**Answer 2.C.3. Q 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of hire** | **Passengers** | **Staff** | **Cost** | **Mixture** |
| Regular | 6 | 1 | $90 | X |
| Delux | 10 | 2 | $135 | Y |
|  | $$\geq 60$$ | $$\geq 20$$ | $$\leq \$1530$$ |  |

(a)

**Purpose**

Maximise earnings

**Constraints:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| $$6x+10y\geq 60$$ | $$x+2y\leq 20$$ | $$90x+135y\leq 1530$$ | $$x\geq 0$$ | $$y\geq 0$$ |

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

|  |  |  |  |
| --- | --- | --- | --- |
| (0, 6) (10, 0) | (0, 10) (20, 0) | (0, 11.3) (17, 0) | (0, 20) (20, 0) |

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Points of****Vertex** | **Costs** | **Sunday night** | **Saturday night** |
| **$90x+$135y** | **$600x+$900y** | **$900+$1800y** |
| (0, 10) | $1,350 | $9,000 | **$18,000** |
| (2, 9) | $1,395 | $9,300 | **$18,000** |
| (4, 8) | $1,440 | $9,600 | **$18,000** |
| (6, 7) | $1,485 | $9,900 | **$18,000** |
| (8, 6) | $1,530 | **$10,200** | **$18,000** |
| (11, 4) | $1,530 | $10,200 | $17,100 |
| (14, 2) | $1,530 | $10,200 | $16,200 |
| (17, 0) | $1,530 | $10,200 | $15,300 |

**(a)** Multiple maximum points on the vertex provide solutions that reach the budget of $1530 per night and maximise profits – as per the table

**(b)** Multiple maximum points on the vertex provide solutions that maximise profits on Saturday night – as per table.

**(c)** The limousine combination that will maximise Lenny’s earnings regardless of which day is **8 Regular and 6 Deluxe**.

**Critical point to note:**

Multiple solutions may exist when the objective function is parallel to one of the constrain lines.