CASE 4.1 Blending Aviation Gasoline at Jansen Gas

Jansen Gas creates three types of aviation gasoline (avgas), labeled A, B, and C. It does this by blending four feedstocks: Alkylate; Catalytic Cracked Gasoline; Straight Run Gasoline; and Isopentane. Jansen's production manager, Dave Wagner, has compiled the data on feedstocks and gas types in Tables 4.6 and 4.7. Table 4.6 lists the availabilities and values of the feedstocks, as well as their key chemical properties, Reid vapor pressure, and octane rating. Table 4.7 lists the gallons required, the prices, and chemical requirements of the three gas types.

Table 4.6 Data on Feedstocks

Feedstock	Alkylate	CCG	SRG	Isopentane
Gallons available (1000s)	140	130	140	110
Value per gallon	$4.50	$2.50	$2.25	$2.35
Reid vapor pressure	5	8	4	20
Octane (low TEL)	98	87	83	101
Octane (high TEL)	107	93	89	108

Table 4.7 Data on Gasoline

Gasoline	A	B	C
Gallons required (1000s)	120	130	120
Price per gallon	$3.00	$3.50	$4.00
Max Reid pressure	7	7	7
Min octane	90	97	100
TEL level	Low	High	High

Note that each feedstock can have either a low or a high level of TEL, which stands for tetraethyl lead. This is measured in units of milliliters per gallon, so that a low level might be 0.5 and a high level might be 4.0. (For this problem, the actual numbers do not matter.) As indicated in Table 4.6, the TEL level affects only the octane rating, not the Reid vapor pressure. Also, gas A is always made with a low TEL level, whereas gas types B and C are always made with a high TEL level.

As indicated in Table 4.7, each gasoline has two requirements: a maximum allowable Reid vapor pressure and a minimum required octane rating. In addition to these requirements, the company wants to ensure that the amount of gas A produced is at least as large as the amount of gas B produced.

Dave believes that Jansen can sell all of the gasoline it produces at the given prices. If any feedstocks are left over, they can be sold for the values indicated in Table 4.6. He wants to find a blending plan that meets all the requirements and maximizes the revenue from selling gasoline and leftover feedstocks. To help Dave with this problem, you should develop an LP optimization model and then use PulP in python to find the optimal blending plan.