1. For its national defense, the country needs soldiers every year. The country’s demand for soldiers is given by

\[ q^d(w) = 4 - \frac{w}{10,000} \]

where \( w \) is the yearly wage paid to a soldier and \( q^d(w) \) is the number of soldiers per year demanded by the armed forces at the yearly wage \( w \). This year there are four potential soldiers, equally eager and motivated to serve their country. They differ, however, in the opportunity cost of their respective time. Alfred is a young and successful east coast lawyer who makes $50,000 a year. Bill is a successful west coast entrepreneur who makes $40,000 a year. Charles is a lovely southern school teacher who gets paid $15,000 a year for educating our next generation. Finally, Donald is a diligent postal worker from the Midwest, who is happy with the $10,000 a year he makes.

(a) What is the minimum amount of money that would compensate each of the above citizens for spending a year in the army instead of doing their regular jobs?

(b) For each citizen, draw his individual supply of time as a soldier.

(c) Draw the country’s demand for soldiers, the aggregate supply of soldiers, and the competitive equilibrium.

(d) At the competitive equilibrium, who are the individuals who become soldiers?

(e) What is their “producer’s” surplus?

Claiming that the current system is discriminatory because only the poor serve in the army, a well-intentioned representative proposes a system of compulsory military service, whereby each and every citizen will serve half a year in the army and will get $10,000 in return. (You can read the news item at http://www.cnn.com/2003/ALLPOLITICS/01/07/rangel.draft/. There Rep. Charles Rangel, (D-N.Y.) justifies his initiative to reinstate the draft by saying: “For those who say the poor fight better, I say give the rich a chance.”)

(a) Under this proposed system, what is the surplus each of our four citizens will get?

(b) Which system would they prefer?

(c) Is there a price that Donald is willing to pay and Alfred is willing to accept so that Donald can replace Alfred in the army?

2. There are two kinds of people in Happyville: those who like peanuts and opera, and those who like peanuts and dislike opera. It so happens that those who like opera have an income of $5 while those who dislike opera have an income of $3. There are five individuals of each kind in Happyville and their individual demand for peanuts is given by:

\[ q^d(p) = 1 - \frac{p}{10} \]

(a) What is the aggregate demand for peanuts?

The supply function of peanuts is given by

\[ q^s(p) = p. \]
(a) What is the equilibrium in the peanut market?
(b) What are the consumers’ surplus and the producers’ surplus associated with this equilibrium?

In order to cultivate the people’s spirit, the town decided to build an opera house. The cost of the project is $8 and it will be financed by a quantity tax of $2 per unit of peanuts.

(a) What will the new equilibrium be?
(b) Will the tax revenues be enough to finance the new opera house?
(c) What will consumer’s and producers’ surplus be in the new equilibrium?
(d) If instead of using a quantity tax on peanuts, the opera house was financed by means of a proportional income tax of \( t \), what should this tax rate \( t \) be to cover the cost?
(e) Which tax system quantity tax on peanuts or income taxation do the opera “dislikers” prefer?