AARHUS UNIVERSITET, SCIENCE, DATALOGI

Assignment Title

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Vi har følgende variabler og konstanter:

x_i = vægt for produkt i, og den eneste variable
p_i = pris for produkt i
a_{Pi} = proteindhold i produkt i
a_{Fi} = fedtindhold i produkt i
a_{Ki} = kulhydratindt i produkt i
a_{Ei} = samlede energi i KJ for produkt i

vi har udarbejdet ud fra følgende varer:

	A	B	C	D	E	F	G
1		Kylhudrat	Protein	fedt	pris	vægt	KJ
2	Rugbrød	40.0	6.5	0.9	27.95	1000.0	879.0
3	Salt køb	1.0	18.0	2.0	14.75	140.0	394.0
4	Skinke	1.0	18.0	8.0	7.95	150.0	603.0
5	Frilands Æg	1.0	12.0	11.0	17.50	390.0	628.0
6	Banankage	57.0	5.1	26.0	27.95	350.0	1993.0
7	Kalkunschnitzler	0.0	21.3	2.2	49.95	500.0	445.0
8	Kyllingebryst	0.5	21.0	3.0	64.95	600.0	444.0
9	Minimælk	4.8	3.5	0.5	7.95	1000.0	167.0
10	Ost	0.5	23.0	16.0	60.95	700.0	1344.0
11	Ketchup	28.9	1.5	0.2	36.50	580.0	528.0
12	Appelsin Sorbet	30.4	0.8	0.4	48.50	0.725	532.0
13	Stripleon	0.0	18.2	21.3	89.95	360.0	1097.0
14	Laksefillet	0.0	19.9	10.9	62.95	400.0	741.0
15	Kærgården	0.6	0.5	75.0	14.95	200.0	2801.0
16	Margarine	0.0	0.0	80.0	22.95	700.0	3014.0
17	Skalrejer	0.0	23.0	1.3	44.95	500.0	435.0
18	Red bull 4pack	11.0	0.0	0.0	52.95	1000.0	193.0
19	Yogurt	1.9	4.3	1.5	16.95	1000.0	172.0
20	Bacon	1.0	15.0	23.0	17.95	200.0	1118.0

med følgende objective function og constraints:

Max		$\zeta = \sum_{i=1}^{n} x_i * p_i$
Engergi	s.t.	$10000 \leq \sum_{i=1}^{n} x_i * a_{Ei}$
Protein		$\sum_{i=1}^{n} x_i * a_{Pi} * 17 \leq 0.25 * \sum_{i=1}^{n} x_i * a_{Ei}$
		$0.10 * \sum_{i=1}^{n} x_i * a_{Ei} \leq \sum_{i=1}^{n} x_i * a_{Pi} * 17$
Kulhydrater		$\sum_{i=1}^{n} x_i * a_{Ki} * 17 \leq 0.60 * \sum_{i=1}^{n} x_i * a_{Ei}$
		$0.55 * \sum_{i=1}^{n} x_i * a_{Ei} \leq \sum_{i=1}^{n} x_i * a_{Ki} * 17$
Fedt		$\sum_{i=1}^{n} x_i * a_{Ki} * 38 \leq 0.30 * \sum_{i=1}^{n} x_i * a_{Ei}$
		$0.2 * \sum_{i=1}^{n} x_i * a_{Ei} \leq \sum_{i=1}^{n} x_i * a_{Fi} * 38$

Nogle af disse constraints er vendt rundt når de indsættes i programmet. Hvilket giver følgende input, results i terminalen, og resultat ift fødevare

```
max -28x1-15x2-8x3-18x4-28x5-50x6-65x7-8x8-61x9-37x10-49x11-90x12-63x13-15x14-23x15-45x16-53x17-17x18-18x19

add
-880x1-394x2-603x3-628x4-1993x5-445x6-444x7-167x8-1344x9-528x10-532x11-1097x12-741x13-2801x14-3014x15-435x16-193x17-172x18-1118x19 < -10000

add
-22000x1-9850x2-15075x3-15700x4-49824x5-11125x6-11100x7-4175x8-33600x9-13200x10-13300x11-27425x12-18525x13-70025x14-75350x15-10875x16-4825x17-4300x18-27950x19 <
-11900x1-3400x10-30600x2-30600x3-20400x4-8500x5-35700x6-35700x7-6800x8-39100x9-1700x11-30600x12-34000x13-1700x14-39100x16-6800x18-8500x19

add
8800x1+3940x2+6030x3+6280x4+19930x5+4450x6+4440x7+1670x8+13440x9+5280x10+5320x11+10970x12+7410x13+28010x14+30140x15+4350x16+1930x17+1720x18+11180x19 <
11900x1+30600x2+30600x3+20400x4+8500x5+35700x6+35700x7+6800x8+39100x9+3400x10+1700x11+30600x12+34000x13+1700x14+39100x16+6800x18+25500x19

add
-52800x1-32640x2-36180x3-37680x4-119580x5-26700x6-26640x7-10020x8-80640x9-31680x10-31920x11-65820x12-44460x13-168060x14-180840x15-26100x16-11580x17-10320x18-67080x19 < -68000 x1 x2-1700 x3-1700 x4-96900 x5-1700 x8-8500 x9 -1700 x10-49300 x11-51000 x12-1700 x15-18700 x17-3400 x18-1700 x19-1700

add
48400x1+21670x2+33165x3+34540x4+109615x5+24475x6+24420x7+9185x8+73920x9+29040x10+29260x11+60335x12+40755x13+154055x14+165770x15+23925x16+10615x17+9460x18+61490x19 < 68000 x1 x2+1700 x3+1700 x4+96900 x5+1700 x8+8500 x9 +1700 x10+49300 x11+51000 x12+1700 x15+18700 x17+3400 x18+1700 x19+1700

add
-26400x1-11820x2-18090x3-18840x4-59790x5-13350x6-13320x7-5010x8-40320x9-15840x10-15960x11-32910x12-22230x13-84030x14-90420x15-13050x16-5790x17-5160x18-33540x19 < -3400 x1 -6800 x2-27200 x3-37400 x4-95200 x5-10200 x6-3400 x7-54400 x8 -71400 x12-37400 x13-255000 x14-272000 x15-3400 x16-6800 x18-78200 x19

add
17600x1+7880x2+12060x3+12560x4+39860x5+8900x6+8880x7+3340x8+26880x9+10560x10+10640x11+21940x12+14820x13+56020x14+60280x15+8700x16+3860x17+3440x18+22360x19 < 3400 x1 x2+27200 x3+37400 x4+95200 x5+10200 x6+3400 x7+54400 x8 +71400 x12+37400 x13+255000 x14+272000 x15+3400 x16+6800 x18+78200 x19+6800
```

```
Max -35925330/170833 - 682797/32458270 x20 - 1269/32458270 x24 - 183560821/32458270 x2 - 61543/162291350 x25 - 5142687/190931 x14 - 7713856/190931 x6 - 10091255/190931 x7 - 4488584/190931 x8 - 2503376/190931 x4 - 4000973/190931 x10 - 454901/14687 x11 - 15634236/190931 x12 - 10455047/190931 x13 - 3817709/190931 x9 - 6657591/190931 x15 - 6324637/190931 x16 - 8864599/190931 x17 - 2718975/190931 x18 - 2626220/190931 x19
s.t.
x5 = 838109/341666 + 32067/129833080 x20 + 6437/649165400 x24 + 134643763/649165400 x2 - 581/32458270 x25 - 849481/381862 x14 + 72235/381862 x6 + 59198/190931 x7 - 162502/190931 x8 - 61745/381862 x4 + 161995/381862 x10 - 1305/29374 x11 - 331207/381862 x12 - 19261/381862 x13 + 396551/381862 x9 - 904171/381862 x15 + 115525/381862 x16 - 4620/190931 x17 - 2243/190931 x18 - 184315/381862 x19
x21 = 40268450791/341666 + 1551522233/129833080 x20 + 627091263/649165400 x24 - 196640161463/649165400 x2 - 13653387/16229135 x25 + 15211128581/381862 x14 - 1374700735/381862 x6 + 387466002/190931 x7 - 7435127498/190931 x8 + 1490909045/381862 x4 + 16506625505/381862 x10 - 20240595/29374 x11 - 15140033693/381862 x12 + 869414561/381862 x13 + 28851678749/381862 x9 + 17207503471/381862 x15 - 837581425/381862 x16 - 80265980/190931 x17 - 15503457/190931 x18 + 10033314015/381862 x19
x1 = 772290/170833 + 29363/64916540 x20 + 47/32458270 x24 - 8829507/32458270 x2 + 16189/649165400 x25 + 614761/190931 x14 - 46663/190931 x6 - 78827/190931 x7 + 222816/190931 x8 + 43217/190931 x4 - 113462/190931 x10 - 9806/14687 x11 + 91111/190931 x12 + 19505/190931 x13 - 289966/190931 x9 + 649654/190931 x15 - 76901/190931 x16 - 46472/190931 x17 - 5370/190931 x18 + 132625/190931 x19
x23 = 50000 + 5 x20 - x24 + 9002 x2
x22 = 322959150/10049 + 1164535/381862 x20 - 368881/381862 x24 + 115591481/381862 x2 + 321263/381862 x25 - 7605139550/190931 x14 + 687314250/190931 x6 - 387525200/190931 x7 + 7435290000/190931 x8 - 745423650/190931 x4 - 8253393750/190931 x10 + 10120950/14687 x11 + 7570182450/190931 x12 - 434697650/190931 x13 - 14426037650/190931 x9 - 8603299650/190931 x15 + 418732950/190931 x16 + 80270600/190931 x17 + 15505700/190931 x18 - 1770737850/190931 x19
x3 = 641921/341666 + 23623/129833080 x20 - 22647/649165400 x24 - 611470753/649165400 x2 + 739/32458270 x25 - 760463/381862 x14 - 384355/381862 x6 - 221206/190931 x7 + 159043/190931 x8 - 319757/381862 x4 - 538617/381862 x10 + 7019/29374 x11 + 134059/381862 x12 - 462523/381862 x13 - 1315437/381862 x9 - 816435/381862 x15 - 432845/381862 x16 + 21979/190931 x17 - 39211/190931 x18 - 485907/381862 x19
x26 = 106800 + 10 x20 - 6799 x2 - x25
```

	antal 100g	protein	fedt	kulhydrater	KJ	pris
Rugbrød	4.5	29,25	4,05	160	3371,15	12,5775
Skinke	1.87	33,66	14,96	1,87	1172,49	9,911
Banakage	2.45	12	63,7	139,65	5007,065	19,565
	i alt				9550,705	42,0535
		75	184,881176	301,52		
	fordeling	0,13421889	0,32908356	0,53669755		