The LP Model Assignment

1. Back Savers

a) Decision variables are number backpacks to be produced per model per week

x1 – number of collegiate backpacks to be produced per week

x2 – number of mini backpacks to be produced per week

b) Objective function is to determine what quantities of collegiate and mini backpacks will generate the most profit. The company makes $32 in profit per collegiate backpack and $24 in profit per mini backpack.

Max: Z = 32x1 + 24x2

c) Constraints in this problem are:

1. The supplier can only supply 5,000 sq ft nylon per week that is to be used for both backpacks
2. Available labor per week is limited to 84,000 min (35 employees\*40hours\*60minutes)
3. The company can only sell maximum of 1,000 collegiate backpack per week
4. The company can only sell maximum of 1,200 mini backpack per week
5. All decision variables are non-negative

d)

Max: Z = 32x1 + 24x2

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3x1 + 2x2 ≤ 5,000

45x1 + 40x2 ≤ 84,000

x1 ≤ 1,000

x2 ≤ 1,200

x1, x2 ≥ 0

2. The Weigelt Corp

a) Decision variables are the quantities of each size to be produced at each plant.

|  |  |  |  |
| --- | --- | --- | --- |
| Size | Plant | | |
| 1 | 2 | 3 |
| Large | X1 | X2 | X3 |
| Medium | X4 | X5 | X6 |
| Small | X7 | X8 | X9 |

b) The Weigelt Corporation

Max: Z = 420 (x1 + x2 + x3) + 360 (x4 + x5 + x6) + 300 (x7 + x8 + x9)

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Daily sales limits:

x1 + x2 + x3 ≤ 900

x4 + x5 + x6 ≤ 1,200

x7 + x8 + x9 ≤ 750

Daily production limit:

x1 + x4 + x7 ≤ 750

x2 + x5 + x8 ≤ 900

x3 + x6 + x9 ≤ 450

Daily in-process storage space limit:

20x1 + 15x4 + 12x7 ≤ 13,000

20x2 + 15x5 + 12x8 ≤ 12,000

20x3 + 15x6 + 12x9 ≤ 5,000

The same percentage of excess capacity limit:

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Converting above equations into a linear form as follows:

6(x1 + x4 + x7) – 5(x2 + x5 + x8) = 0

(x2 + x5 + x8) – 2(x3 + x6 + x9) = 0

5(x3 + x6 + x9) – 3(x1 + x4 + x7) = 0

Nonnegativity:

xj ≥ 0, for j = 1, 2, …9