Dakota Benders Example

Dakota furniture company makes desk, tables and chairs from three types of input: lumber and two types of labour: finishing and carpentry. They are faced with a two-stage recourse problem in the following way: They need to purchase their input factors before demand for the different products are known. However, as demand is revealed, they are free to divide the input factors between the different products in a way that maximizes their income, given the availability of inputs.

The first stage problem is thus to determine how much lumber to buy, and how much finishing and carpentry-skilled labour to hire. The random variable is demand quantities, and the second stage problem is to figure out how many desks, tables and chairs to produce, recognizing that production opportunities are limited by the inputs bought in stage 1.

The parameters of the problem are as follows:

Table 1: Cost of input factors and input factor requirements

Resource	Costs	Input requirements		
	$	Desk	Table	Chair
Lumber (bd ft)	2	8	6	1
Finishing (hrs)	4	4	2	1.5
Carpentry (hrs)	5.2	2	1.5	0.5

Table 2: Demand scenarios and sell prices

	Demand scenarios			Sell price
	Low	Most likely	High	$
Desks	50	150	250	60
Tables	20	110	250	40
Chairs	200	225	500	10
Probability	0.3	0.4	0.3	