

Opgave 3: oplossing

Oefening 1-

6a. Raw material shadow price = 50 cents

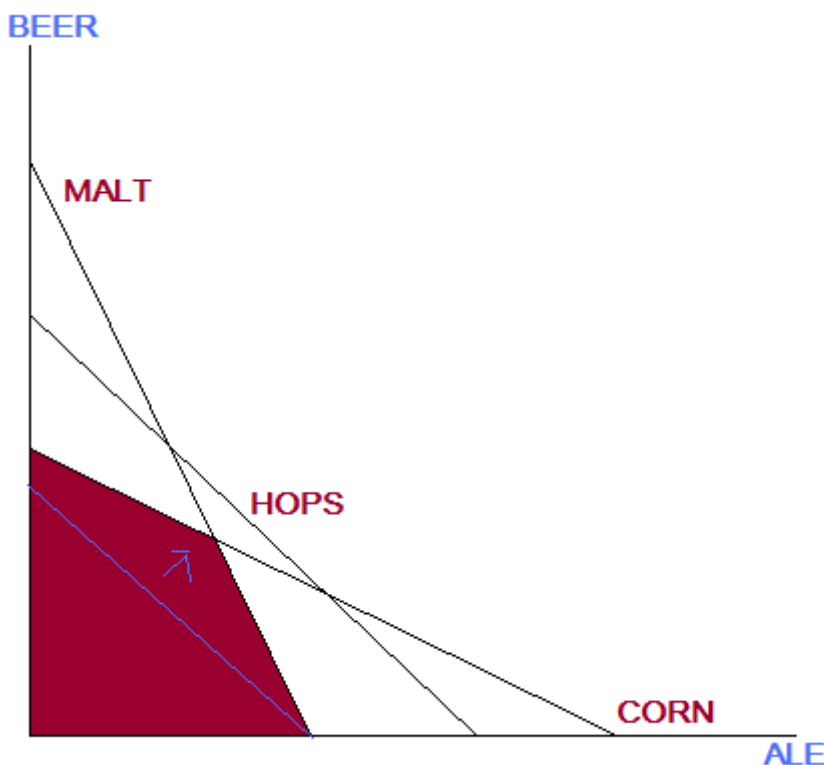
6b. Row 4 Shadow Price + 1 = \$1.75

6c. 6 + reduced cost for x_1 = \$6.25

6d. change within the allowable range; $97.5 + 10(.75) = \$105$

6e. change within the allowable range; All decision variables are same. Profit increases by $2(7.5) = 15$, so new profit is $97.5 + 15 = \$112.50$

Oefening 2-



5. Let p_A = price of ale and p_B = price of beer

5a. Current basis remains optimal if isoprofit line has slope between malt constraint and corn slope. Thus current basis remains optimal if $-2 \leq -p_A/50 \leq -.5$ or $25 \leq p_A \leq 100$.

5b. Current basis remains optimal if $-2 \leq -40/p_B \leq -.5$ or

$20 \leq p_B \leq 80$.

5c. Optimal solution is where corn and malt constraints are binding. If we change amount of available corn we lose feasibility if corn constraint moves below (20, 0) (using 20 bushels of corn) or moves beyond hops-malt intersection (10, 20) (using 50 pounds of corn). Thus current basis remains optimal for

$20 \leq \text{Corn availability} \leq 50$. If $40 + \Delta$ bushels of corn are available, then new solution is where $A + 2B = 40 + \Delta$ and $2A + B = 40$, or $A = 40/3 - \Delta/3$ and $B = 40/3 + 2\Delta/3$, and $z = 1200 + 20\Delta$. Thus corn shadow price is \$20.

5d. Current basis remains optimal until hops constraint is moved in beyond corn-malt intersection of $(40/3, 40/3)$. At this point $80/3$ pounds of hops are used. Thus current basis remains optimal for Hops availability $\geq 80/3$. If $30 + \Delta$ pounds of hops are available, decision variables and z-value remain unchanged, so shadow price of hops constraint is \$0.

5e. Current basis remains optimal until malt constraint hits $(0, 20)$ (using 20 pounds of malt) or where the intersection of the corn and malt constraint lies on the right hand side of the hops constraint. Thus current basis remains optimal for $20 \leq \text{Available malt} \leq 50$. If $40 + \Delta$ pounds of malt are available new optimal solution is where $A + 2B = 40$ and $2A + B = 40 + \Delta$ or $A = 40/3 + 2\Delta/3$ and $B = 40/3 - \Delta/3$. This yields $z = 1200 + 10\Delta$, so malt constraint has a shadow price of \$10.

5f. Corn Shadow Price = \$1.25 Hops Shadow price = \$0 Malt Shadow Price = \$0.625. This is because an extra ounce of a crop will increase z by 1/16 of the amount by which an extra pound of the same crop will increase z.

Oefening 3-

Duaal:

Min $y_1 + y_2$

st $1/40 y_1 + 1/50 y_2 \geq 3$

$1/60 y_1 + 1/50 y_2 \geq 2$

Alle $y \geq 0$

Stel dat iemand de paint shop en de assembly shop wil overkopen. Dan moet die persoon de prijs bepalen die hij ervoor wil geven. y_1 is dan de prijs die gegeven wordt voor de paint shop, en y_2 de prijs die gegeven wordt voor de assembly shop. De koper wil deze prijs minimaliseren. Die prijs moet echter hoog genoeg zijn zodat de verkoper zou willen verkopen. Dit wil zeggen dat de koper minstens 300 dollar moet betalen voor een combinatie van beide shops omdat de verkoper met die combinatie een truck kan produceren en verkopen voor 300 dollar. Om een truck te maken is er nood aan $1/40$ van de paint shop en $1/50$ van de assembly shop. $1/40$ ste van de prijs voor de paint shop + $1/50$ ste van de prijs voor de assembly shop moet dus minstens 300 dollar opleveren. Dezelfde redenering geldt voor de auto's.

Oefening4-

Zie bijgevoegde excel file voor de oplossing.

14a. Negative Dual Prices for rows 6 and 8 tell us that Type 1 and 3 DRG's are costing us profit. This implies that Type 2 and 4 DRG's should be increased, if possible.

14b. Bed-days and Nursing hours are in excess supply. Drugs and diagnostic services should be expanded.

14c. Since there is a surplus of nursing hours at the current nursing salary, there is no need to hire additional nurses.

Oefening 5-

LP OPTIMUM FOUND AT STEP 1

OBJECTIVE FUNCTION VALUE

1) 14.00000

VARIABLE	VALUE	REDUCED COST
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X1	3.500000	0.000000
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X2	0.000000	0.000000
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ROW	SLACK OR SURPLUS	DUAL PRICES
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2)	75.000000	0.000000
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3)	0.000000	-2.000000
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NO. ITERATIONS= 1