MIG Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 4 Prerequisite 1**

Minimization –Practice

1. Miss Keller is making sandwiches for an event. She will make ham sandwiches, turkey sandwiches, and deluxe sandwiches (which have both ham and turkey). Due to her busy schedule, Miss Keller has only 500 minutes to make sandwiches. A ham sandwich takes 3 minutes to put together and takes 4 slices of ham. A turkey sandwich takes 5 minutes to assemble and takes 4 pieces of turkey. The deluxe sandwich takes 9 minutes to assemble and takes 2 slices each of ham and turkey. All together Miss Keller has 350 pieces of ham and 150 pieces of turkey. There will be 100 people attending the event, but extra sandwiches are ALWAYS alright! Miss Keller also has 5 people that have preordered deluxe sandwiches. If it costs $5 to make a ham sandwich, $3 to make a turkey sandwich and $4 to make the deluxe sandwich; determine how many of each type of sandwich Miss Keller should make to minimize costs.

Decision Variables:

Constraints:

Objective Function:

1. A biologist is developing two new strains of bacteria. Each sample of Type I bacteria produces 10 new viable bacteria, and each sample of Type II produces 25 new viable bacteria. Altogether, at least 550 new viable bacteria must be produced. At least 30 but not more than 50, of the original samples must be Type I. Not more than 50 of the samples can be Type II. A sample of Type I costs $10 and a sample of Type II costs $8. How many samples of each should be used to minimize cost?

Decision Variables:

Constraints:

Objective Function:

1. Hiwatha Manufacturing has two factories that produce three grades of paper: low grade, medium grade, and high grade. It needs to supply at least 42 tons of low grade, 30 tons of medium grade, and 12 tons of high grade paper. Factory A produces 3 tons of low grade, 1 ton of medium grade, and 3 tons of high grade paper daily, and costs $1200 per day to operate. Factory B produces 6 tons of low grade, 6 ton of medium grade, 1 tons of high grade paper daily, and costs $1800 per day to operate. How many days should each factory operate to fill the orders at minimum cost?

Decision Variables:

Constraints:

Objective Function:

1. A doctor has told a sick patient to take vitamin pills. The patient needs at least 42 units of vitamin A, at least 8 units of vitamin B, and at least 50 units of vitamin C each day. The red vitamin pills cost $0.10 each and contain 6 units of A, 1 unit of B, and 2 units of C. The blue vitamin pills cost $0.20 each and contain 3 units of A, 1 unit of B, and 7 units of C. How many pills of each color should the patient take each day to minimize costs?

Decision Variables:

Constraints:

Objective Function:

1. A large institution is preparing lunch menus containing foods A and B. The specifications for the two foods are given in the following table. Each lunch must provide at least 16 units of fat per serving, no more than 17 units of protein, and at least 20 units of carbohydrates. The institution can purchase food A for $0.12 per ounce and food B for $0.08 per ounce. How many ounces of each food should a serving contain to meet the dietary requirements at the least cost?

|  |  |  |  |
| --- | --- | --- | --- |
| **Food** | **Units of Fat per Ounce** | **Units of Carbs  per Ounce** | **Units of Protein per Ounce** |
| **A** | **5** | **4** | **2** |
| **B** | **3** | **6** | **2** |

Decision Variables:

Constraints:

Objective Function:

1. Two brands of fertilizers ARE available: SuperGro & CropQuick. A farmer’s field requires at least 16 kgs of nitrogen and 24 kgs of phosphate. SuperGro costs $6 per bag and CropQuick costs $3 per bag. SuperGro has 2 kgs of nitrogen and 4 kgs of phosphate while CropQuick has 4 kgs of nitrogen and 3 kgs of phosphate. How much of each brand should the farmer buy to minimize total cost of fertilizer?

Decision Variables:

Constraints:

Objective Function: