Hermione: Now, if you two don't mind, I'm going to bed before either of you come up with another clever idea to get us killed. Or worse, expelled.

Ron: She needs to sort out her priorities.

Please sort out your priorities and complete this quiz. Good luck! ~ E.C.

Harry Potter, the famous young wizard, discovers that his deceased parents have left him a handsome stash of money at Gringott’s wizarding bank, totalling 6000 galleons (gold coins). His friends, Ron and Hermione have offered him the opportunity to become a partner in two different entrepreneurial ventures – Ron plans to start a business creating a variety of famous wizard cards (to be included in chocolate frog candy), and Hermione plans to start a center for rehabilitation of magical animals.

Becoming full partner in Ron’s venture would require an investment of 4000 galleons and 300 hours, and the estimated profit would be 4900 galleons. Investing in Hermione’s venture would require 3000 galleons and 400 hours, with an estimated return of 4900 galleons. Harry can choose to enter at any fraction of a full partnership, and his share of the profit would be proportional to this fraction.

Harry has 600 hours to spare and is looking for an interesting summer job. He has decided to participate in one or both friends’ ventures in whichever combination would maximize his total estimated profit. You now need to help Harry solve the problem of finding the best combination.

(a) Formulate the Linear Programming model for this problem. Let \( x_1 \) be the fractional investment in Ron’s venture, and \( x_2 \) be the fractional investment in Hermione’s venture. Bear in mind the possible ranges for \( x_1 \) and \( x_2 \). (25 points)

(b) Label all the corner point solutions. Identify the feasible region and label all the corner point feasible solutions. Without solving the problem, suggest a sequence of solutions for the Simplex Method. (15 points)

(c) Solve this model graphically. What is Harry’s estimated profit? (25 points)

(d) Write out the augmented form of the linear program. Then set up the problem in a simplex tableaux. Perform the first pivot. (25 points)

(e) Suggest different estimated profits for the two ventures such that the problem has multiple solutions. (10 points)