CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Computing@CIT

DECISION ANALYTICS.

Lab10: Linear Programming

BACKGROUND.

This exercise you will implement two models that can be solved using linear programming. First, you will look at the *diet problem* and compare the linear programming solution to the integer linear programming solution. In task 3 you will also implement the *transport problem* as linear programming model.

Task 1 (diet problem).

Let's assume a farmer can feed the animals using two different products, which have different nutritional composition and come at different costs as follows:

Feed	Energy	Protein	Calcium	Cost
A	2	5	4	9
B	4	3	1	7

In order to achieve the required quality of meat the farmer needs to ensure that the following minimum nutritional requirements are met:

Energy	Protein	Calcium
12	15	8

Define a Linear Program that optimises the cost of the mixture of feeds while at the same time meeting the minimum nutritional requirements.

Task 2 (mixed inter programming).

Let's now assume that the above problem is a once-off decision only, so it is not about determining the optimal mixture of feed products but about determining how many units of

each to buy to satisfy demand. The problem then is an Integer Linear Program, with the decision variables being integers.

Use a Mixed Integer Programming solver to solve the above problem and observe the difference.

Task 3 (transport problem).

Let's assume there are two energy suppliers connected to the grid delivering the following amount of energy

	Supply
Supplier A	6
Supplier B	9

This energy is to meet the consumer demand as follows

	Demand
Consumer A	8
Consumer B	5
Consumer C	2

Let's further assume the DSO of the electricity grid charges the following transmission fees

	Consumer A	**Consumer B**	**Consumer C**
Supplier A	**5**	**5**	**3**
Supplier B	**6**	**4**	**1**

Define a linear program that optimises the transmission costs between energy suppliers and consumers and determine the optimal energy mix for each consumer.