Decision Management Community's Challenge Feb-2025

"Mr Bates vs The Post Office"

A solution with OpenRules Rule Solver

This challenge is described at https://dmcommunity.org/challenge/challenge-feb-2025/:

Challenge Feb-2025

Mr Bates vs The Post Office

Solutions

The Post Office in DS City has come up with a new measure to limit packages that can be sent under a new flat rate, regardless of weight or volume. The "strap measure" of a box is the length of the longest side plus two times the sum of the two shorter sides. For the new flat rate for sending a packet, the strap measure may not exceed 100 inches.

Your e-commerce client Mr. Bates sells large comforters of 9,000 cubic inches in volume and wants to make use of this new flat rate if possible. Can you design a box that will be large enough to hold these comforters and that can be sent at a flat rate price? Source: InsideOpt

OpenRules Decision Model

As usual with Rule Solver, we start with two tables "Define" and "Solve":

Decision Define
ActionExecute
Decision Tables
DefineVariables
PostConstraints

Decision Solve
ActionExecute
Actions
SetObjective
SolverMinimize
SolverLogSolution

Here we define decision variables:

Decision DefineVariables					
SolverDefineVariables					
Variable Name	**Method**	**Par 1**	**Par 2**	**Par 3**	
"LongSide"	New Variable	"1"	"Strap Measure Max"		Define 3 sides
"ShortSide1"					
"ShortSide2"					
"Sum of Short Sides"	Variable Operator Variable	"ShortSide1"	"+"	"ShortSide2"	Define Sum of Short Sides
"Two times Sum of Short Sides"	Variable Operator Value	"Sum of Short Sides"	"*"	"2"	
"Strap Measure"	Variable Operator Variable	"LongSide"	"+"	"Two times Sum of Short Sides"	Starp Measure = LongSide + Two times Sum of Short Sides
"All Sides"	Add Variable	"LongSide"			Add all sides in an array
"All Sides"		"ShortSide1"			
"All Sides"		"ShortSide2"			
"Volume"	Prod	"All Sides"			Define Volume as a product of all sides

Then we post constraints:

Decision PostConstraints				
SolverPostConstraints				
Constraint Name	**Constraint Type**	**Par 1**	**Par 2**	**Par 3**
"LongSide >= ShortSide1"	Variable Operator Variable	"LongSide"	">="	"ShortSide1"
"LongSide >= ShortSide2"		"LongSide"	">="	"ShortSide2"
"Strap Measure <= 100"	Variable Operator Value	"Strap Measure"	"<="	"Strap Measure Max"
"Volume >= Requested Volume"		"Volume"	">="	"Requested Volume"

And we define the objective “Volume” which we want to minimize under posted constraints:

Decision SetObjective
SolverSetObjective
Objective
"Volume"

To run this decision model, we add the proper test data:

DecisionTest testCases		
#	Define	Define
Test	**Strap Measure Max**	**Requested Volume**
1	100	9,000

Here is the glossary for our decision model:

Glossary glossary			
Variables	**Business Concept**	**Attribute**	**Type**
Strap Measure Max	PostOffice	StrapMeasureMax	int
Requested Volume		requestedVolume	int
Volume		volume	int

After executing this decision model, we receive the following results:

```
Found a solution #1 with objective 9044. Tue Feb 25 12:53:45 EST 2025
Found a solution #2 with objective 9000. Tue Feb 25 12:53:45 EST 2025
Optimal solution is found. Objective: 9000
Solution #2:
        LongSide[30] ShortSide1[15] ShortSide2[20] Sum of Short Sides[35]
Two times Sum of Short Sides[70] Strap Measure[100] Volume[9000]
*** Execution Profile ***
Number of Choice Points: 493
Number of Failures: 490
Execution time: 50 msec

      Solve #3 (B15:B15)
        THEN 'Actions'  = SolverLogSolution
Solution #2:
        LongSide[30] ShortSide1[15] ShortSide2[20] Sum of Short Sides[35]
Two times Sum of Short Sides[70] Strap Measure[100] Volume[9000]
```

Thus, Mr. Bates may get a flat rate using the box 30 x 15 x 20 with a volume of 9000.