ECONS 101 – PRINCIPLES OF MICROECONOMICS, SECTION 01

WASHINGTON STATE UNIVERSITY

Spring Semester 2009, 02/24/2009

Midterm 1, February 24, 2009.

Time: From 9:10am to 10:25am.

Name: _____

Student ID: _____

EXAM TYPE 1 (white color pages)

Instructions: This exam has two parts: 15 multiple choice questions and 4 problems. Record your answers for the multiple choice questions on the bubble sheet. Regarding the four problems, please show all your work. This will help you to obtain more points from partial credit.

Exercise 1. [17 points]

Farmers in Corntopia successfully lobby their government to enact a price floor for their agricultural commodity. The price floor is set at $10 above the equilibrium price. The initial demand and supply curves for agricultural production in Corntopia are as follows: $P = 100 - Q$ and $P = Q$, where price is per bushel and quantity is measured in bushels.

a. [1 points] Draw the demand and supply curve in this market. What is the equilibrium price and quantity without the price floor?

Math

demand: $P = 100 - Q^d \Rightarrow Q^d = 100 - P$ (1)

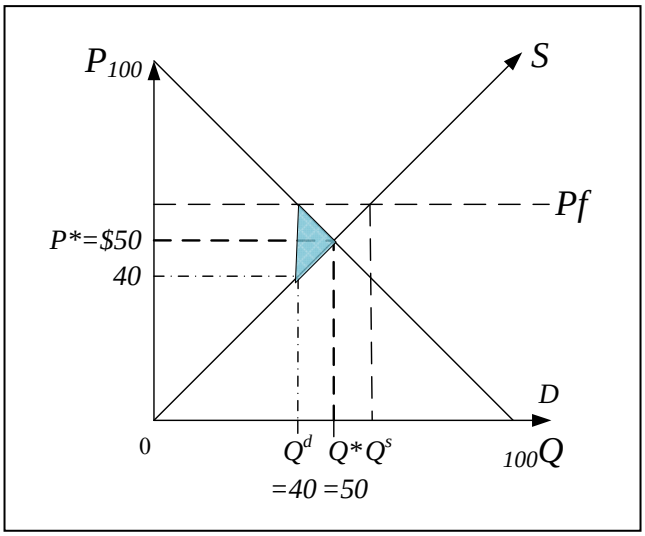
supply: $P = Q^s$ (2)

P	Q^d	Q^s
0	100	0
10	90	10
20	80	20
30	70	30
40	60	40
50	50	50
60	40	60
70	30	70
80	20	80
90	10	90
100	0	100

Graphically

Equation 1 = Equation 2

$$\Rightarrow 100 - Q = Q$$
$$\Rightarrow 2Q = 100$$
$$\Rightarrow Q^* = 50$$
$$\text{and } P^* = Q^* \text{ (from 2)}$$
$$= \$50$$



b. [1 points] What is then the level of the price floor in this market, if the price floor is set at \$10 above the equilibrium price?

$$\begin{aligned} Pf &= \$10 + P^* \\ &= \$10 + \$50 \\ &= \$60 \end{aligned}$$

c. [4 points] How many units of the agricultural product will be demanded and supplied at this price floor level?

From (1):
$$\begin{aligned} Q^d &= 100 - Pf \\ &= 100 - 60 \\ &= 40\# \end{aligned}$$

From (2):
$$\begin{aligned} Q^s &= Pf \\ &= 60\# \end{aligned}$$

d. [2 points] Suppose the government purchases the surplus in this market once the price floor is implemented. What will be the cost to the government of buying this surplus?

$$@\, Pf = \$60 \qquad \begin{aligned} Surplus &= Q^s - Q^d \\ &= 60 - 40 \\ &= 20 \end{aligned}$$

$$\therefore \text{ it costs } \quad 20 \times 60 = \$1200$$

e. [3 points] Given the price floor, what is the expenditure consumers make when purchasing this commodity? Do not include in your calculation the cost to the government of buying the surplus.

Consumer will pay:

$$Q^d \times Pf = 40 \times 60 = \$2,400$$

f. [4 points] What is the deadweight loss associated with this price floor? [Assume that the most efficient farmers are those who sell the good in the market].

$$@\, Q^d = 40 \Rightarrow P = 40 \text{ (from 2)}$$

$$\therefore \text{DWL} = \frac{(60-40)\times(50-40)}{2}$$

$$= \frac{10 \times 10}{2}$$

$$= \$50\#$$

g. [2 points] Could the deadweight loss be higher? Why?

It could. If the consumers who buy the good are not those with the highest willingness to pay for the good.

Exercise 2. [8 points]

Suppose the market for demand for the market of milk is given by Q=100-2P and the supply is given by $Q=\frac{P}{2}$ (quantity is given in thousand gallons of milk).

a. [1 points] Find the equilibrium price of a gallon of milk and the equilibrium quantity.

demand: $Q^d = 100 - 2P$ (1)

supply: $Q^s = \frac{P}{2}$ (2)

@ equation 1 = equation 2

$\Rightarrow 100 - 2P = \frac{P}{2}$

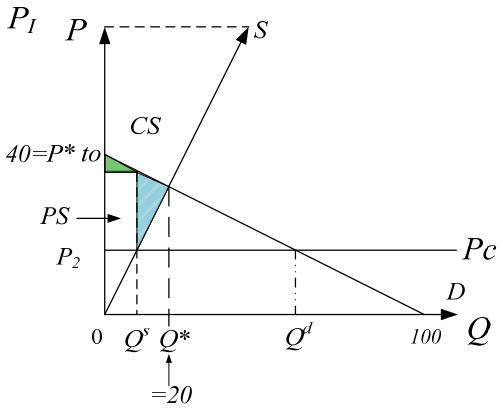
$\Rightarrow 2P + \frac{P}{2} = 100$

$2.5P = 100$

$P^* = \frac{100}{2.5} = \$40\#$

$\therefore Q^* = \frac{P^*}{2} = \frac{40}{2} = 20\#$

b. [1 point] Find the consumer surplus and producer surplus.



$CS = \frac{(50 - P^*) \times (20 - 0)}{2}$

$= \frac{(50 - 40) \times (20)}{2}$

$= \frac{(10 \times 20)}{2} = \$100$

$PS = \frac{(P^* - 0) \times (20 - 0)}{2}$

$= \frac{(40) \times (20)}{2}$

$= \$400$

c. [2 points] How will the equilibrium change if the government imposes a price ceiling of 20, this is what is the **new price** and quantity of milk?

From (1): $Q^d = 100 - 2Pc$
$= 100 - 2(20)$
$= 100 - 40$
$= 60$

From (2): $Q^s = \frac{Pc}{2}$
$= \frac{20}{2}$
$= 10\#$

$@\ Q^s = 10 \Rightarrow 10 = 100 - 2P$
$\Rightarrow 2P = 100 - 10$
$\Rightarrow P = \frac{90}{2}$
$= 45$

d. [2 points] Find the loss in efficiency due to this price ceiling. [You can use Case 1 or Case 2. That is, you can assume that milk is bought by those consumers with the highest willingness to pay (case 1), or those with the lowest willingness to pay (case 2).]

$$DWL = \frac{(45-20)\times(20-10)}{2} = \frac{25\times 10}{2} = \$125$$

e. [2 points] Find the consumer surplus after the price ceiling. [Here too, you can use Case 1 or Case 2. That is, you can assume that milk is bought by those consumers with the highest willingness to pay (case 1), or those with the lowest willingness to pay (case 2).]

$$CS = \frac{(50-45)\times 10}{2} + (45-20)\times 10 = 25 + 250 = \$275$$

Exercise 3. [20 points]

The government wishes to limit the quantity of alcoholic beverages sold and therefore is considering the imposition of an excise tax on the market for alcoholic drinks. Suppose the market for alcoholic drinks can be described by the following demand and supply equations:

Demand: $Q = 10{,}000 - 2{,}000P$

Supply: $Q = 2{,}000P$

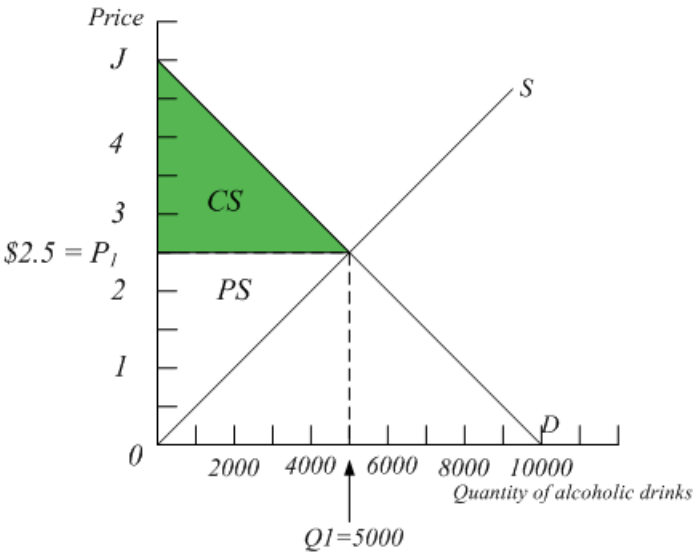
where P is the price of an alcoholic drink and Q is the quantity of alcoholic drinks sold and consumed during the time period. The proposed excise tax is $2 per alcoholic drink.

a. [1 points] Draw a graph representing the initial market for alcoholic drinks. Label the equilibrium price $P1$, and the equilibrium quantity $Q1$.

demand: $Q^* = 10000 - 2000P$ (1)

supply: $Q^s = 2000P$ (2)

P	Q^d	Q^s
0	10000	0
1	8000	2000
2	6000	4000
3	4000	6000
4	2000	8000
5	0	10000



b. [1 points] Compute the numeric value of $P1$ and $Q1$ in this market.

@ equation 1 = equation 2

$\Rightarrow 10000 - 2000P = 2000P$

$\Rightarrow \quad 4000P = 10000$

$\Rightarrow \quad P_1 = \frac{10000}{4000} = \$2.5\,\#$

$Q^* = 2000P^*$ (from 2)

$= 2000 \times 2.5$

$= 5000$ drinks #

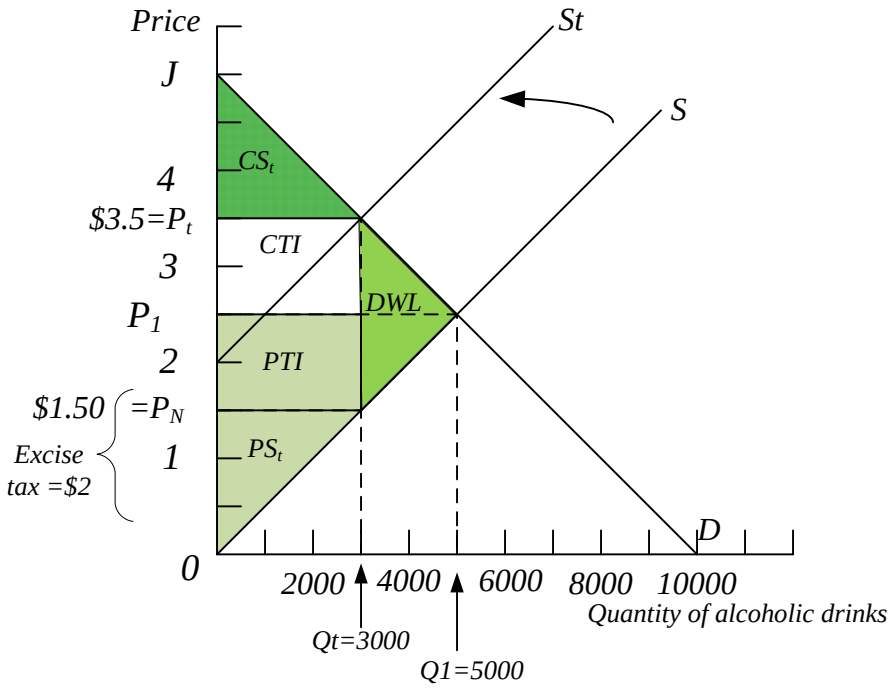
c. [2 points] What is the value of consumer and producer surplus (*CS* and *PS*) in this market prior to the imposition of the tax? Shade in these two areas on your graph in part (a) and label these areas clearly. What is the value of total surplus before the tax?

$$CS = \frac{(5 - P_1) \times (5000 - 0)}{2} = \frac{(5 - 2.5) \times 5000}{2} = \frac{2.5 \times 5000}{2} = \$6,250$$

$$PS = \frac{(P_1 - 0) \times (5000 - 0)}{2} = \frac{2.5 \times 5000}{2} = \$6,250$$

Value of total surplus
$= CS + PS$
$= 6250 + 6250$
$= \$12,500 \#$

d. [4 points] Suppose the excise tax is implemented and producers are legally responsible for paying the tax. Draw a new graph (use next page) representing this market now that the excise tax has been implemented. Label the new equilibrium price with the tax (*P*t), the new equilibrium quantity with the tax (*Q*t), and the net price received by producers after they pay the tax to the government (*P*n).



e. [4 points] Calculate the numeric values of *P*t, *Q*t, and *P*n that you marked on your graph in part (d).

Consider the new supply curve

$P = \frac{1}{2000}Q^s + a$

$@\ \ P = 2 \Rightarrow Q^s = 0 \Rightarrow a = 2$

$\therefore P = \frac{1}{2000}Q^s + 2$

$\Rightarrow Q^s = 2000(P - 2)$

$\therefore Q^s = 2000P - 4000 \qquad (2)'$

$@$ equation 1 = equation 2′

$\Rightarrow$ 10000-2000P=2000P-4000

$\Rightarrow$ 4000P=10000+4000

$\Rightarrow \mathrm{P}_t = \frac{14000}{4000} = \$3.5$

$\because Q_t = 2000P_t - 4000 \qquad$ (from 2′)

$= 2000(3.5) - 4000$

$= 7000 - 4000$

$= 3000$ drinks

$P_N = P_t - excise\ tax$

$= 3.5 - 2$

$= \$1.5\#$

f. [4 points] On your graph from part (d), label the areas that correspond to consumer surplus with the tax (*CS*t), producer surplus with the tax (*PS*t), CTI, PTI, and DWL.

See graph.

$$DWL = \frac{(P_t - P_N) \times (5000 - 3000)}{2}$$

$$= \frac{(3.5 - 1.5) \times 2000}{2}$$

$$= \frac{2 \times 2000}{2} = \$2000$$

g. [4 points] Calculate the value of *CS*t, *PS*t, CTI, PTI, tax revenue, and DWL once the tax is implemented. Is the sum of (*CS*t) + (*PS*t) + (tax revenue) + DWL equal to the original value of total surplus before the tax was implemented?

$CS_t = \frac{(5 - P_t) \times 3000}{2}$ $= \frac{(5 - 3.5) \times 3000}{2}$ $= \$2,250$	$PS_t = \frac{(P_N - 0) \times 3000}{2}$ $= \frac{1.5 \times 3000}{2}$ $= \$2,250$
$CTI = (P_t - P_1) \times 3000$ $= (3.5 - 2.5) \times 3000$ $= \$3000$ $PTI = (P_1 - P_N) \times 3000$ $= (2.5 - 1.5) \times 3000$ $= \$3000$	$CSt + PSt + CTI + PTI + DWL =$ $= 2,250 + 2,250 + 3,000 + 3,000 + 2,000$ $= \$12,500$ *= original value of total surplus before tax*

Exercise 4. [10 points]

When Luigi's income increases by 10%, his consumption of noodles *decreases* from 100 units a year to 70 units a year. In contrast, when his income increases by 10%, his consumption of salmon *increases* from 20 units a year to 60 units a year.

$$\therefore \textit{Income elasticity of demand for Salmon}^d = \frac{200\%}{10\%} = 20$$

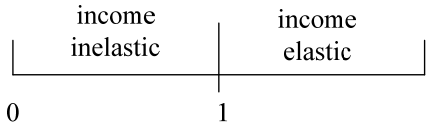
a. [3 points] What is Luigi's income elasticity of demand for noodles? What is Luigi's income elasticity of demand for salmon?

Noodles:	*Income elasticity of demand:*	*Salmon:*
$\%\ \Delta\ in\ Q^d = \frac{70-100}{100}\times 100\%$ $= 30\%$ $\%\ \Delta\ in\ I = 10\%$	$= \frac{\%\ \Delta\ in\ Q^d}{\%\ \Delta\ in\ Income}$ $= \frac{-30\%}{10\%} = -3$	$\%\Delta in Q^d = \frac{60-20}{20}\times 100\%$ $= \frac{40}{20}\times 100\%$ $= 200\%$ $\%\Delta in I = 10\%$

b. [4 points] Is either of these goods <u>income elastic</u> for Luigi? Is either of these goods <u>income inelastic</u> for Luigi?

Salmon is income elastic

Neither good is income inelastic



c. [3 points] From Luigi's perspective, is either of these goods a luxury good? Is either of these goods an inferior good? Explain your answer.

Salmon is luxury good $\left(\because \varepsilon_{I,Q^d} = 20 \text{ which is } +ve\right)$

Noodles is inferior good $\left(\because \varepsilon_{I,Q^d} = -3 \text{ which is } -ve\right)$

MULTIPLE CHOICE QUESTIONS [15 questions, 3 points each]

1. Consider that we are given the following information about the relative elasticities of the demand and supply curves: price-elasticity of demand is -5, and price-elasticity of supply is -0.5. An excise tax of *t* dollars per unit is implemented, and sellers are officially required to pay the tax. How is the distribution of the burden distributed between buyers and sellers?

   a. The decrease in the price that sellers will receive is 10 times higher than the increase in the price that buyers will have to pay.

   b. Since sellers are officially required to pay the tax, the tax burden is bear only by sellers.

   c. The increase in the price that sellers will receive is 5 times higher than the increase in the price that buyers will have to pay.

   d. The increase in the price that consumers will have to pay is 5 times as much as the decrease that sellers will receive.

Answer a. *Using the expression we discussed in class, relating tax incidence and relative elasticities (see Chapter 7 – additional materials in the class website), we have*

$$\frac{\varepsilon_{Q^d,p}}{\varepsilon_{Q^S,p}} = \frac{\dfrac{\Delta p^S}{p}}{\dfrac{\Delta p^d}{p}} = \frac{\Delta p^S}{\Delta p^d}$$

And given the information we have,

$$\frac{\Delta p^S}{\Delta p^d} = \frac{\varepsilon_{Q^d,p}}{\varepsilon_{Q^S,p}} = \frac{-5}{-0.5} = -10$$

which implies that $\Delta p^S = -10\Delta p^d$ *, that is, the decrease in the price that sellers receive is 10 times bigger than the increase in the price that buyers have to pay.*

2. Price-elasticity of demand of good A,

   a. Increases if there are other goods which can be easily substituted for good A.

   b. Decreases if there are other goods which can be easily substituted for good A.

   c. Increases if the good is a necessity.

   d. Decreases if consumers have more time to adapt their consumption pattern.

When considering the formal formula of price elasticity of demand. Answer a when considering the absolute value of price elasticity of demand.

3. If we know that price-elasticity of demand of pizzas in Pullman is -3, what can we recommend to the manager of a pizzeria in Pullman?

    a. Increasing prices will raise total revenue of the firm.

    b. Decreasing prices will raise total revenue, since the price effect of lower prices is stronger than the quantity effect.

    c. Decreasing prices will raise total revenue, since the quantity effect of lower prices is stronger than the price effect.

    d. We do not have enough information for making such a strong prediction about total revenue.

Answer c. *Use the formula of price-elasticity of demand,*

$$\varepsilon_{Q^d,p} = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta p^d}{p}}$$

Therefore, if we know that $\varepsilon_{Q^d,p}$ *=-3, then the quantity effect* $\frac{\Delta Q}{Q}$ *> price effect,* $\frac{\Delta p^d}{p}$*. For example, a 10% price decrease implies a -10x-3 = 30% increase in Q.*

Then if price set at $100, and quantity is set at 100 units, then a 10% decrease in p, implies $90, and a 30% increase in Q => 130 units.

Before changes, the total revenue = 100x100 = $10,000

After changes, the total revenue = 90x130 = $11,700

4. What can we infer from the following statement: "the cross-price elasticity between the demand of goods A and B is -2".

    a. The demand of both goods is relatively elastic.

    b. The demand of both goods increases faster than income.

    c. Consumers regard these two goods as complements, like in the example of cars and gasoline.

    d. Consumers regard these two goods as substitutes, like in the example of two brands of mineral water.

Answer c. *When the cross-price elasticity is positive, the two goods are substitutes. When the cross-price elasticity is negative, the two goods are complements.*

5. When reading about food demand, we often find the expression "demand for food products is *income-inelastic* in most countries, including the US." What is the implication of such statement for farmers?

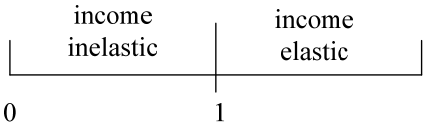
    a. When consumer's income increases by 10% (for example, because of economic growth), the agricultural products they sell will increase by more than 10%.

    b. When consumer's income increases by 10% (for example, because of economic growth), the agricultural products they sell will decrease by more than 10%.

    c. When consumer's income increases by 10% (for example, because of economic growth), the agricultural products they sell will increase by less than 10%.

    d. It means that the demand curve for the agricultural products farmers sell is very inelastic, which allows them to raise prices.

Answer c.



Using the following formula:

$$Income\ elasticity\ of\ \ demand = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ income}$$

For example, if income elasticity of demand is .5, then 10 % increase in income implying that 5% increase in quantity demanded.

6. The distribution of the burden of an excise tax,

    a. Does not depend on the relative price-elasticity of supply and demand.

    b. Depends on the price-elasticity of demand more than on the price-elasticity of supply.

    c. Depends on who is officially paying the tax, according to tax law.

    d. Depends on the relative price-elasticity of demand and supply.

Answer d. *The distribution of the burden of an excise tax depends on the relative price-elasticity of demand and supply.*

7. The deadweight loss due to the imposition of an excise tax is lowest when

    a. demand is relatively inelastic and supply is relatively elastic.

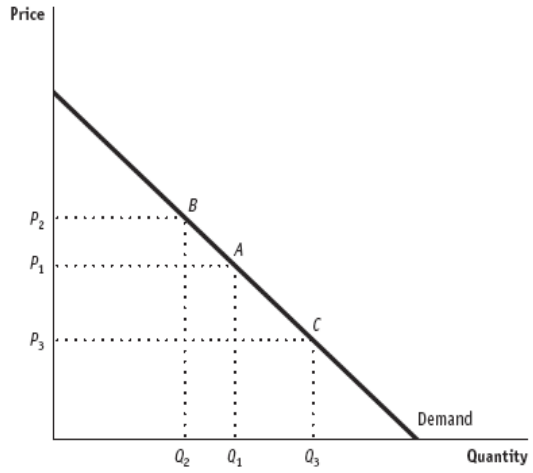
    b. demand is relatively inelastic and supply is relatively inelastic.

    c. demand is relatively elastic and supply is relatively elastic.

    d. demand is relatively elastic and supply is relatively inelastic.

    Answer b. *The deadweight loss from an excise tax is smallest when both the demand and supply curves are relatively inelastic, since this implies that the percentage increase in the price is relatively greater than the percentage decrease in the quantity supplied and demanded in the market.*

Use the figure below to answer the next two questions, where point A is exactly the midpoint of the depicted linear demand curve.



8. At prices greater than P1 demand is _____, while at prices less than P1 demand is _____, and at price P1 demand is _____.

    a. elastic; elastic; unit elastic

    b. inelastic; inelastic; unit elastic

    c. elastic; inelastic; unit elastic

    d. inelastic; elastic; unit elastic

Answer c. *This is definitional: above the midpoint on a linear demand curve, demand is elastic; below the midpoint on a linear demand curve, demand is inelastic; and at the midpoint on a linear demand curve, demand is unit elastic.*

9. Suppose price is initially at P1. Which of the following statements is true?

    a. If price rises to P2, then the quantity effect will dominate over the price effect and total revenue will increase.

    b. If price falls to P3, then the quantity effect will dominate over the price effect and total revenue will increase.

    c. If price rises to P2, then the price effect will dominate over the quantity effect and total revenue will increase.

    d. If price falls to P3, then the price effect will dominate over the quantity effect and total revenue will decrease.

Answer d. *When price rises above P1, the quantity effect is dominant over the price effect and this dominance results in total revenue decreasing. When price falls below P1, the price effect is dominant over the quantity effect and this dominance results in total revenue decreasing.*

10. Suppose the income elasticity of demand for a good is greater than one. Which of the following statements is true?

    a. The percentage change in the quantity demanded of this good is larger than the percentage change in income.

    b. This good is a necessity, since as income increases the quantity demanded of the good increases.

    c. This good is an inferior good, since as income increases the quantity demanded of the good increases at a much greater rate than the rate of increase in income.

    d. This good could not be a luxury good, since income and the quantity demanded have a positive relationship.

Answer a. *When income elasticity of demand is greater than one, this tells us that the good is not an inferior good, since as income increases this leads to an increase in the quantity demanded of the good. From the definition of income elasticity of demand, a value greater than one implies that the percentage change in the quantity demanded of the good is greater than the percentage change in income. When the income elasticity of demand is greater than one, this implies that the good is a luxury, since the percentage increase in the quantity demanded is increasing at a faster rate than the percentage increase in income.*

11. Suppose there are two countries, Texia and Urbania, that produce food and clothing and currently do not trade. Both countries have linear production possibility frontiers. Texia, if it devotes all of its resources to food production can produce 1,000 units of food this year and 0 units of clothing. If Texia devotes of all of its resources to clothing production this year, it can produce 500 units of clothing and 0 units of food. Urbania can either produce 500 units of food this year and 0 units of clothing, or it can produce 200 units of clothing this year and 0 units of food. _____ has the comparative advantage in the production of clothing and _____ has the comparative advantage in the production of food.

    a. Texia; Texia.

    b. Texia; Urbania.

    c. Urbania; Texia.

    d. Urbania; Urbania.

Answer b.

12. Which of the following statements is true?

    I. An effective price floor benefits some suppliers.

    II. An effective price floor benefits all demanders.

    III. An effective price floor results in a persistent surplus.

    IV. An effective price floor results in an inefficiently high level of quality in the good offered by suppliers.

    a. Statements I and III are true.

    b. Statements I, III, and IV are true.

    c. Statements III and IV are true.

    d. Statements II, III, and IV are true.

Answer b. *Statement I is correct because those suppliers who are lucky enough to sell their good at the higher price are benefited. Statement III is also correct since an effective price floor results in excess supply of the good. Statement IV is correct as well because suppliers will compete for customers by offering higher-quality goods since they cannot compete for customers by offering lower prices. Statement II is incorrect: demanders of this good now have to pay a higher price than they would have in a freely functioning market.*

13. Which of the following statements is true?

    a. An effective price ceiling reduces the quantity of the good available to consumers, while an effective price floor increases the quantity of the good available to consumers.

    b. An effective price floor reduces the quantity of the good available to consumers, while an effective price ceiling increases the quantity of the good available to consumers.

    c. Government intervention in markets in the form of effective price ceilings or price floors increases the quantity of the good available to consumers.

    d. Government intervention in markets in the form of effective price ceilings or price floors decreases the quantity of the good available to consumers.

Answer d. *Effective price ceilings and price floors both reduce the quantity of the good available to consumers, so answers (a), (b), and (c) are not true.*

14. The demand curve for videos has shifted to the right. What could have caused it?

    a. A fall in the price of videos.

    b. An increase in the price of videos.

    c. An increase in the supply of videos.

    d. An increase in the incomes of buyers.

Answer d. *Increase in the income of buyers will shift the demand curve rightward.*

15. Consider that the demand curve a product shifts to the right, while the supply curve shift to the left. What can we predict about the equilibrium quantity and equilibrium price?

    a. The equilibrium quantity will increase, but we do not know what the effect on the equilibrium price is.

    b. The equilibrium price will increase, and the equilibrium price will increase as well.

    c. The equilibrium price will increase, but we do not know what the effect in the equilibrium quantity is.

    d. The equilibrium quantity increases, and as a consequence, the equilibrium price decreases.

Answer c. *By drawing a graph with supply curve shifting to the left and demand curve shifting to the right will result in an increase in equilibrium price. However, the equilibrium quantity is uncertain.*