WeighIt Corporation Problem – Assignment 3

Formulating Objective function and Constraints from the Problem:

Given,

Net profit per product;

Large = $420

Medium = $360

Small = $300

Excess production capacity;

Plant 1 = 750

Plant 2 = 900

Plant 3 = 450

Available storage space;

Plant 1 = 13000 sq. ft

Plant 2 = 12000 sq. ft

Plant 3 = 5000 sq. ft

Storage space used per unit;

Large = 20 sq. ft

Medium = 15 sq. ft

Small = 12 sq. ft

Sales of each size product per day;

Large = 900

Medium = 1200

Small = 750

Let, L1 = Large product produced in plant 1

L2 = Large product produced in plant 2

L3 = Large product produced in plant 3

M1= Medium product produced in plant 1

M2 = Medium product produced in plant 2

M3 = Medium product produced in plant 3

S1 = Small product produced in plant 1

S2 = Small product produced in plant 2

S3 = Small product produced in plant 3

Based on above information and assumptions, the objective function for the problem is as below,

Max: 420(L1 + L2 + L3) + 360(M1 + M2 + M3) + 300(S1 + S2 + S3)

OR Max: 420 L1 + 360 M1 + 300 S1 + 420 L2 + 360 M2 + 300 S2 + 420 L3 + 360 M3 + 300 S3

Where,

Capacity L1 + M1 + S1 <= 750

L2 + M2 + S2 <= 900

L3 + M3 + S3 <= 450

Storage 20L1 + 15M1 + 12S1 <= 13000

20L2 + 15M2 + 12S2 <= 12000

20L3 + 15M3 + 12S3 <= 5000

Sales L1 + L2 + L3 <= 900

M1 + M2 + M3 <= 1200

S1 + S2 + S3 <= 750

Percentage $\frac{1}{750}$(L1 + M1 + S1) - $\frac{1}{900}$(L2 + M2 + S2) = 0

$\frac{1}{750}$(L1 + M1 + S1) - $\frac{1}{450}$(L3 + M3 + S3) = 0

OR

900 L1 + 900 M1 + 900 S1 - 750 L2 - 750 M2 - 750 S2 = 0;

450 L1 + 450 M1 + 450 S1 - 750 L3 - 750 M3 - 750 S3 = 0;

L1, L2, L3, M1, M2, M3, S1, S2, S3 >=0

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Dual Function for the LP Problem:

The Dual Form of the above problem is as follows;

Min : 750y1 + 900y2 + 450y3 + 13000y4 + 12000y5 + 5000y6 + 900y7 + 1200y8 + 750y9

Where,

y1 + 20 y4 + y7 + 900 y10 + 450 y11 >= 420

y1 + 15 y4 + y8 + 900 y10 + 450 y11 >= 360

y1 + 12 y4 + y9 + 900 y10 + 450 y11 >= 300

y2 + 20 y5 + y7 - 750 y10 >= 420

y2 + 15 y5 + y8 - 750 y10 >= 360

y2 + 12 y5 + y9 - 750 y10 >= 300

y3 + 20 y6 + y7 - 750 y11 >= 420

y3 + 15 y6 + y8 - 750 y11 >= 360

y3 + 12 y6 + y9 - 750 y11 >= 300