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Whiskas mini problem:

linear programming

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Decision Support Analysis

Group 351

May 27, 2023

1. **What are the two parameters that the LpProblem function implements?**

Main ingredients cost and total nutritional contribution. But only the chicken and beef percentage are presented as variables or parameters.

2. **Is it mandatory to name the prob variable as prob?**

No, it is only to recognize that that is the problem or function we are trying to solve.

3. **What are LpContinous and LpInteger used for**

   Lp continuous refers to the type of variable used in LP problems where the variable can take on any real value in a given interval. LP variables are often represented as continuous variables when there are no bounds on their values.

   On the other hand, LpInteger refers to the variable type used in LP problems where the variables must be integers. In some optimization problems, the variables must be integers because they represent indivisible quantities or because they have a special interpretation as discrete quantities.

4. **Explain and copy the section of code that defines the objective function.**

prob += 0.013 * x1 + 0.008 * x2, "Total Cost of Ingredients per can"

- objective function
- terms: represent the coast per can
- cost rates: represent quantities that can be adjusted during the optimization process
- means optimization problem of a linneal problem

Explain it

The code defines a optimization problem which needs to be solved with a linneal programing approach, the objective function calculates the "Total Cost of Ingredients per can"

5. **Explain and copy the section of code that defines the constraints.**

prob += x1 + x2 == 100, "PercentagesSum"

prob += 0.100 * x1 + 0.200 * x2 >= 8.0, "ProteinRequirement"

prob += 0.080 * x1 + 0.100 * x2 >= 6.0, "FatRequirement"

prob += 0.001 * x1 + 0.005 * x2 <= 2.0, "FibreRequirement"

prob += 0.002 * x1 + 0.005 * x2 <= 0.4, "SaltRequirement"

Explain it.

prob += x1 + x2 == 100, "SumOfPercentages": is a constraint that guarantees that the sum of x1 and x2 is equal to 100. It imposes that the percentages must be correctly distributed.

prob += 0.100 * x1 + 0.200 * x2 >= 8.0, "ProteinRequirement". This constraint sets a requirement for the amount of protein. It indicates that the product of 0.100 multiplied by x1 (representing the protein content of ingredient 1) plus 0.200 multiplied by x2 (representing the protein content of ingredient 2) must be greater than or equal to 8.0. Ensures that the combined protein content of the ingredients meets or exceeds the specified 8.0.

prob += 0.080 * x1 + 0.100 * x2 >= 6.0, "FatRequirement" : is similar to the previous restriction, it sets a requirement for the amount of fat. It specifies that the product of 0.080 multiplied by x1 plus 0.100 multiplied by x2 must be greater than or equal to 6.0.

prob += 0.001 * x1 + 0.005 * x2 <= 2.0, "FibreRequirement": It indicates that the product of 0.001 multiplied by x1 plus 0.005 multiplied by x2 must be less than or equal to 2.0. The restriction states that the combined fiber content of the ingredients shall not exceed the specified maximum value.

prob += 0.002 * x1 + 0.005 * x2 <= 0.4, "SaltRequirement": This restriction sets an upper limit for the amount of salt. It indicates that the product of 0.002 multiplied by x1 plus 0.005 multiplied by x2 must be less than or equal to 0.4.

6. **Is this a minimization or maximization problem?**

This is a minimization problem, since it is well established from the beginning that they want to meet the nutritional requirements, while making production cheaper.

7. **Run the WhiskasModel1.py code. (no need to make changes, just runt it as is) What is the value of the following variables Status: BeefPercent = ChickenPercent = Total Cost of Ingredients per can =**

According to the run through of the program, to achieve an optimal production, the can should have 66% of beef and 34% of chicken, leaving a total cost of ingredients per can of less than a dollar, only $0.97.