

Tutorial 10
IP Part 1

Question 1

Harrison Electric Company produces two expensive products that are popular with renovators of historic old homes: ornate lamps and old-fashioned ceiling fans. Both lamps and ceiling fans require a two-step production process involving wiring and assembly time. It takes about 2 hours to wire each lamp and 3 hours to wire a ceiling fan. Final assembly of each lamp and fan requires 6 and 5 hours, respectively. The production capability in this period is such that only 12 hours of wiring time and 30 hours of assembly time are available. Each lamp produced nets the firm \$600, and each fan nets \$700 in profit.

- (a) Formulate the LP relaxation problem.
- (b) Solve the problem graphically and interpret the results.
- (c) Create the spreadsheet to solve this model.

Question 2

Student Enterprises sells two sizes of wall posters, a large 3- by 4-foot poster and a smaller 2- by 3-foot poster. The profit earned from the sale of each large poster is \$3; each smaller poster earns \$2. The firm, although profitable, is not large; it consists of one art student, Jan Morgan, at the University of Kentucky. Because of her classroom schedule, Jan has the following weekly constraints: (1) up to three large posters can be sold, (2) up to five smaller posters can be sold, and (3) up to 10 hours can be spent on posters during the week, with each large poster requiring 2 hours of work and each smaller one taking 1 hour. With the semester almost over, Jan plans on taking a 3-month summer vacation to England and doesn't want to leave any unfinished posters behind. Solve the problem graphically and find the optimal integer solution that will maximize her profit.

CB2203 Data-Driven Business Modeling

Question 3

Bagwell Chemical Company, in Jackson, produces two industrial chemicals. The first product, xylene, must be produced in 50-pound bags; the second, hexall, is sold by the pound in dry bulk and hence can be produced in any quantity. Both xylene and hexall are composed of three ingredients—A, B, and C as follows:

Amount per 50-pound Bag of xylene (lb)	Amount per pound Hexall (lb)	Amount of Ingredients Available
30	0.5	2,000 lb – ingredient A
18	0.4	800 lb – ingredient B
2	0.1	200 lb – ingredient C

Bagwell sells 50-pound bags of xylene for \$85 and hexall in any weight for \$1.50 per pound. If we let X = number of 50-pound bags of xylene produced and Y = number of pounds of hexall (in dry bulk) mixed:

- (a) Formulate this integer programming
- (b) Create the spreadsheet to solve this model.