**How to Answer 2.C.2. Q 3**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Food** | **Protein** | **Fat** | **Carbohydrates** | **Fibre** | **Cost** | **Mixture** |
| 1 Scoop of FoodO | 12g | 4g | 24g | 5g | $2 | X |
| 1 Scoop of Petmix | 4g | 8g | 16g | 5g | $1 | Y |
|  | $$\geq 96$$ | $$\geq 80$$ | $$\geq 288$$ | $$\leq 100$$ |  |  |

(a)

**Purpose**

Minimum Cost = **$2x + $1y**

**Constraints:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| $$12x+4y\geq 96$$ | $$4x+8y\geq 80$$ | $$24x+16y\geq 288$$ | $$5x+5y\leq 100$$ | $$x\geq 0$$ | $$y\geq 0$$ |

**Coordinates (x=0 and y=0)**

|  |  |  |  |
| --- | --- | --- | --- |
| (0, 24) (8, 0) | (0, 10) (20, 0) | (0, 18) (12, 0) | (0, 20) (20, 0) |

**Points of the Simplex (Feasible Area):**

|  |  |
| --- | --- |
| Scoop Ratio | $2x + $1Y |
| (2, 18) | $22 |
| **(4, 12)** | **$20 (cheapest)** |
| (8, 6) | $22 |
| (20, 0) | $40 |

**(b)** Yes it is possible to feed the pet with a diet of 20 scoops of FoodO only (20,0). No it is not possible to feed the pet with a diet of Petmix only.

**(c)** Cheapest is 4,12 or 4 scoops of FoodO and 12 scoops of Petmix for $20

|  |  |
| --- | --- |
| Scoop Ratio | $1.25x + $1Y |
| (2, 18) | $20.50 |
| (4, 12) | $17 |
| **(8, 6)** | **$16 (cheapest)** |
| (20, 0) | $25 |

**(d)**

(i)8 scoops of FoodO and 6 scoops of Petmix for $16

(ii) FoodO increases by four scoops

(iii)Optimal mixture (put x = 8 and y = 6 into the ingredients):

|  |  |  |  |
| --- | --- | --- | --- |
| **Protein** | **Fat** | **Carbohydrates** | **Fibre** |
| 12 (**8**) = 96 | 4(**8**) = 32 | 24(**8**) = 192 | 5(**8**) = 40 |
| 4 (**6**) = 24 | 8(**6**) = 48 | 16(**6**) = 96 | 5(**6**) = 30 |
| **= 120g** | **= 80g** | **= 288g** | **= 70g** |
| **Above by 24g** | **Even** | **Even** | **Below by 30g** |