

This is the midterm 1 solution guide for Fall 2012 Form A.

1) The answer to this question is A, corresponding to Form A.

2) Since widgets are an inferior good (like ramen noodles) and income increases, the demand curve will shift to the left. The supply curve does not shift. The quantity and price will both decrease. The answer is D.

3) If the price of smidgets increases, where smidgets and widgets are complements, the demand curve for widgets will shift to the left. The supply curve does not shift. The quantity and price will both decrease. The answer is D.

4) The price of wood increases. Wood is an input in the production of widgets. This causes the supply curve to shift to the left. The demand curve does not shift. The quantity decreases and the price increases. The answer is B.

5) Two things happen: (i) the price of smidgets increases; (ii) the price of wood increases. Smidgets and widgets are complements, so the demand curve for widgets will shift to the left. Wood is an input in the production of widgets, so the supply curve to shift to the left. The quantity decreases (since both the supply shift and the demand shift put downward pressure on quantity) and we can't tell what happens to price (because the demand curve shift puts downward pressure on price, and the supply curve shift puts upward pressure on price). The answer is B.

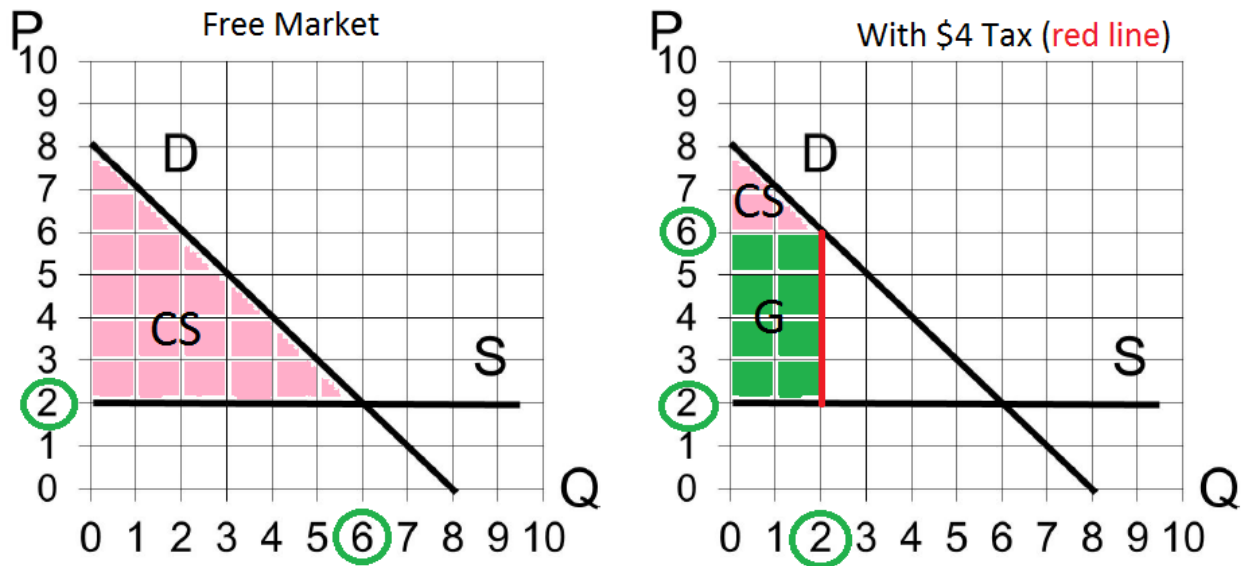
6) The price of an input for production went up; this is a shifter for our supply curve. Demand is unchanged. If demand was perfectly inelastic, then quantity would be unchanged and the equilibrium price would rise. On the opposite end, if demand is perfectly elastic, then the price is unchanged and the equilibrium quantity falls, which is exactly the situation described in the question. The answer is C.

7) We know that the less elastic part of the market bears the burden of taxation. Also we know that when demand is perfectly inelastic, the demand curve is a vertical line, which is equivalent to say that the demanded quantity is constant for any price. So here demand is less elastic (it's perfectly inelastic!) so buyers pay the tax and since demand is perfectly inelastic, the equilibrium quantity is unchanged. The answer is B.

8) D1 and S1, who are respectively the consumer that value the widget the most and the most efficient producer, are out, so this violates 2 of our efficiency principles. (a) and (b) can't be right, since D7 values the widget less than \$5 (so he's not better off if he consumes and pays \$5) and also S7 has a cost of production of \$7, so he won't be better off if he sells the widget for \$5. (c) is wrong because it's not feasible: we have only 5 widgets in the original situation, and if nobody gives up anything in exchange for something else (trading), D1 and S1 are just out. (d) works: S6 has a cost of \$6 to produce, so he can just pay \$3 to S1, that will spend only \$1 to produce the widget and will then make a profit: both are better off, nobody is worse off and the allocation is feasible. The answer is D.

9) Price ceiling means that nobody can sell for more than \$3. At that price there is excess demand: only 3 producers are willing to sell the widget but 7 consumers will be willing to buy. Not only the quantity is too low, but we don't even know who's going to consume. We know that the most efficient producers

will sell: so (c) and (d) are wrong. (a) is wrong because D9 values the widget less than \$3, so he/she will never buy for \$3. (b) works: D6 values the widget \$4 and he/she might end up buying the widget while D1, who values the widget more, might not. The answer is B.



Variable	Free Market	\$4 Tax	Change
Q	6	2	-4
$P^D$	2	6	4
$P^S$	2	2	0
CS	18	2	-16
PS	0	0	0
G	0	8	8
TS	18	10	-8

Note that the producer surplus (PS) is the area above the supply curve (S) and below the supplier price ( $P^S$ ). Since in this market  $S = P^S$ ,  $PS = 0$ .

10) Without externalities, the efficient output level is the free market equilibrium quantity, 6. The answer is C.

11) As you can see in the graph, the \$4 tax brings the equilibrium quantity to 2, and  $P^D$  becomes 6. The answer is C.

12) The consumer surplus (CS) is the area below the demand curve (D) and above the consumer price ( $P^S$ ), which is the area colored in pink in the graph above. So  $CS = 2 \times 2 \times 0.5 = 2$ . The answer is B.

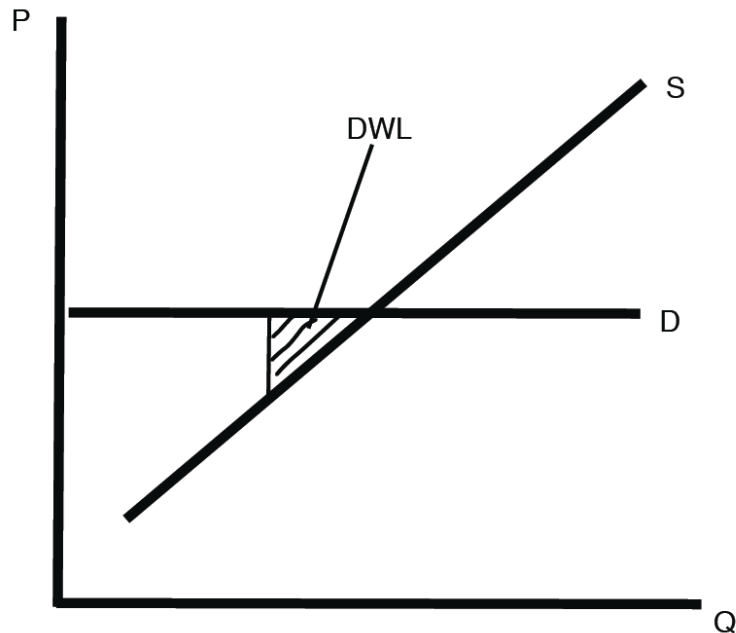
13)  $TS = CS + PS + G$ . With tax,  $G = 4 \times 2 = 8$  (\$4 tax per unit, for 2 units), and corresponds to the rectangle in green. So with \$4 Tax  $TS = 2 + 0 + 8 = 10$ . TS in the free market was 18, so with tax TS has changed by -8. The answer is D.

14) When the government limits quantity to 4 units in the market, this means that the market price of the good is \$4, since at \$4, exactly 4 people (D1, D2, D3, D4) are willing to buy the item. Remember now that the market price of a quota must be such that the cost of the last seller selling plus the price of the quota is equal to the market price of the good. In other words, the marginal seller must break even. Thus, we are trying to find the price of the quota such that when we add the quota price onto the last producer's cost, we will get exactly \$4. Since the cost is always \$2 for suppliers, the price of the quota must be \$2 in order for there to be exactly 4 sellers in the market. We see that this is the equilibrium price of a quota because at \$2, there are 4 units of quotas being sold and 4 units of quota being demanded. The answer is C.

15) We can simply calculate the market value at each quota to see which one maximizes the market value of quota. Starting with a quota of 2, we see that the market price of quota will be \$4. Since there are two units of quotas, the total market value is 2 times \$4, or \$8. At a quota of 3, the market value of quota is \$3. Thus, the total market value is \$9. At a quota of 4, as we found in the previous question, the market value of a quota is \$2. Thus, the total market value is \$8. At a quota of 5, the market value of a quota is \$1, so the total market value of quotas is \$5. Lastly, when there is a quota of 6 units, the quota has no value, since the free market quantity is at 6, and a quota does not limit the market at all. We see then that the quota market value is largest when  $Q=3$ , when the total market value is \$9. The answer is B.

16) In a Pareto efficient allocation, the three general principles must be satisfied. The first is that the consumers who value the good the most should consume first. The second is the producers who have the lowest costs should produce first. Lastly, the efficient quantity principle says that quantity should be where the value of the last person consuming is equal to the cost of the last producer selling. Therefore, these corresponds to (1), (2), and (3). Note that Pareto efficiency does not say anything about fairness of equity, so (4) is not correct. The answer is C.

17) We see that as the amount of tax increases in the market, that the deadweight loss will become greater and greater. This relates to the idea that when the bigger the tax, the more disruptive it is on the market and the more inefficiency it will produce. Thus, we see that (1) is false, since a small tax will have a small deadweight loss. When demand is perfectly elastic, it means that the demand curve is horizontal. Remember that a tax can be represented on a graph by a wedge going down from the demand curve to the supply curve. Thus, we will have the following diagram:



Therefore, since the deadweight loss of the tax is not zero when demand is perfectly elastic, the deadweight loss of the tax per dollar collected cannot be zero. The answer is D.

18) This question is simply asking under what circumstances does the First Welfare Theorem hold. You can cycle through the four conditions to determine which are necessary.

(1) Recall that a "normal" good is simply a product for which demand increases as income increases. In our simple models from class, an increase in income would shift the demand curve right. But, to show that the free market is efficient, we never used this result. In fact, we hold income constant (we only consider one demand curve) when measuring total surplus. So this is not one of the conditions.

(2) Pareto efficiency says nothing about equitable distribution of the social pie. Efficiency only guarantees that the size of the pie is maximized. So this is not one of the conditions.

(3) Perfect competition market structure guarantees that no buyer or seller has enough influence to affect price. We will look at the case of monopolies (single sellers) later this semester and determine what problems can arise from having concentrated market power. This is one of the conditions.

(4) A condition of no externalities guarantees that the participants in the market internalize all costs and benefits of trading the product. As we will learn later this semester, if there are externalities present in the market, there is a difference between the social cost and benefit or private cost and

benefit. This difference will cause the market to impose an extra cost (or miss a potential benefit) than would increase total welfare for society over the free market allocation. This is one of the conditions. The answer is C.

19) Immediately you can eliminate d) and e). We only have information in how quantity demanded changes in response to *price* changes so there is no way we could measure income elasticity. To determine whether a, b, or c is correct, you can calculate the price elasticity of demand:

$$e^D = -\frac{(Q_2 - Q_1)/.5(Q_2 + Q_1)}{(P_2 - P_1)/.5(P_2 + P_1)} = \frac{.2}{.5} = .4$$

The important thing to notice is that elasticity is less than 1, so it *inelastic*. You might even immediately notice from problem that the percentage change in price is greater than the percentage change in demand so elasticity must be less than 1. The answer is B.

20) At a price of \$8, 5 units are supplied (actually in this market the supply is *always* 5 no matter what the price is) and only 2 units are demanded. The excess supply = supply – demand = 5-2= 3 units. As per the question the government buys these 3 units of excess supply to maintain the price floor of \$8. Thus the government's total expenditure on this policy is \$8\*3 = \$24. The answer is C.

21) In the free market producers would sell 5 units at a price of \$5. With a price floor of \$8 *along with* the government policy to buy up the excess supply (of 3 units as calculated in Q20) sellers still sell 5 units but not get a price of \$8 per unit. There is a gain in producer's surplus of \$3 (\$8-\$5) *per unit sold*. Thus the change in producer's surplus is rectangle ACHF. The answer is A.

22) Dead weight loss from price ceilings comes from the fact that a price ceiling (if it is lower than the free market price and hence binding) causes some suppliers who would be in the free market to drop out because of legally enforced low prices. With inelastic supply, a price ceiling does not change the quantity supplied; that remains at 5 units. So any dead weight loss that might occur can't come from the supply side. Now let's think about the demand side of the market. Who consumes these 5 units? If resales were not legal then any of the 8 consumers who are willing and able to consume at the price ceiling of \$2 could be consuming not necessarily the consumers with the highest reservation value – this could be a source of inefficiency in the economy. If resales are legal then we know that the 5 consumers with the highest reservation values will end up consuming the 5 units being supplied (at \$2 each). There is hence no inefficiency on the demand side either. There is no dead weight loss in this economy. The answer is E.

23) Remembering the general formula for price elasticity of demand is useful here. Elasticity is equal to the (negative) percentage change in demand over the percentage change in price. At first one might be tempted to claim that the elasticity must then be equal to .5 since percentage change in demand is 5 and percentage change in price is 10. However, we generally assume that *all other determinants of demand are held constant* when measuring elasticity; here, this is not the case. The price of a complement has fallen, and we would expect this change to *increase demand* for widgets. So the 5 percent change in demand we observe overstates the increase in demand from the decrease in price because we are also picking up the effect from the complement price falling. Therefore, *holding*

*everything constant* a 10 percent decrease in price should cause quantity demanded to increase by *less than* 5 percent. So elasticity must be less than .5. The answer is D.

24) Most of these statements follow from definitions in class. It useful, however, to remember that income elasticity of demand is the percentage change in demand over the percentage change in income.

(1) A good is inferior if an *increase* income leads to a *decrease* in the quantity demanded. This definition implies income elasticity of an inferior good must be negative. So this statement is true.

(2) A good is a necessity if as your income increases, your share of money spent on it decreases. Income elasticity between zero and one means that percent change in quantity demanded is less than percent change in income. This implies that the total share spent on this good will decrease with income. So this statement is true.

(3) This statement is true using the same logic from the argument above.

The answer is D.

25) If there is a price ceiling \$30, all buyers are willing to buy books. However, only a fraction of sellers with cost  $\leq$  \$30 is willing to sell books. Demand > Supply therefore each buyer should bid \$30. The answer is C.

26) At 3pm more consumers are willing to buy electricity. The demand curve at 3pm is above the demand curve at 3am. Thus the equilibrium price should be higher at 3pm. The answer is B

27) If demand is more elastic in the long run than in the short run, the long run demand curve is flatter than short run demand curve. Thus in response to an (upward) shift of supply curve, Relative to the initial price and quantity, in the long run, price increases less and quantity decreases more, than in the short run. The answer is B.

28) Since we use data of June 2007 and June 2008, we have fixed the seasonal pattern. (both are June). It is possible that gasoline supply shifts from June 2007 to June 2008, therefore we are not holding gasoline supply fixed. The answer is A.

29) The answers to this question can be found in Reading 2: Fuel Consumption in the US and Europe. A is correct, as Norway does in fact have better public transportation than the US. B is incorrect, because Norway's per capita income is higher than the US. C is incorrect as well. We are trying to calculate the long-run relationship between market price and quantity demanded. For this, we want the price to vary but other factors that influence gas to remain the same. Since a gas tax changes the price, it won't cause us to over(or under)estimate the elasticity for gas. Since only A is correct, A is the answer.

30) Again, the answers to this question can be found in Reading 2. Gasoline is a normal good, thus we expect demand for it to increase when income rises. Thus, when income increases in the near future for China, we would expect its demand for gasoline to also increase. Thus, the answer is B.

31) The first step in this question is to sort the buyer bids from highest to lowest, and seller bids from lowest to highest. We do this so that the consumers who want the electricity most go first, as do the sellers. We get

Buyers	Bid (Offer to Buy in \$)	Sellers	Bid (Offer to Sell in \$)
Charles	11	Cindy	1
Dayne	9	Brett	2
Elizabeth	9	David	4
Bill	8	Earl	8
Aretha	2	Allie	11

The price that clears the market will cause the number of buyers to equal the number of sellers. At a price of 8, exactly 4 people want to buy and 4 want to sell. Thus, the market clearing price is 8 and the answer is E.

32) Using the answer to question 31, we see that the only people not buying or selling are Aretha and Allie. Since a, b, and c all have at least one of them buying or selling, the answer must be d. You can also get the answer by noticing that Dayne is buying and Dave is selling. The answer is D.