Loft Story

In the popular reality show *Loft Story*; a group of young people share a loft in a high-rise building, and are being videotaped constantly. They have to compete in different challenges during their stay. Viewers of the show vote them out of the loft, one at a time. The last person wins a car and $50 000.

Catherine has been named producer of the coming season of *Loft Story*. She has asked for an expense budget of $97 000. This amount includes 10% for unexpected expenses.

It is your job to review the production constraints for the show, to confirm that the budget requested by Catherine is realistic, and to make recommendations if necessary.

Production Constraints

1) **The Rooms** :

The rooms for the girls and boys are both rectangular, and must have equal areas. Also, based on the results of a survey of previous tenants in *Loft Story*, we know that the length of the girls' room must be 8 metres more than twice its width. As for the boys' room, the width must be 3 metres more than the width of the girls' room, and its length must be 7 metres less than that of the girls' room.

The floors will be covered with bamboo flooring, which costs $12 per m^2.

To furnish the two rooms, estimate spending a total of $4 000.

2) **The court** :

We know that if 700 m^2 is added to the area of the square court, the area would be 1 100 m^2.

The court will be divided into 4 identical square parts, such that :

- $\dfrac{3}{4}$ of the court will be lawn. Sod can be purchased in rectangular sections of 70 dm^2 which cost $10 each.

- The other part of the court must be fenced in, as a pool will be added later. Fencing costs $30 a metre.

3) **Salaries** :

- The weekly salary of each camera operator is twice that of the hair stylist. There are 7 camera operators for the show. The hair stylist, according to him, makes 100 dollars more each week than the makeup artist does. You know that the total combined salaries of all these employees is $1100 more than 13 times the hair stylist's salary.

- The salary of the director is calculated per show. If $300 is deducted from 3 times her salary, the resulting amount is less than or equal to twice her salary.

- The show will be broadcast 5 evenings a week, for 10 weeks.

4) **Food** :

- On average, each week the boys eat 4 kilograms more than three times what the girls eat. If you find the product of the amount of food eaten by the girls and the amount eaten by the boys each week, the result is 100 times what the girls eat per week.

- The food cost is estimated to be $6 a kilogram.

Solution to Loft Story

1) The Rooms
Girl's room: x by 2x+8
Boy's room : x+3 by 2x+1

$$A_g = A_b$$
(x)(2x+8) = (x+3)(2x+1)
$2x^2 + 8x = 2x^2 + 7x + 3$
8x = 7x + 3
x = 3

Therefore:
Girl's room is 3m by 14 m; Area = 42 m^2
Boy's room is 6m by 7m; Area = 42 m^2
Total floor area = 42 + 42 = 84 m^2

Floor cost = (84)(12) = $ 1008
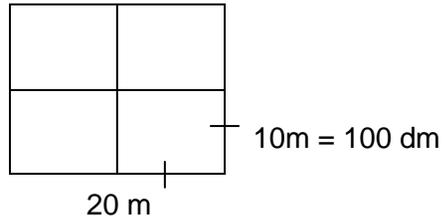
<mark>Total cost for the rooms = 1008 + 4000 = $ 5008</mark>

2) The court

Area = 1100 – 700
= 400 m^2
So the sides are 20 m by 20 m
1 m = 10 dm
10 m = 100 dm

10m = 100 dm

20 m

$\frac{3}{4}$ Area = 300m^2 = 30000 dm^2
Number of sections: 30000 / 70 = 429 sections

Cost of sod = (429)(10) = $ 4290

Fence length = (4)(10) = 40 m
Cost for fence = (40)(30) = $ 1200

<mark>Total cost for the Court = 4290 + 1200 = $ 5490</mark>

3) Salaries

Makeup : m
Camera(c) : 2h   7c = 14h = 1400 + 14m
Hair (h) : 100 + m

m + 100 + m + 1400 + 14m = 1100 + 1300 + 13m
16m + 1500 = 2400 + 13m
3m = 900

m = $ 300 / weak
Therefore   7c = $ 5600
h = $ 400
Their total per week = $ 6300

Director: 3x – 300 ≤ 2x
x ≤ 300

for 50 shows: x ≤ $ 15000

<mark>Total salaries = (6300)(10) + 15000 = $ 78000</mark>

4) Food :

b = 4 + 3g
g(4 + 3g) = 100g
$4g + 3g^2 = 100g$
$3g^2 = 96g$
g = 32
so   b = 100
Total food per weak = 132 kg
Cost of food per weak = (132)(6) = $ 792

Total cost of food = (792)(10) = $ 7920

Total budget needed = 5008 + 5490 + 78000 + 7920 + 10%
= 96418 + 10%
<mark>= $ 106 060</mark>
<mark>Therefore she is short by $ 9 060</mark>