

1. A = units frisky pup produced/sold

B = units husky hound produced/sold

$$\text{Production Cost of Frisky Pup} = (1A)*1 + (1.5A)*2 = 4$$

$$\text{Production Cost of Husky Hound} = (2B)*1 + (1B)*2 = 4$$

$$\text{Profit for Frisky Pup} = (7-4-1.4)A = 1.6A$$

$$\text{Profit for Husky Hound} = (6-4-.6)B = 1.4B$$

$$\text{Total Profit} = 1.6A + 1.4B$$

$$\text{Objective: Max}(1.6A + 1.4B)$$

Constraints:

$$0 \leq A \leq 110,000 \text{ (max of 110,000 units of Frisky Pup packaged/month)}$$

$$0 \leq B$$

$$A + 2B \leq 240,000 \text{ (240,000 pounds cereal available)}$$

$$1.5A + B \leq 180,000 \text{ (180,000 pounds meat available)}$$

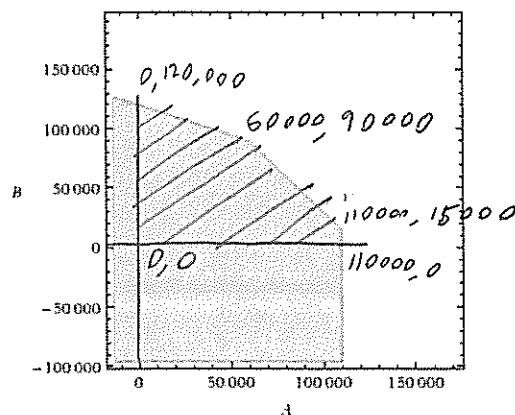
Input interpretation:

$$A \leq 110\,000$$

plot $A + 2B \leq 240\,000$

$$1.5A + B \leq 180\,000$$

Inequality plot



max profit at $(60,000, 90,000)$
 $= \$222,000$

2. variables:

x_1 = units tomato, x_2 = units lettuce, x_3 = units spinach, x_4 = units carrots,
 x_5 = units oil

constraints:

$x_1, x_2, x_3, x_4, x_5 \geq 0$ (all amounts ≥ 0)

$x_1 \cdot 0.85 + x_2 \cdot 1.63 + x_3 \cdot 12.79 + x_4 \cdot 8.38 + x_5 \cdot 0.00 \geq 15$ (at least 15 protein)

$x_1 \cdot 0.33 + x_2 \cdot 0.2 + x_3 \cdot 1.58 + x_4 \cdot 1.39 + x_5 \cdot 100 \geq 2$ (at least 2 fat)

$x_1 \cdot 0.33 + x_2 \cdot 0.2 + x_3 \cdot 1.58 + x_4 \cdot 1.39 + x_5 \cdot 100 \leq 6$ (at most 6 fat)

$x_1 \cdot 4.65 + x_2 \cdot 2.37 + x_3 \cdot 73.68 + x_4 \cdot 80.70 + x_5 \cdot 0 \geq 4$ (at least 4 carbs)

$x_1 \cdot 9 + x_2 \cdot 8 + x_3 \cdot 7 + x_4 \cdot 506.4 + x_5 \cdot 0 \leq 100$ (at most 100 sodium)

$x_2 + x_3 - x_1 - x_4 - x_5 \leq 0$ (less than 50% greens)

objective: minimize ($x_1 \cdot 21 + x_2 \cdot 17 + x_3 \cdot 370 + x_4 \cdot 345 + x_5 \cdot 883$)

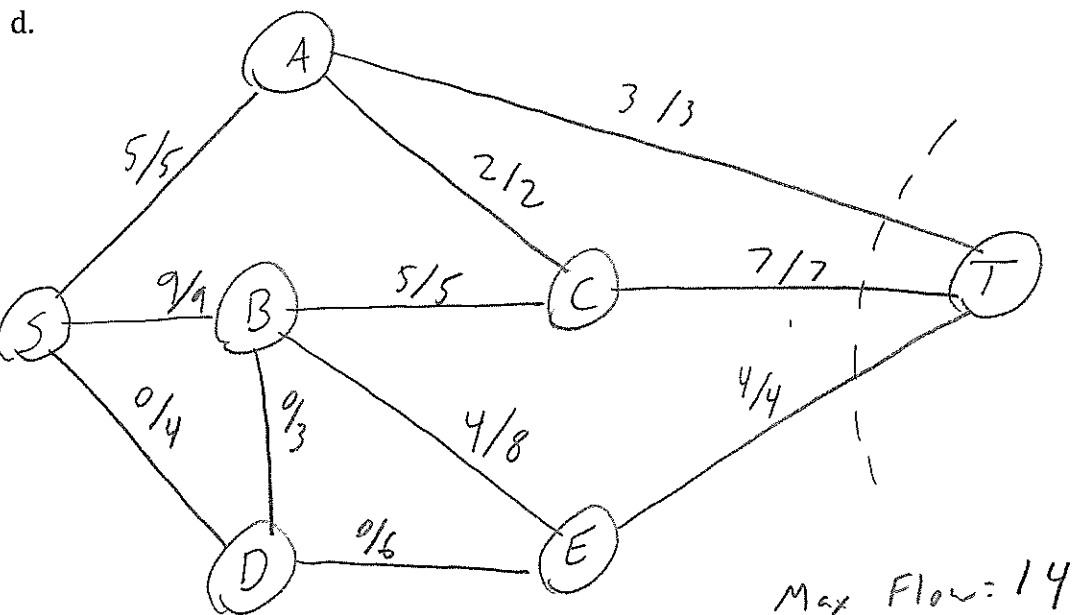
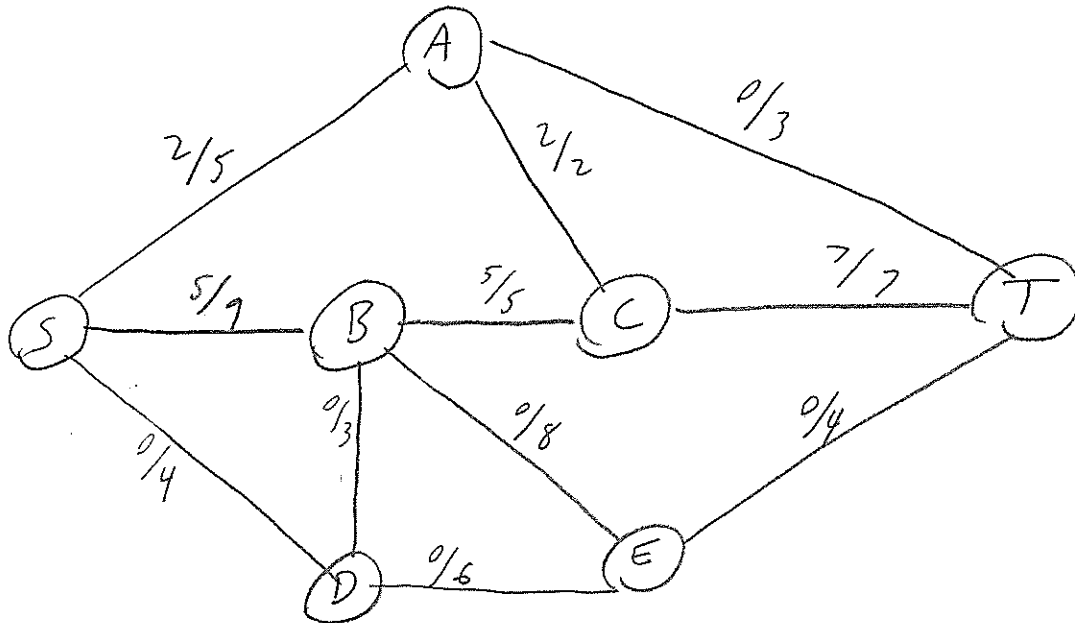
Solution: 588.4 grams tomato, 584.8 grams lettuce, 3.6 grams spinach, 0 grams carrot, 0 grams oil;

236.5 calories, 15 grams protein, 3.17 grams fat, 43 grams carbohydrates, 100 milligrams sodium

Solved with glpsol (GLPK):

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↑ donovanjamesguelde -- bash -- 80x24
A: min|a[ij]| = 2.000e-01 max|a[ij]| = 5.064e+02 ratio = 2.532e+03
GM: min|a[ij]| = 2.071e-01 max|a[ij]| = 4.828e+00 ratio = 2.331e+01
EQ: min|a[ij]| = 4.407e-02 max|a[ij]| = 1.000e+00 ratio = 2.269e+01
Constructing initial basis...
Size of triangular part is 6
0: obj = 0.000000000e+00 infeas = 6.420e-01 (0)
* 4: obj = 4.299853372e+02 infeas = 0.000e+00 (0)
* 5: obj = 2.364672216e+02 infeas = 0.000e+00 (0)
OPTIMAL LP SOLUTION FOUND
Time used: 0.0 secs
Memory used: 0.1 Mb (119058 bytes)
Display statement at line 44
objVal.val = 236.467221644121
x1.val = 5.88449531737773
x2.val = 5.8480749219563
x3.val = 0.0364203954214361
x4.val = 0
x5.val = 0
15
3.16904266389178
43.9062955254943
100
Model has been successfully processed
rgnt2-71-40-dhcp:~ donovanjamesguelde$
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3. a. Augmenting Path $S \rightarrow B \rightarrow C \rightarrow T$, flow rate of 5 (B \rightarrow C has capacity 5, smallest in path)
b. Can increase this path by 2 (C \rightarrow T is currently rate=5, capacity=7)
c.



"On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance."

