38

Route for vehicle 2:

0 Load(0) -> 4 Load(38) -> 0 Load(38)

Distance of the route: 600m

Load of the route: 38

Total Distance of all routes: 2717m

Total Load of all routes: 147

-----------------------------------------------------------------------------------------------------------------------------

15\_b4.py

-------------------------------------------------------------------

{0: 0, 1: 15, 2: 26, 3: 31, 4: 38, 5: 12, 6: 38, 7: 18, 8: 34, 9: 25, 10: 33, 11: 31, 12: 19, 13: 14, 14: 29}

[38, 38, 34, 33, 31, 31, 29, 26, 25, 19, 18, 15, 14, 12, 0]

Mandatory Nodes To Be Picked

[38, 38, 34, 33, 31, 31, 19, 0]

Node id Which must be dropped [1, 2, 5, 7, 9, 13, 14]

Dropped Nodes [1, 2, 5, 7, 9, 13, 14]

{0: 0, 3: 31, 4: 38, 6: 38, 8: 34, 10: 33, 11: 31, 12: 19}

Objective: 11489

Route for vehicle 0:

0 Load(0) -> 4 Load(38) -> 8 Load(72) -> 0 Load(72)

Distance of the route: 389m

Load of the route: 72

Route for vehicle 1:

0 Load(0) -> 11 Load(31) -> 3 Load(62) -> 0 Load(62)

Distance of the route: 421m

Load of the route: 62

Route for vehicle 2:

0 Load(0) -> 10 Load(33) -> 12 Load(52) -> 0 Load(52)

Distance of the route: 679m

Load of the route: 52

Total Distance of all routes: 1489m

Total Load of all routes: 186

-----------------------------------------------------------------------------------------------------------------------------------

15\_b5

--------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 20, 2: 12, 3: 30, 4: 48, 5: 45, 6: 39, 7: 28, 8: 45, 9: 38, 10: 16, 11: 23, 12: 10, 13: 18, 14: 21}

[48, 45, 45, 39, 38, 30, 28, 23, 21, 20, 18, 16, 12, 10, 0]

Mandatory Nodes To Be Picked

[48, 45, 45, 39, 38, 10, 0]

Node id Which must be dropped [1, 2, 3, 7, 10, 11, 13, 14]

Mandatory Nodes By Id [0, 4, 5, 6, 8, 9, 12]

Dropped Nodes [1, 2, 3, 7, 10, 11, 13, 14]

{0: 0, 4: 48, 5: 45, 6: 39, 8: 45, 9: 38, 12: 10}

Objective: 22859

Route for vehicle 0:

0 Load(0) -> 9 Load(38) -> 0 Load(38)

Distance of the route: 966m

Load of the route: 38

Route for vehicle 1:

0 Load(0) -> 8 Load(45) -> 12 Load(55) -> 0 Load(55)

Distance of the route: 1171m

Load of the route: 55

Route for vehicle 2:

0 Load(0) -> 5 Load(45) -> 0 Load(45)

Distance of the route: 722m

Load of the route: 45

Total Distance of all routes: 2859m

Total Load of all routes: 138

------------------------------------------------------------------------------------------------------------------------------

30\_b1

-------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 40, 2: 26, 3: 12, 4: 43, 5: 40, 6: 36, 7: 12, 8: 37, 9: 24, 10: 39, 11: 11, 12: 27, 13: 18, 14: 25, 15: 14, 16: 37, 17: 10, 18: 29, 19: 18, 20: 14, 21: 29, 22: 34, 23: 29, 24: 14, 25: 40, 26: 16, 27: 4, 28: 33, 29: 21}

[43, 40, 40, 40, 39, 37, 37, 36, 34, 33, 29, 29, 29, 27, 26, 25, 24, 21, 18, 18, 16, 14, 14, 14, 12, 12, 11, 10, 4, 0]

Mandatory Nodes To Be Picked

[43, 40, 40, 40, 39, 37, 37, 36, 34, 33, 29, 29, 12, 0]

Node id Which must be dropped [2, 9, 11, 12, 13, 14, 15, 17, 19, 20, 24, 26, 27, 29]

Mandatory Nodes By Id [0, 1, 3, 4, 5, 6, 7, 8, 10, 16, 18, 21, 22, 23, 25, 28]

Dropped Nodes [2, 9, 11, 12, 13, 14, 15, 17, 19, 20, 24, 26, 27, 29]

{0: 0, 1: 40, 3: 12, 4: 43, 5: 40, 6: 36, 7: 12, 8: 37, 10: 39, 16: 37, 18: 29, 21: 29, 22: 34, 23: 29, 25: 40, 28: 33}

Objective: 22936

Route for vehicle 0:

0 Load(0) -> 3 Load(12) -> 7 Load(24) -> 18 Load(53) -> 25 Load(93) -> 10 Load(132) -> 0 Load(132)

Distance of the route: 1185m

Load of the route: 132

Route for vehicle 1:

0 Load(0) -> 28 Load(33) -> 6 Load(69) -> 1 Load(109) -> 5 Load(149) -> 0 Load(149)

Distance of the route: 845m

Load of the route: 149

Route for vehicle 2:

0 Load(0) -> 4 Load(43) -> 22 Load(77) -> 23 Load(106) -> 16 Load(143) -> 0 Load(143)

Distance of the route: 906m

Load of the route: 143

Total Distance of all routes: 2936m

Total Load of all routes: 424

----------------------------------------------------------------------------------------------------------------------------------

30\_b2

--------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 23, 2: 27, 3: 22, 4: 13, 5: 18, 6: 40, 7: 31, 8: 38, 9: 26, 10: 21, 11: 18, 12: 36, 13: 31, 14: 40, 15: 34, 16: 26, 17: 29, 18: 31, 19: 38, 20: 18, 21: 21, 22: 39, 23: 34, 24: 15, 25: 19, 26: 23, 27: 40, 28: 21, 29: 27}

[40, 40, 40, 39, 38, 38, 36, 34, 34, 31, 31, 31, 29, 27, 27, 26, 26, 23, 23, 22, 21, 21, 21, 19, 18, 18, 18, 15, 13, 0]

Mandatory Nodes To Be Picked

[40, 40, 40, 39, 38, 38, 36, 34, 34, 31, 31, 31, 18, 0]

Node id Which must be dropped [1, 2, 3, 4, 9, 10, 16, 17, 21, 24, 25, 26, 28, 29]

Mandatory Nodes By Id [0, 5, 6, 7, 8, 11, 12, 13, 14, 15, 18, 19, 20, 22, 23, 27]

Dropped Nodes [1, 2, 3, 4, 9, 10, 16, 17, 21, 24, 25, 26, 28, 29]

{0: 0, 5: 18, 6: 40, 7: 31, 8: 38, 11: 18, 12: 36, 13: 31, 14: 40, 15: 34, 18: 31, 19: 38, 20: 18, 22: 39, 23: 34, 27: 40}

Objective: 12477

Route for vehicle 0:

0 Load(0) -> 27 Load(40) -> 13 Load(71) -> 8 Load(109) -> 6 Load(149) -> 0 Load(149)

Distance of the route: 425m

Load of the route: 149

Route for vehicle 1:

0 Load(0) -> 12 Load(36) -> 18 Load(67) -> 7 Load(98) -> 5 Load(116) -> 23 Load(150) -> 0 Load(150)

Distance of the route: 1095m

Load of the route: 150

Route for vehicle 2:

0 Load(0) -> 11 Load(18) -> 20 Load(36) -> 19 Load(74) -> 15 Load(108) -> 22 Load(147) -> 0 Load(147)

Distance of the route: 957m

Load of the route: 147

Total Distance of all routes: 2477m

Total Load of all routes: 446

--------------------------------------------------------------------------------------------------------------------------------------

30\_b3

--------------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 23, 2: 19, 3: 31, 4: 40, 5: 16, 6: 36, 7: 23, 8: 12, 9: 36, 10: 18, 11: 21, 12: 10, 13: 21, 14: 18, 15: 38, 16: 21, 17: 17, 18: 29, 19: 35, 20: 31, 21: 19, 22: 18, 23: 34, 24: 14, 25: 23, 26: 10, 27: 26, 28: 35, 29: 13}

[40, 38, 36, 36, 35, 35, 34, 31, 31, 29, 26, 23, 23, 23, 21, 21, 21, 19, 19, 18, 18, 18, 17, 16, 14, 13, 12, 10, 10, 0]

Mandatory Nodes To Be Picked

[40, 38, 36, 36, 35, 35, 34, 31, 31, 29, 26, 23, 23, 23, 10, 0]

Node id Which must be dropped [2, 5, 8, 10, 11, 13, 14, 16, 17, 21, 22, 24, 29]

Mandatory Nodes By Id [0, 1, 3, 4, 6, 7, 9, 12, 15, 18, 19, 20, 23, 25, 26, 27, 28]

Dropped Nodes [2, 5, 8, 10, 11, 13, 14, 16, 17, 21, 22, 24, 29]

{0: 0, 1: 23, 3: 31, 4: 40, 6: 36, 7: 23, 9: 36, 12: 10, 15: 38, 18: 29, 19: 35, 20: 31, 23: 34, 25: 23, 26: 10, 27: 26, 28: 35}

Objective: 13953

Route for vehicle 0:

0 Load(0) -> 15 Load(38) -> 18 Load(67) -> 9 Load(103) -> 6 Load(139) -> 0 Load(139)

Distance of the route: 1198m

Load of the route: 139

Route for vehicle 1:

0 Load(0) -> 3 Load(31) -> 28 Load(66) -> 19 Load(101) -> 4 Load(141) -> 0 Load(141)

Distance of the route: 1069m

Load of the route: 141

Route for vehicle 2:

0 Load(0) -> 12 Load(10) -> 25 Load(33) -> 26 Load(43) -> 1 Load(66) -> 27 Load(92) -> 20 Load(123) -> 7 Load(146) -> 0 Load(146)

Distance of the route: 1686m

Load of the route: 146

Total Distance of all routes: 3953m

Total Load of all routes: 426

-------------------------------------------------------------------------------------------------------------------------------------

30\_b4

-----------------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------------------

30\_b5

--------------------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 21, 2: 28, 3: 38, 4: 40, 5: 18, 6: 36, 7: 31, 8: 30, 9: 28, 10: 21, 11: 29, 12: 31, 13: 39, 14: 30, 15: 18, 16: 29, 17: 34, 18: 27, 19: 21, 20: 38, 21: 36, 22: 27, 23: 28, 24: 36, 25: 40, 26: 21, 27: 14, 28: 34, 29: 33}

[40, 40, 39, 38, 38, 36, 36, 36, 34, 34, 33, 31, 31, 30, 30, 29, 29, 28, 28, 28, 27, 27, 21, 21, 21, 21, 18, 18, 14, 0]

Mandatory Nodes To Be Picked

[40, 40, 39, 38, 38, 36, 36, 36, 34, 34, 33, 31, 14, 0]

Node id Which must be dropped [1, 2, 5, 8, 9, 10, 11, 14, 15, 16, 18, 19, 22, 23, 26]

Mandatory Nodes By Id [0, 3, 4, 6, 7, 12, 13, 17, 20, 21, 24, 25, 27, 28, 29]

Dropped Nodes [1, 2, 5, 8, 9, 10, 11, 14, 15, 16, 18, 19, 22, 23, 26]

{0: 0, 3: 38, 4: 40, 6: 36, 7: 31, 12: 31, 13: 39, 17: 34, 20: 38, 21: 36, 24: 36, 25: 40, 27: 14, 28: 34, 29: 33}

Objective: 22518

Route for vehicle 0:

0 Load(0) -> 12 Load(31) -> 7 Load(62) -> 25 Load(102) -> 13 Load(141) -> 0 Load(141)

Distance of the route: 773m

Load of the route: 141

Route for vehicle 1:

0 Load(0) -> 3 Load(38) -> 17 Load(72) -> 21 Load(108) -> 28 Load(142) -> 0 Load(142)

Distance of the route: 839m

Load of the route: 142

Route for vehicle 2:

0 Load(0) -> 4 Load(40) -> 27 Load(54) -> 6 Load(90) -> 24 Load(126) -> 0 Load(126)

Distance of the route: 906m

Load of the route: 126

Total Distance of all routes: 2518m

Total Load of all routes: 409

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

50\_b1

------------------------------------------------------------------------------

{0: 0, 1: 43, 2: 41, 3: 45, 4: 29, 5: 39, 6: 37, 7: 37, 8: 37, 9: 37, 10: 36, 11: 36, 12: 35, 13: 33, 14: 33, 15: 31, 16: 31, 17: 30, 18: 29, 19: 29, 20: 28, 21: 26, 22: 25, 23: 24, 24: 23, 25: 23, 26: 22, 27: 22, 28: 22, 29: 22, 30: 21, 31: 20, 32: 16, 33: 16, 34: 15, 35: 15, 36: 15, 37: 14, 38: 12, 39: 12, 40: 10, 41: 10, 42: 8, 43: 6, 44: 5, 45: 3, 46: 27,

47: 14, 48: 30, 49: 15}

[45, 43, 41, 39, 37, 37, 37, 37, 36, 36, 35, 33, 33, 31, 31, 30, 30, 29, 29, 29, 28, 27, 26, 25, 24, 23, 23, 22, 22, 22, 22, 21, 20, 16, 16, 15, 15, 15, 15, 14, 14, 12, 12, 10, 10,

8, 6, 5, 3, 0]

Mandatory Nodes To Be Picked

[45, 43, 41, 39, 37, 37, 37, 37, 36, 36, 35, 33, 33, 31, 31, 30, 30, 29, 29, 29, 28, 27, 26, 21, 0]

Node id Which must be dropped [22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 49]

Mandatory Nodes By Id [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 30, 46, 48]

Dropped Nodes [22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 49]

Route for vehicle 2:

0 Load(0) -> 14 Load(33) -> 6 Load(70) -> 5 Load(109) -> 21 Load(135) -> 15 Load(166) -> 16 Load(197) -> 0 Load(197)

Distance of the route: 1134m

Load of the route: 197

Route for vehicle 3:

0 Load(0) -> 9 Load(37) -> 17 Load(67) -> 20 Load(95) -> 12 Load(130) -> 48 Load(160) -> 4 Load(189) -> 0 Load(189)

Distance of the route: 1260m

Load of the route: 189

Total Distance of all routes: 4500m

Total Load of all routes: 783

-------------------------------------------------------------------------------------------------------------------

50\_b2.py

---------------------------------------------------

{0: 0, 1: 40, 2: 23, 3: 47, 4: 44, 5: 23, 6: 43, 7: 19, 8: 41, 9: 21, 10: 40, 11: 39, 12: 33, 13: 12, 14: 33, 15: 12, 16: 30, 17: 36, 18: 27, 19: 27, 20: 11, 21: 26, 22: 24, 23: 24, 24: 24, 25: 23, 26: 22, 27: 18, 28: 17, 29: 40, 30: 15, 31: 17, 32: 32, 33: 40, 34: 13, 35: 10, 36: 10, 37: 29, 38: 14, 39: 28, 40: 39, 41: 34, 42: 16, 43: 29, 44: 23, 45: 19, 46:

20, 47: 23, 48: 17, 49: 19}

[47, 44, 43, 41, 40, 40, 40, 40, 39, 39, 36, 34, 33, 33, 32, 30, 29, 29, 28, 27, 27, 26, 24, 24, 24, 23, 23, 23, 23, 23, 22, 21, 20, 19, 19, 19, 18, 17, 17, 17, 16, 15, 14, 13, 12,

12, 11, 10, 10, 0]

Mandatory Nodes To Be Picked

[47, 44, 43, 41, 40, 40, 40, 40, 39, 39, 36, 34, 33, 33, 32, 30, 29, 29, 28, 27, 27, 26, 23, 0]

Node id Which must be dropped [7, 9, 13, 15, 20, 22, 23, 24, 26, 27, 28, 30, 31, 34, 35, 36, 38, 42, 45, 46, 48, 49]

Mandatory Nodes By Id [1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 14, 16, 17, 18, 19, 21, 25, 29, 32, 33, 37, 39, 40, 41, 43, 44, 47]

Dropped Nodes [7, 9, 13, 15, 20, 22, 23, 24, 26, 27, 28, 30, 31, 34, 35, 36, 38, 42, 45, 46, 48, 49]

{0: 0, 1: 40, 2: 23, 3: 47, 4: 44, 5: 23, 6: 43, 8: 41, 10: 40, 11: 39, 12: 33, 14: 33, 16: 30, 17: 36, 18: 27, 19: 27, 21: 26, 25: 23, 29: 40, 32: 32, 33: 40, 37: 29, 39: 28, 40: 39, 41: 34, 43: 29, 44: 23, 47: 23}

Objective: 33154

Route for vehicle 0:

0 Load(0) -> 17 Load(36) -> 12 Load(69) -> 19 Load(96) -> 44 Load(119) -> 29 Load(159) -> 8 Load(200) -> 0 Load(200)

Distance of the route: 836m

Load of the route: 200

Route for vehicle 1:

0 Load(0) -> 14 Load(33) -> 16 Load(63) -> 33 Load(103) -> 21 Load(129) -> 11 Load(168) -> 37 Load(197) -> 0 Load(197)

Distance of the route: 848m

Load of the route: 197

Route for vehicle 2:

0 Load(0) -> 4 Load(44) -> 25 Load(67) -> 2 Load(90) -> 10 Load(130) -> 32 Load(162) -> 43 Load(191) -> 0 Load(191)

Distance of the route: 696m

Load of the route: 191

Route for vehicle 3:

0 Load(0) -> 18 Load(27) -> 40 Load(66) -> 41 Load(100) -> 47 Load(123) -> 3 Load(170) -> 5 Load(193) -> 0 Load(193)

Distance of the route: 774m

Load of the route: 193

Total Distance of all routes: 3154m

Total Load of all routes: 781

--------------------------------------------------------

50\_b3.py

----------------------------------------------------------------------------------------------------------------------------

{0: 0, 1: 25, 2: 38, 3: 21, 4: 34, 5: 21, 6: 18, 7: 29, 8: 29, 9: 21, 10: 39, 11: 12, 12: 40, 13: 16, 14: 17, 15: 32, 16: 34, 17: 28, 18: 19, 19: 37, 20: 13, 21: 23, 22: 33, 23: 45, 24: 42, 25: 14, 26: 36, 27: 48, 28: 24, 29: 37, 30: 49, 31: 22, 32: 47, 33: 48, 34: 16, 35: 37, 36: 43, 37: 38, 38: 48, 39: 21, 40: 14, 41: 28, 42: 14, 43: 48, 44: 17, 45: 10, 46:

31, 47: 42, 48: 43, 49: 20}

[49, 48, 48, 48, 48, 47, 45, 43, 43, 42, 42, 40, 39, 38, 38, 37, 37, 37, 36, 34, 34, 33, 32, 31, 29, 29, 28, 28, 25, 24, 23, 22, 21, 21, 21, 21, 20, 19, 18, 17, 17, 16, 16, 14, 14,

14, 13, 12, 10, 0]

Mandatory Nodes To Be Picked

[49, 48, 48, 48, 48, 47, 45, 43, 43, 42, 42, 40, 39, 38, 38, 37, 37, 37, 31, 0]

Node id Which must be dropped [1, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 25, 26, 28, 31, 34, 39, 40, 41, 42, 44, 45, 49]

Mandatory Nodes By Id [2, 10, 12, 19, 23, 24, 27, 29, 30, 32, 33, 35, 36, 37, 38, 43, 46, 47, 48]

Dropped Nodes [1, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 25, 26, 28, 31, 34, 39, 40, 41, 42, 44, 45, 49]

{0: 0, 2: 38, 10: 39, 12: 40, 19: 37, 23: 45, 24: 42, 27: 48, 29: 37, 30: 49, 32: 47, 33: 48, 35: 37, 36: 43, 37: 38, 38: 48, 43: 48, 46: 31, 47: 42, 48: 43}

Objective: 15072

Route for vehicle 0:

0 Load(0) -> 36 Load(43) -> 35 Load(80) -> 27 Load(128) -> 46 Load(159) -> 19 Load(196) -> 0 Load(196)

Distance of the route: 1386m

Load of the route: 196

Route for vehicle 1:

0 Load(0) -> 11 Load(12) -> 32 Load(59) -> 24 Load(101) -> 47 Load(143) -> 38 Load(191) -> 0 Load(191)

Distance of the route: 1027m

Load of the route: 191

Route for vehicle 2:

0 Load(0) -> 10 Load(39) -> 2 Load(77) -> 29 Load(114) -> 33 Load(162) -> 37 Load(200) -> 0 Load(200)

Distance of the route: 1535m

Load of the route: 200

Route for vehicle 3:

0 Load(0) -> 44 Load(17) -> 48 Load(60) -> 30 Load(109) -> 43 Load(157) -> 12 Load(197) -> 0 Load(197)

Distance of the route: 1124m

Load of the route: 197

Total Distance of all routes: 5072m

Total Load of all routes: 784

---------------------------------------------------------------------------------------------------------------------------

50\_b3.py

---------------------------------------------------------------------------------------------------------------------------

------------------------------------------------------------------------------------------------------------------------------------

50\_b4.py

---------------------------------------------------------------------------------------------------------------------------------