

A nutritionist working for NASA must meet certain nutritional requirements and yet keep weight to a minimum. She is considering a combination of two foods that are packaged in tubes. Each tube of food A contains four units of protein, two units of carbohydrates, two units of fats and weighs three pounds. Each tube of food B contains three units of protein, six units of carbohydrates and one unit of fat, and weighs two pounds. The mission requirements call for forty-two units of protein, thirty units of carbohydrates, and eighteen units of fat. How many tubes of each food should be taken to minimize weight?

A nutritionist working for NASA must meet certain nutritional requirements and yet keep **weight** to a **minimum**.

She is considering a combination of two foods that are packaged in tubes.

Each tube of food A contains **four units of protein**, **two units of carbohydrates**, **two units of fats** and **weighs three pounds**.

Each tube of food B contains **three units of protein**, **six units of carbohydrates** and **one unit of fat**, and **weighs two pounds**.

The mission requirements call for **forty-two units of protein**, **thirty units of carbohydrates**, and **eighteen units of fat**.

How many tubes of each food should be taken to **minimize weight**?

Objective function:

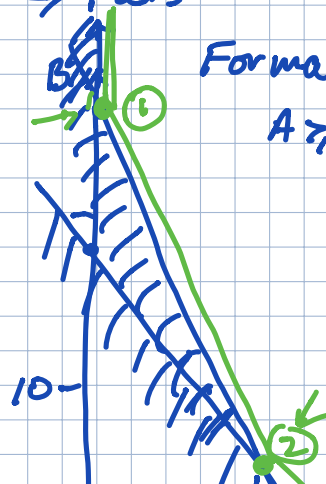
$$\text{Minimize weight} = 3A + 2B$$

subject to:

				"at least"	
				A-int	B-int
→ Protein	$4A + 3B$	≥ 42		10.5	14
→ Carbs	$2A + 6B$	≥ 30		15	5
→ Fats	$2A + B$	≥ 18		9	18

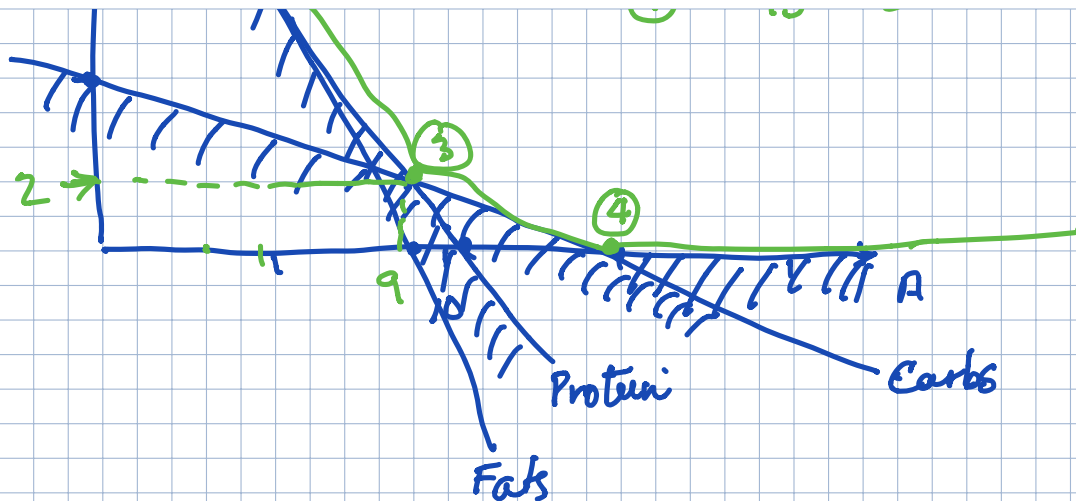
Formal constraints:

$$A \geq 0 \quad B \geq 0$$



	A	B	weight
①	0	18	$3 \cdot 0 + 2 \cdot 18 = 36$
②	6	6	30
③	9	2	31.4
④	15	0	45

Feasible Set



$$\begin{array}{rcl}
 \textcircled{2} & 4A + 3B & = 42 \\
 - & 2A + B & = 18 \\
 \hline
 & 4A + 2B & = 36 \\
 & 0 & B = 6 \\
 & 2A + 6 & = 18 \\
 & 2A & = 12 \\
 & A & = 6
 \end{array}$$

$$\begin{array}{rcl}
 \textcircled{3} & 4A + 3B & = 42 \\
 - & 2A + 6B & = 30 \\
 \hline
 & 4A + 12B & = 60 \\
 & -9B & = -18 \\
 & B & = 2 \\
 & 2A + 12 & = 30 \\
 & 2A & = 18 \\
 & A & = 9
 \end{array}$$

A: Take 6 tubes of A and 6 of B
to achieve the mean wt of 30 lbs.