

Format Description of the Instances for the Multi-Zone Picker Routing Problem

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The format of the instances is based on the instances of (Heßler and Irnich, 2024).

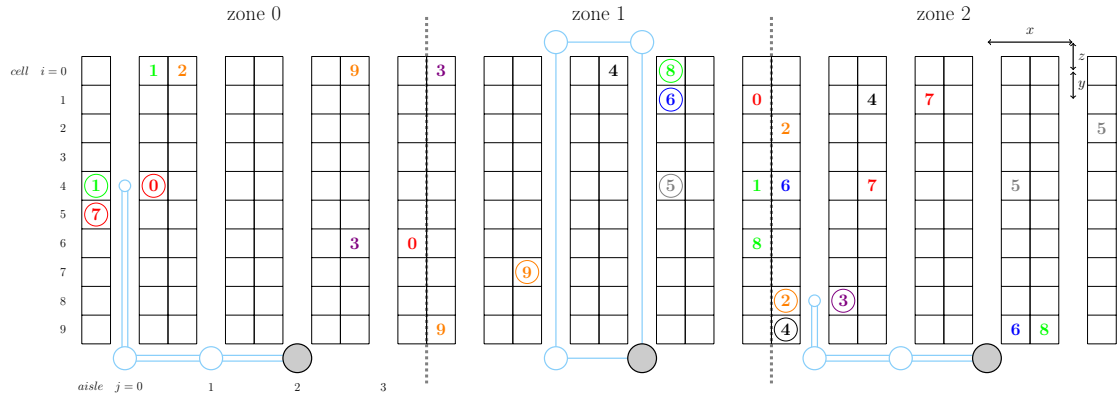


Figure 1: Depicted instance `example.txt` including the optimal solution.

In the following, we describe the depicted instance in Figure 1, which includes the optimal solution. The corresponding instance file is shown here:

```
NAME : example.txt
TYPE : Multi_zone_picker_routing_problem
COMMENT : LUEKE
LAYOUT : single-block
NUM_ZONES : 3
NUM_BLOCKS : 1
NUM AISLES : 12
NUM_CELLS : 10
DISTANCE AISLE_TO AISLE : 3
DISTANCE_CELL_TO_CELL : 1
DISTANCE_TOP_TO_CELL : 1
DISTANCE_BOTTOM_TO_CELL : 1
DISTANCE_TOP_OR_BOTTOM_TO_DEPOT : 0
ZONE_SECTION
NUM AISLES_ZONE_0 : 4
DEPOT AISLE_ZONE_0 : 2
DEPOT_LOCATION_ZONE_0 : bottom
PICKER_CAPACITY_ZONE_0 : 5
SKU_SECTION_ZONE_0
NUM SKUS_ZONE_0 : 8
ID 1 AISLE 0 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 1 AISLE 0 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 0 AISLE 0 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 7 AISLE 0 CELL 5 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 2 AISLE 1 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
```

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ID 9 AISLE 3 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 0 AISLE 3 CELL 6 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 3 AISLE 3 CELL 6 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
NUM_AISLES_ZONE_1 : 4
DEPOT_AISLE_ZONE_1 : 2
DEPOT_LOCATION_ZONE_1 : bottom
PICKER_CAPACITY_ZONE_1 : 5
SKU_SECTION_ZONE_1
NUM_SKUS_ZONE_1 : 10
ID 3 AISLE 0 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 9 AISLE 0 CELL 9 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 9 AISLE 1 CELL 7 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 4 AISLE 2 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 8 AISLE 2 CELL 0 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 6 AISLE 2 CELL 1 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 5 AISLE 2 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 0 AISLE 3 CELL 1 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 1 AISLE 3 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 8 AISLE 3 CELL 6 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
NUM_AISLES_ZONE_2 : 4
DEPOT_AISLE_ZONE_2 : 2
DEPOT_LOCATION_ZONE_2 : bottom
PICKER_CAPACITY_ZONE_2 : 5
SKU_SECTION_ZONE_2
NUM_SKUS_ZONE_2 : 12
ID 2 AISLE 0 CELL 2 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 6 AISLE 0 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 2 AISLE 0 CELL 8 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 3 AISLE 0 CELL 8 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 4 AISLE 0 CELL 9 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 4 AISLE 1 CELL 1 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 7 AISLE 1 CELL 1 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 7 AISLE 1 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ID 5 AISLE 2 CELL 4 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 6 AISLE 2 CELL 9 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 5 AISLE 3 CELL 2 QUANTITY 1 LEFT_RIGHT_HAND_SIDE right
ID 8 AISLE 3 CELL 9 QUANTITY 1 LEFT_RIGHT_HAND_SIDE left
ORDER_SECTION
NUM_ARTICLES : 10
ID 0 QUANTITY 1
ID 1 QUANTITY 1
ID 2 QUANTITY 1
ID 3 QUANTITY 1
ID 4 QUANTITY 1
ID 5 QUANTITY 1
ID 6 QUANTITY 1
ID 7 QUANTITY 1
ID 8 QUANTITY 1
ID 9 QUANTITY 1

```

In Table 1 a detailed description of all instance parameters is listed.

Name	Description
NAME	instance name
TYPE	problem type
COMMENT	authors of the instances or other comments
LAYOUT	warehouse layout
NUM_ZONES	number of zones
NUM_BLOCKS	number of blocks
NUM_AISLES	number of aisles in the warehouse
NUM_CELLS	number of pick positions per rack per aisle
DISTANCE_AISLE_TO_AISLE	distance between neighboring aisles, see value x in Figure 1
DISTANCE_CELL_TO_CELL	distance between neighboring pick positions, see value y in Figure 1
DISTANCE_TOP_TO_CELL	distance between the top cross-aisle and the first cell, see value z in Figure 1
DISTANCE_BOTTOM_TO_CELL	analog to DISTANCE_TOP_TO_CELL for the bottom cross-aisle
DISTANCE_TOP_OR_BOTTOM_TO_DEPOT	distance between the depot and the top or bottom cross-aisle
ZONE_SECTION	beginning of the zone section
NUM_AISLES_ZONE_X	number of aisles in zone X
DEPOT_AISLE_ZONE_X	aisle in which the depot of zone X is located
DEPOT_LOCATION_ZONE_X	depot location of zone X (top or bottom)
PICKER_CAPACITY_ZONE_X	capacity of the picker in zone X
SKU_SECTION_ZONE_X	beginning of the SKU section of zone X
NUM_SKUS_ZONE_X	number of SKUs in zone X
ID	article id
AISLE	aisle number, see j in Figure 1
CELL	cell number, see i in Figure 1
QUANTITY	available or demanded quantity
LEFT_RIGHT_HAND_SIDE	left or right
ORDER_SECTION	beginning of order section
NUM_ARTICLES	number of articles

Table 1: Description of the instance parameters.

References

Heßler, K. and Irnich, S. (2024). Exact solution of the single-picker routing problem with scattered storage. *INFORMS Journal on Computing*.