

Primal dual pair of a blending problem

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A student is deciding what to purchase from a bakery for a tasty afternoon snack.

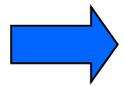
There are two choices of food: Brownies which costs 50 cc and mini Cheesecakes which costs 80 cc. The bakery is service oriented and is happy to let the student purchase a fraction of an item if he/she wishes.

The bakery requires 3 oz (ounces) of chocolate to make each brownie, no chocolate is needed for Cheesecake; 2 oz of sugar are needed for each brownie and 4 oz for each cheesecake; 2 oz of cream cheese for each brownie and 5 for each cheesecake.

	chocolate	sugar	Cream cheese	Cost
Brownie	3	2	2	50
cheesecake	0	4	5	80



Being health-conscious the student has decided that he/she needs at least 6 oz chocolate in the snack, along with at least 10 oz of sugar and at least 8oz of cream cheese.



The student wishes to optimize his/her purchase by finding the least expensive combination of brownies and cheesecakes that meet the requirements.

	chocolate	sugar	Cream cheese
Min Requiriments	6	10	8

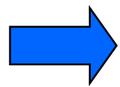


	variables
Brownie	x_1
cheesecake	x_2

$$\begin{array}{rcl}
 \min & 50x_1 & +80x_2 \\
 & 3x_1 & \geq 6 \\
 & 2x_1 & +4x_2 \geq 10 \\
 & 2x_1 & +5x_2 \geq 8 \\
 & & x_1, x_2 \geq 0
 \end{array}$$



We now adopt the perspective of the wholesaler who supplies the baker with the chocolate, sugar, and cream cheese needed to make the goodies. The baker informs the supplier that he intends to purchase at least 6 oz of chocolate, 10 oz of sugar and 8 oz of cream cheese.



He also shows the supplier all the other data

	chocolate	sugar	cream cheese	Sales price of the bakery
brownie	3	2	2	50
cheesecake	0	4	5	80
Minimum demand	6	10	8	



The supplier wants to decide:

How can I set the prices pr oz of chocolate, sugar and cream cheese so that the baker will buy from me and so that I will max my revenue ?



	chocolate	sugar	cream cheese
Sales prices	u_1	u_2	u_3

$$\begin{aligned}
 \max \quad & 6u_1 + 10u_2 + 8u_3 \\
 & 3u_1 + 2u_2 + 2u_3 \leq 50 \\
 & 4u_2 + 5u_3 \leq 80 \\
 & u_1, u_2, u_3 \geq 0
 \end{aligned}$$