Homework #7

This is an individual assignment. All work you submit must be your own.

1. Milford Suits, Inc. produces men's suits and sport coats. Each suit requires 1.2 hours of cutting time, 0.7 hours of sewing time, uses 6 yards of fabric, and generates $190 of profit. Each sport coat requires 0.8 hours of cutting time, 0.6 hours of sewing time, uses 4 yards of fabric, and contributes $150 in profit. For the next week, MSI has 200 hours of cutting time, 180 hours of sewing time, and 1200 yards of fabric available. At a minimum, MSI must produce at least 100 suits and 75 sport coats to fill its current orders.

    a. Construct an optimization model for this problem in Python and use it to find the optimal solution and value.

    b. If MSI could schedule additional overtime for the cutting operation at a cost of $15 per hour, how much overtime should it schedule for cutting and what would be the net benefit from this overtime?

    c. If MSI could schedule additional overtime for the sewing operation at a cost of $10 per hour, how much overtime should it schedule for sewing and what would be the net benefit of this overtime?

    d. MSI is considering a price increase for the suits. How does the optimal value for this problem change as the profit contribution increases from $190 to $220 per suit?

2. Taylor Farms (TF) grows wheat, corn, soybeans, and barley on 1,000 acres of farmland. In order to qualify for federal subsidies, TF must produce at least 600 tons of wheat, and it cannot produce more than 1,000 tons of corn and 1,200 tons of soybeans. The table below indicates the crop production per acre planted, the planting cost per acre, and the sales price per ton produced for each crop.

Crop	Production (tons/acre)	Planting Cost ($/acre)	Sales Price ($/ton)
Wheat	2.0	$150	$170
Corn	2.5	$135	$150
Soybeans	3.0	$140	$140
Barley	1.5	$150	$190

   a. Construct an optimization model in Python, and use it to find an optimal solution and value.

   b. Another local landowner has some land available to lease at a cost of $100 per acre. Should TF consider leasing some of this additional land? If it should, what would be the impact on TF's total profit?

   c. TF has the opportunity to renegotiate the limits for wheat, corn, and soybeans. How should TF try to renegotiate each crop limit?