SECTION 3.1: SETTING LINEAR PROGRAMMING PROBLEMS

- Always Define Your Variables must include units
- Objective Function =
- Constraints ≥ ≤

Pr 1. Set up, but do not solve.

An investment company has two funds, A and B, that you can pick from for your personal investments. Each unit of fund A costs \$15, yields an annual return of 6%, and has a risk index of 2 per unit. Each unit of fund B costs \$12, yields an annual return of 5%, and has a risk index of 1.5 per unit. You have \$42,000 available for investing and want to earn at least \$2,400 in interest in the coming year. How many units of each fund should you purchase in order to meet your goals and also to minimize the total risk index for your portfolio?

in question

Variables:

a := the number of units of fund A purchased

b := the number of units of fund B purchased

I := the total risk index of the portfolio

______ := ____________________

Objective: Maximize/ Minimize $I = 2a + 1.5b$

in paragraph

Subject to: $15a + 12b \leq 42000$ (amount to invest)

$0.06(15a) +$ (annual interest goal)

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Pr 2. Set up, but do not solve.

A housing contractor wants to develop a 41 acre tract of land. He has three types of houses: a small 3 bedroom, a large 3 bedroom and a 4 bedroom house. The small three bedroom house requires \$60,000 of capital for a profit of \$20,000, the large three bedroom house requires \$64,000 of capital for a profit of \$25,000, and the four bedroom house requires \$80,000 of capital for a profit of \$24,000. The small three bedroom needs 4000 labor hours, the large three bedroom needs 3000 labor hours, and the 4 bedroom house needs 3900 labor hours. There are currently 250,000 labor hours available. If the small three bedroom house is on half an acre, the large 3 bedroom house is on 0.75 acres, the four bedroom house is on 1.5 acres and the contractor has 4.5 million in capital, how many of each type should be built to maximize the profit?

Variables:

________:= ____

________:= ____

________:= ____

________:= ____

Objective: Maximize/ Minimize ____

Subject to: ____

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Pr 3. Set up, but do not solve.

Your umbrella company makes three models: the Sprinkle, the Storm, and the Hurricane. The amounts of cloth (square yards), metal(pounds), and wood(pounds) used in making each model are given in the table.

	Cloth	Metal	Wood
Sprinkle	1	2	1
Storm	2	1	3
Hurricane	2	3	6

The profit for the Storm is \$1, for the Hurricane is \$2 and for the Sprinkle is \$1. Due to certain agreements, the company can make at most 170 Sprinkle umbrellas. If the company has 300 square yards of cloth, 800 pounds of metal, 600 pounds of wood, how many of each type of umbrella should be produced in order to maximize the profit?

Pr 4. Set up, but do not solve.

A cellphone store sells two types of cellphone, standard and deluxe. The supplier demands that at least 300 phones be sold a month. In order to keep profits up, the number of standard cellphones sold must be at least twice the number of deluxe cellphones. The store spends \$150 a week to market each standard phone and \$100 a week to market each deluxe phone. How many of each type of cellphone must be sold to minimize weekly marketing costs? What is the minimum weekly marketing cost?

Pr 5. Set up, but do not solve.

A company produces three types of blankets (full, queen, and king, at its College Station and Galveston factories. Daily production of each factory for each type of blanket is listed below.

	Full	Queen	King
College Station	200	200	600
Galveston	200	400	200

To fulfill a particular order the company must produce at least 12000 full size blankets, 16000 queen size blankets, and 18000 king size blankets. The cost of operating the College Station factory is \$4500 per day and the cost of operating the Galveston factory is \$6000. The College Station factory must operate at least twice as many days as the Galveston factory. The Galveston factory must operate at least 5 days during this production time. How many days should each factory operate to complete the order at a minimum cost, and what is the minimum cost?

Pr 6. Set up, but do not solve.

You have \$12,000 to invest, some in Stock A and some in Stock B. You have decided that the money invested in Stock A must be at least twice as much as that in Stock B. However, the money invested in Stock A must not be greater than \$9,000. If Stock A earn 3% annual interest, and Stock B earn 4% annual interest, how much money should you invest in each to maximize your annual interest?

Pr 7. Set up, but do not solve.

An independent taffy company makes three flavors of taffy: strawberry, lemon, and orange. Each strawberry taffy requires 3 minutes to cooling and 1 minute to wrap in paper. Each orange taffy requires 5 minutes to cool and 1.5 minutes to wrap in paper. Each lemon taffy requires 4 minutes to cool and 2 minutes to wrap in paper. There are a total of 1.5 hours available for cooling and 0.5 hours available for wrapping. Determine the production of each taffy to maximize profit if the profit on the sale of each orange, lemon, and strawberry taffy is 75 cents, 60 cents, and 50 cents, respectively, and previous sales indicate that they should produce at least three times as many strawberry taffy as lemon taffy. How many of each flavor should the company make to maximize their profits? What is the maximum profit and is any time leftover in cooling or wrapping?

Pr 8. Set up, but do not solve.

Dave operates a book publishing company that prints its books in two different cities. Due to the cost of printing and storing the books, City A can only print up to 15,000 books per month and City B can only print up to 8,000 books per month. These books are shipped to three colleges; C, D and E, located across the country. The minimum requirement of the colleges are 4000, 10,000, and 8000, respectively. The shipping costs from city A are \$1.15 per book to College C, \$1.75 per book to College D, and \$1.35 per book to College E, while the shipping costs from city B are \$1.00, \$1.35, and \$1.28 per book, respectively. What shipping schedule should the company use so that the shipping cost are kept to a minimum?