Solution for the Problem – 1:

The company offers two different models of backpacks. Those are ….

1. Collegiate
2. Mini

Let's assume

No of Collegiate Bags = C

No of Mini Bags = M

Bag-Model	Material Required (Sq. Ft)	Sales per week	Labor Work (Min)	Profit per week
Collegiate	3	1000	45	32
Mini	2	1200	40	24

The size of the material shipment per week = 5000 Sq. Ft

Let Z represented as the Objective Function for Maximum Profit.

$Z = 32C+24M$ → (Objective Function)

Constraints are a combination of Labor work and Material.

$3C+2M<=5000$ → (Material Constraint)

Let convert minutes into hours

$45/60C+40/60M<=40*35$

$3/4C + 2/3M <=1400$ → (Labor work Constraint in Hours)

Non-Negativity Condition of decision Variable

$0<=C<=1000$

$0<=M<=1200$

Solution for Problem – 2:

Formulation of Data into a tabular form:

	Capacity	**Space (Sq. Ft)**
Plant - 1	750	13000
Plant - 2	900	12000
Plant - 3	450	5000

	Profit	**Material Required**	**Sales**
Large	$420	20	900
Medium	$360	15	1200
Small	$300	12	750

Objective Function: For Maximum Profit:

$N = 420(P_1L+P_2L+P_3L) +360(P_1M+P_2M+P_3M) +300(P_1S+P_2S+P_3S)$

P is the No of units produced.

P1 is No. of units produced in plant 1

P2 is No. of units produced in plant 2

P3 is No. of units produced in plant 3

Constraints of Capacity:

$P_1L+P_1M+P_1S<=750$

$P_2L+P_2M+P_2S<=900$

$P_3L+P_3M+P_3S<=450$

Constraints of Storage Space

$20P_1L+15P_1M+12P_1S<=13000$

$20P_2L+15P_2M+12P_2S<=12000$

$20P_3L+15P_3M+12P_3S<=5000$

Constraints of Sales forecasts

$P_1L+P_2L+P3L<=900$

$P_1M+P_2M+P_3M<=1200$

$P_1S+P_2S+P_3S<=750$

The percentage of excess capacity usage of each plant is equal to

$$\frac{P1L+P1M+P1S}{750}\,100 = \frac{P2L+P2M+P2S}{900}\,100 = \frac{P3L+P3M+P3S}{450}\,100$$