Homework 3 – More LP

1. A bricks factory produces four types of blocks, creatively referred to as B1, B2, B3, and B4. The manufacturing process comprises three stages: mixing, vibration, and inspection. Each month there are 800 machining hours available for mixing, 1000 machine hours available for vibration and 340 man-hours for inspection purposes. The requirements for each brick are given below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Requirements in hours** | | |  |
| **Block** | **Mixing** | **Vibration** | **Inspection** | **PROFIT** |
| **B1** | 1 | 1.5 | 0.5 | 8 |
| **B2** | 2 | 2 | 0.6 | 14 |
| **B3** | 10 | 4 | 1 | 30 |
| **B4** | 16 | 5 | 2 | 50 |

Not surprisingly the factory wants your help to maximize its profits.

Consider the following parts independently—reset each time.

1. What is the optimum solution and the optimal value?
2. Is this the only optimum solution? How do you know?
3. How much should the profit of B3 be increased to make its production worthwhile?
4. How much could the profit of B2 be increased without changing the solution?
5. Within what range could the machining hours available for mixing vary without changing the optimum solution?
6. How much is another hour of inspection worth?
7. Additional capacity for mixing is available for $4/hour. Should the brick factory consider purchasing this additional capacity, and how many hours should the purchase?
8. Another bricks factory needs more machine hours for vibration, at what rental price do you suggest this be offered and how many hours can be sold at that price?
9. Would the factory accept the production of a fifth brick if it requires 2 hours of each activity and its profit is $30?
10. A feed company is designing a new feed to meet strict minimum daily requirements consisting of 70g of protein, 3 g of minerals, and 10 mg of vitamins. The company has five feed materials available to help satisfy these requirements. The nutritional content of each of these feed materials per pound of feed material, is as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feed Material** | **Protein (g)** | **Minerals (g)** | **Vitamins (mg)** | **COST per pound** |
| 1 | 0.3 | 0.1 | 0.05 | $.02 |
| 2 | 2.0 | 0.05 | 0.1 | $.07 |
| 3 | 1.0 | 0.02 | 0.02 | $.04 |
| 4 | 0.6 | 0.2 | 0.2 | $.03 |
| 5 | 1.8 | 0.05 | 0.08 | $.05 |

The company wants to package the materials in 100-pound bags that satisfy the minimum daily requirements at cheapest cost. What is the optimum solution and optimum value?