Assignment Module 2: The LP Model

1.

a) Let x be the number of Collegiate backpacks

Let y be the number of Mini backpacks

b) Max Z = 32x + 24y

where Z is the profit

c)

Materials constraint (only have 5,000 ft^2 of nylon to work with)

$3x + 2y \leq 5{,}000$

Time constraint:

$45x + 40y \leq 84{,}000$ (35 laborers*40hr/wk*60min/hr = 84,000 min)

Demand constraints:

$0 \leq X \leq 1{,}000$

$0 \leq Y \leq 1{,}200$

d) Max Z = 32x + 24y

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$3x + 2y \leq 5{,}000$

$45x + 40y \leq 84{,}000$

$0 \leq X \leq 1{,}000$

$0 \leq Y \leq 1{,}200$

2.

a)

Let x_i be the number of small units produced at plant i (where i = 1,2,3)

Let y_i be the number of medium units produced at plant i (where i = 1,2,3)

Let z_i be the number of large units produced at plant i (where i = 1,2,3)

b)

Max: P = $300(x_1 + x_2 + x_3) + 360(y_1 + y_2 + y_3) + 420(z_1 + z_2 + z_3)$ (P is profit in dollars)

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$x_1 + y_1 + z_1 \leq 750$
$x_2 + y_2 + z_2 \leq 900$
$x_3 + y_3 + z_3 \leq 450$
} Production constraints

$12x_1 + 15y_1 + 20z_1 \leq 13{,}000$
$12x_2 + 15y_2 + 20z_2 \leq 12{,}000$
$12x_3 + 15y_3 + 20z_3 \leq 5{,}000$
} Storage constraints

$x_1 + x_2 + x_3 \leq 750$
$y_1 + y_2 + y_3 \leq 1{,}200$
$z_1 + z_2 + z_3 \leq 900$
} Demand constraints

$\frac{x_1 + y_1 + z_1}{750} = \frac{x_2 + y_2 + z_2}{900} = \frac{x_3 + y_3 + z_3}{450}$ } Equivalent percentage constraint

$x_i, y_i \geq 0$ (for i = 1,2,3) } Non-negativity