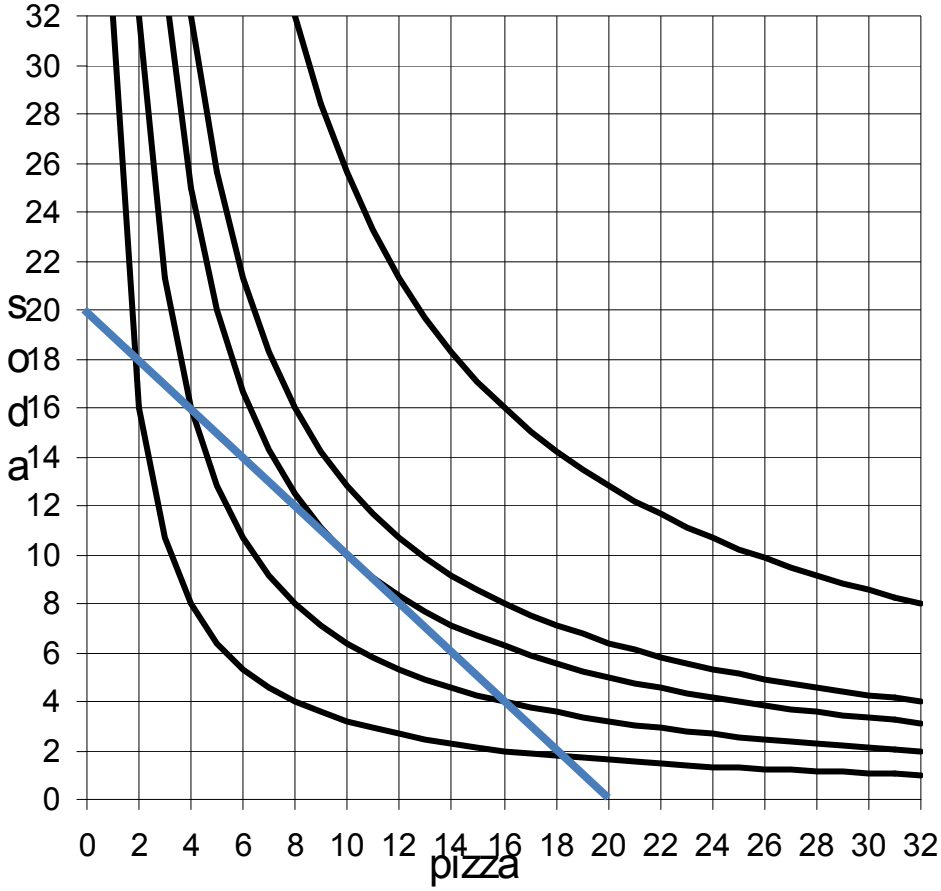
This is the exam solution guide for Form A of Exam 2.

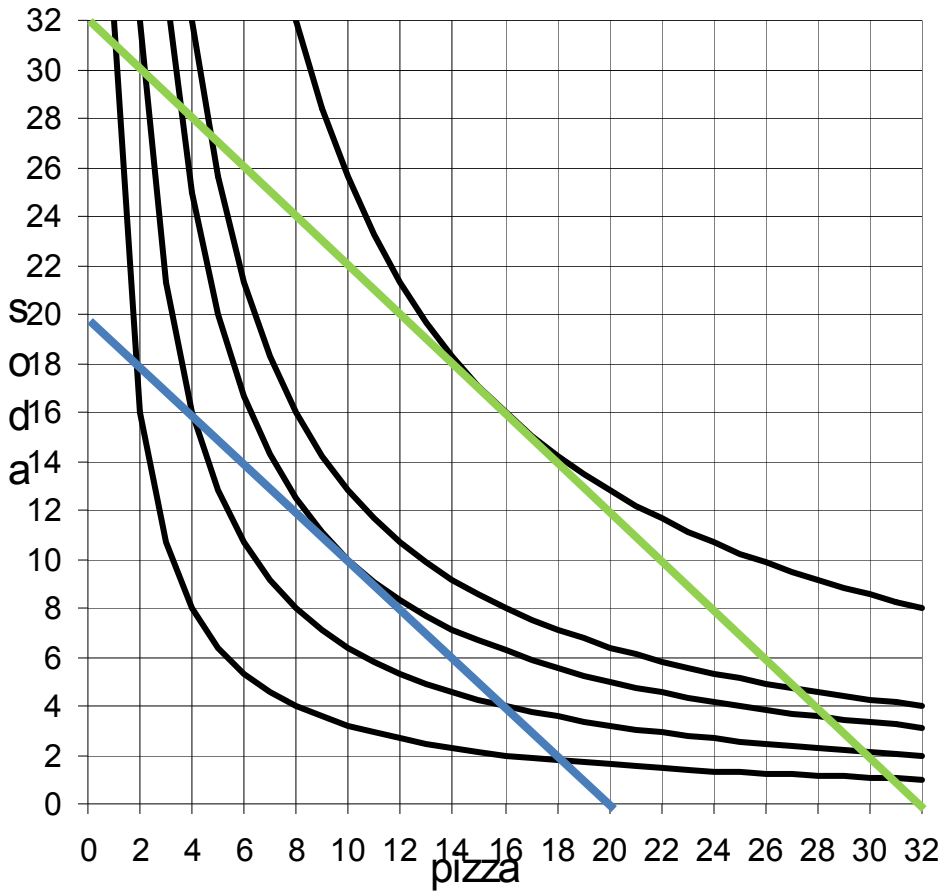
1) The answer to this question is A, since this is Form A.
2) We are trying to find which consumption bundle Wolverine is indifferent to compared with 8 pizzas and 8 sodas. Remember that an indifference curve tells us exactly that: any points on the same indifferent curve are such that the utility gotten from that bundle is the same. Therefore, what we are looking for is just another point on the same indifference curve as the indifference curve that the bundle 8 pizzas, 8 sodas is on. This is the second indifference curve from the bottom. We see that the bundle of 4 pizzas and 16 sodas lies on that same indifference curve. The answer is E.
3) We first draw Wolverine's budget constraint by asking ourselves two simple questions. If he spends all of his income ($40) on soda, how many can he buy? Since the price of soda is $2, this means he can afford 20 soda if he were to spend all his income on it. The second question we ask is how many pizzas Wolverine can afford if he were to spend all his money there. Since the price of pizza is also $2, he can buy 20 pizzas. We now have two points of the budget constraint, and since the budget constraint is linear, we can simply connect the two points.



The opportunity cost of one more slice of pizza in terms of soda is then simply the slope of the budget constraint. Since we already have two points on the budget constraint

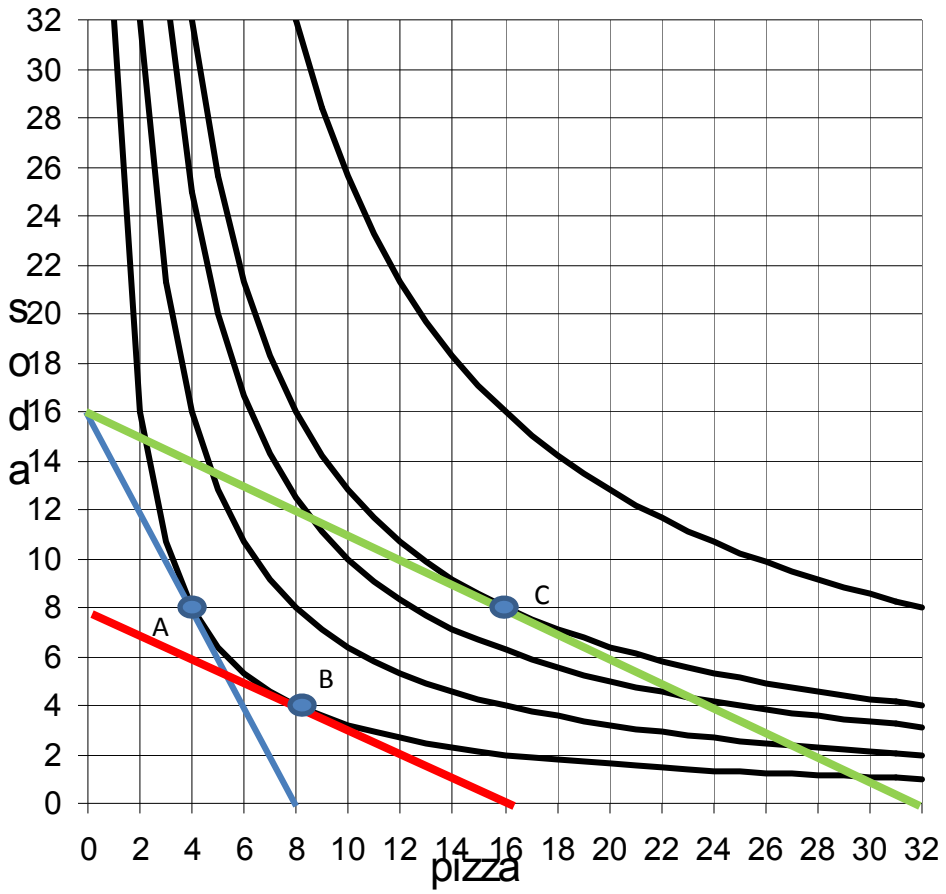
(0,20) and (20,0), we can use the “rise over run” formula to find the slope. The rise here is -20, and the run is 20, meaning the slope of the budget constraint is -1. This means that for every unit of pizza Wolverine buys, he must give up 1 soda. Hence, the opportunity cost of one slice of pizza is 1 soda, and the answer is B.

4) Remember the optimal consumption bundle is the point at which Wolverine is the happiest given his budget constraint. This point occurs where the budget constraint touches the indifference curve at exactly one point (or in other words, the budget constraint is tangent to the indifference curve at the optimal consumption bundle). From the above diagram, the blue budget constraint touches the black indifference curve exactly at the point 10 pizzas and 10 sodas. This is the optimal consumption bundle for Wolverine at that given income and prices. The answer is C.
5) When income increases, the budget constraint shifts upwards. We can figure out the new budget constraint by once again asking two simple questions: “How many pizzas can Wolverine buy if he spent all of his money on pizzas?” and “How many sodas can Wolverine buy if he spent all of his money on sodas?” We see that the answer to both of these questions is 32, since the price of both are still at $2. We denote the new budget constraint below, with a green line.



The new optimal consumption bundle happens at 16 pizzas and 16 sodas. Therefore, we see that Wolverine now demands 6 more pizzas than he did before (since he demanded 10 pizzas at the old budget constraint). The answer is D.

6) If both income and prices double, then we see that nothing will happen to the picture we had above. We can see this by asking ourselves once again the two simple questions that helps us find the budget constraint. Wolverine now has $80 but the prices of both goods are now $4, meaning that he can still get 20 of each good. Therefore, the blue budget constraint will still be the budget constraint we will look at, and the optimal consumption bundle is exactly the same as it was when income was $40 and prices of both pizza and soda were $2. The answer is C.
7) First, we figure out what the budget constraint will be if Wolverine has $32 with the price of pizza being $4 and the price of soda being $2. We have the following budget constraint (the blue one) and optimal consumption bundle (which is labeled as point A).

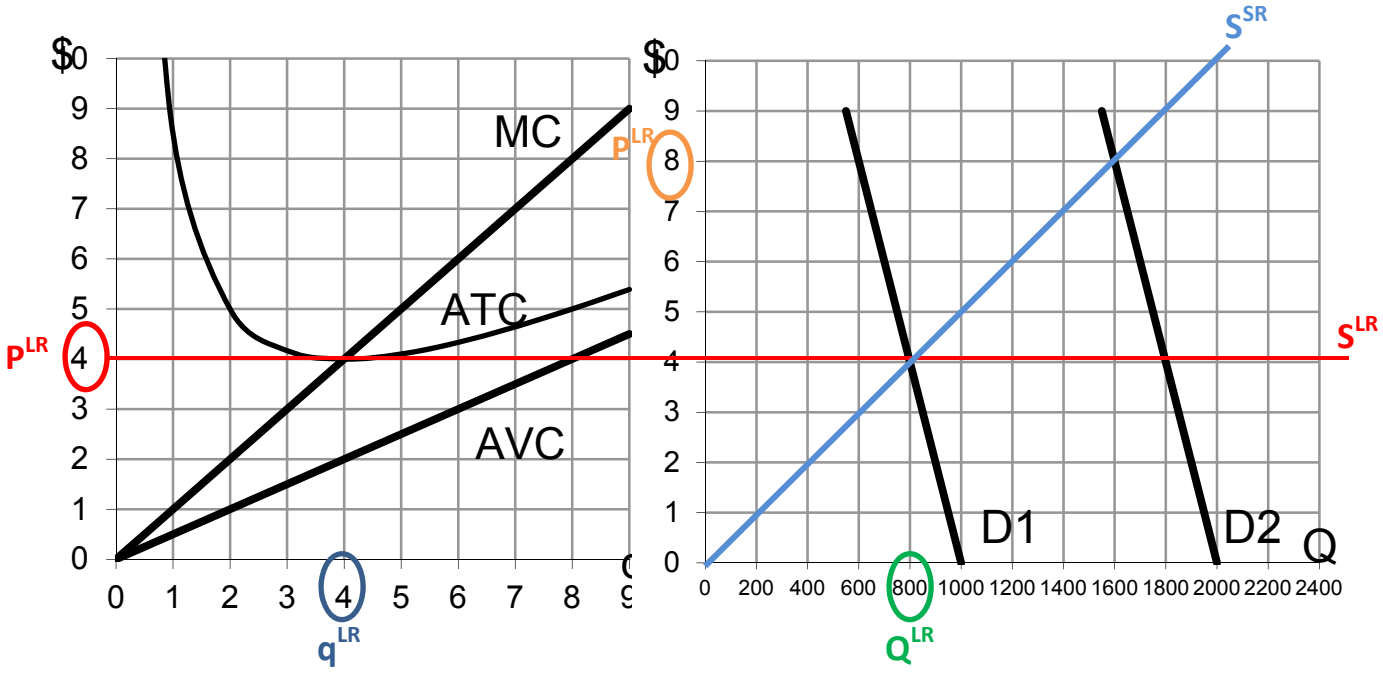


Thus, we see that originally, Wolverine will consume 4 pizzas. Now, the price of pizza falls to $1, and we draw his new budget constraint in the above diagram, represented by the green line. The optimal consumption bundle at this price is labeled point C. To find the substitution, effect, we need to shift the new budget constraint (the green line) back to the original indifference curve (the one where point A is). Doing so will tell us what Wolverine's consumption bundle is if we kept him equally as happy as before but changed the opportunity cost to reflect that of the new prices. This is precisely the substitution effect. We therefore get the red budget constraint above that is parallel to the green budget constraint and also touches the old indifference curve at exactly one point. We call that point "Point B". Now, the substitution effect is simply going from A to

B, and the income effect is going from B to C. We see that at A, 4 pizzas are demanded, and at B, 8. Therefore, the substitution effect is 4 pizzas, and the answer is D.

8) We see from the diagram also that the income effect is also positive, since from point B to point C, we went from 8 to 16 pizzas. Therefore, both the substitution and income effect on the demand for pizza go in the same direction. The answer is A.
9) We have two effects that go in opposite directions here. The negative externality is pushing the social efficient quantity to the left of the market equilibrium quantity (T); at the same time, we also have the positive externality, so for each unit consumed we have an external benefit, so the socially efficient quantity will be pushed to the right of T. Overall, we find the socially efficient quantity looking at the intersection of Social Marginal Benefit and Social Marginal Cost, which happens at quantity T. Notice that this is the same as the free market equilibrium, given by the intersection of private marginal cost and private marginal benefit (supply and demand): the two effects just end up cancelling each other. The answer is D.
10) Taxes and subsidies might in general improve social surplus when we have an externality; the reason is that when we have externalities the market equilibrium allocation might not be the one that maximizes social surplus. Then, the target of imposing a tax or a subsidy is to achieve the socially efficient quantity. In this case, we notice that even if we have externalities, the market equilibrium allocation and the socially efficient quantity coincide. Consequently, we don't need any subsidy or tax: they would just move us away from the socially efficient quantity. The answer is B.
11) Let's start by noting that the long run supply curve is perfectly elastic if, and only if, the industry has many firms all producing the cost minimizing quantity. For this to be the case, it must be possible for identical firms to enter and exit. We therefore need conditions 1, 3 and 4. If condition 2 holds, we should expect the market to be served by a monopoly, so condition 2 is not necessary. Condition 5 is also not necessary, as demand does determine supply (how much firms are willing to produce at various prices) at all. The answer is C.
12) To find the fixed cost, remember that TC = FC + VC, so FC = TC – VC. So, if we can calculate TC and VC for some q, we can easily calculate FC. From the graph, we see that at a quantity of 4, ATC is 4 and AVC is 2. Since ATC = TC / q, TC = ATC * q, and therefore the TC is 4 * 4 = 16. Similarly, AVC = VC / q, so VC = AVC * q, and VC = 2 * 4 = 8. So, we get FC = 16 – 8 = 8. The answer is D.
13) We start with a market price of 8. To find the profit, we need to figure out what quantity maximizes profit for the firm. The rule for profit maximization is to find the quantity at which MR = MC. For a competitive firm, P = MR, so we want the quantity for which P = MC. From the graph, drawing a line at P = 8 shows that this quantity is 8. Then, to calculate profit, we use the formula Profit = q*(P – ATC). From the graph, we see that at q =8, ATC = 5. So, profit = 8 * (8 – 5) = 8 * 3 = 24. The answer is D.
14) In the long run, we know each firm will earn a profit of zero. Since profit = (P – ATC) * q, profit is zero if, and only P = ATC. We also know that firms will produce a quantity that minimizes their ATC. This minimum level of ATC is 4. Thus, the long-run price is 4. The answer is D.

See the following charts for questions 14-18:



14) The long-run price, P^{LR}, in a competitive industry is equal to the minimum of the ATC. P^{LR}=minATC=4. The answer is D.

15) Long-run output per firm, q^{LR}, is the quantity where ATC is minimized. This is also the quantity where P^{LR} is equal to MC. q^{LR} = 4. The answer is B.

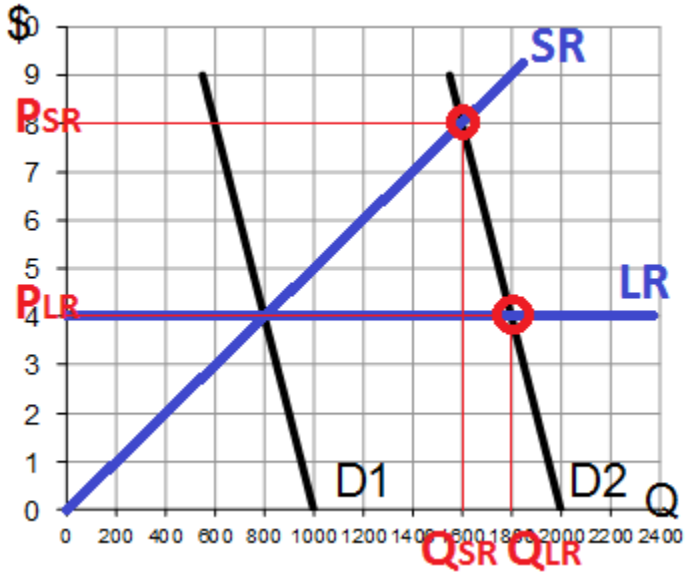
16) Long-run Industry quantity, Q^{LR}, is the quantity where the long-run supply curve interests the demand curve. We are told that demand is D1, so Q^{LR} = 800. The answer is A.

17) The long-run number of firms N^{LR} is equal to the long-run industry quantity divided by the long-run output per firm, $N^{LR}=Q^{LR}/q^{LR}=800/4=200$. The answer is C.

18) In the short run the number of firms is fixed. We are starting in long-run equilibrium at D1, so from the previous question, we know that there are 200 firms. Each firm's short-run supply curve is the marginal cost curve above AVC (in this case the entire MC curve). From this we can see the quantity that each firm will supply (in the short run) for a given price. Since there are 200 firms (each with the same short-run supply) we can multiply the quantity supplied by each firm at a given price by 200 to get the short run industry supply curve, which is indicated on the graph above. This short-run industry supply curve intersects D2 at a price of 8, so in the short-run the equilibrium price is 8. The answer is E.

19) In the short run, the number of firms is fixed and each individual firm produces at the level where MC = P, so the short run supply curve is the MC curve multiplied by the number of firms, and is upward sloping. In the long run, the price is fixed at P=minATC and the number of firms adjust, so the long run supply curve is horizontal at P=minATC. So P changes in the short run

but returns to minATC in the long run, and Q increases in the short run then increases even more in the long run as P returns to minATC. The answer is B.



20) As the light-house is nonrivalrous and nonexcludable, the surplus of building one equals the sum of the marginal benefits (=willingness to pay) of D1~D4, 6+4+2=12. The answer is E.

21) It is helpful to put the information first into a table:

	Olives	Jam
Oliver	4 olives	1 jam
James	5 olives	10 jam

From this, we can also make a table of opportunity costs to find who has comparative advantage. We can find the opportunity cost, for example, for Oliver in producing olives by seeing how many units of jam Oliver gives up when he produces one unit of olive. Since he can make 4 olives per hour or one jam per hour, this means that every unit of olives he makes, he gives up ¼ unit of jam. Thus, his opportunity cost of olives is ¼ jam. We do this for Oliver and James for both goods, and we get the following table:

	Olives	Jam
Oliver	¼ jam	4 olives
James	½ jam	2 olives

Now, we can see that James has an absolute advantage in both goods (looking at the first table) because he can produce more olives and jam in one hour than Oliver can. We see than Oliver has a comparative advantage in olives and James has a comparative advantage in jam because Oliver has a lower opportunity cost in making olives and James has a lower opportunity cost in making jam. Hence, the answer is C.

22) From the opportunity cost table above, we see that the opportunity cost for Oliver to make one more olive is equal to ¼ jam. We should also remember that the opportunity cost is simply the slope of the budget constraint or production possibilities frontier. Hence, the answer is D.

23) The gains from trade here is because of comparative advantage. Increasing returns would imply the Oliver and James trade because they get better at what they are doing when they specialize in a certain good. However, we see that they do not get better in doing what they are doing, as the rates they can make olives and jam remain the same no matter how much time they allocate to making them. Therefore, the answer is B.

24) This question is asking what the tax would need to be for the equilibrium quantity consumed to be 6 gallons of oil in the poor country. Because supply is perfectly elastic, this problem is simpler than usual; the entirety of the tax burden will fall on the consumers and any level of demand can be satisfied at any price over cost ($2). Now, we have a question of at what consumer price ensures that demand is 6 gallons of oil. Looking at the demand curve, it is straightforward to see that at a price of $4, demand is 6 gallons. Finally, the tax (wedge) is simply the distance between demand and supply at 6 gallons, $4 and $2 respectively.

A quick and easy to figure this out is simply to look at the target consumption level (6 units), figure out the size of the wedge between demand and supply at this level, and then set the tax equal to the size of this wedge. The answer is B.

25) This question is essentially the same as question 24 but in the context of the rich country. The target consumption level is 18 units, and the size of the wedge between supply and demand at 18 units is $4. So, the size of the tax to ensure consumption is 18 units is $4. The answer is A.

26) The easiest way to solve this problem is to play around with the tax rate and figure out if global consumption at each tax is too high or too low. If the consumption globally is higher than our target of 18 gallons, we should increase the tax to decrease consumption. If consumption is lower than our target, we should decrease the tax. Using this procedure, you can find that at a tax of $3, consumption in the rich country is 13 gallons and in the poor country is 5 gallons for total global consumption of 18 gallons. The answer is A.

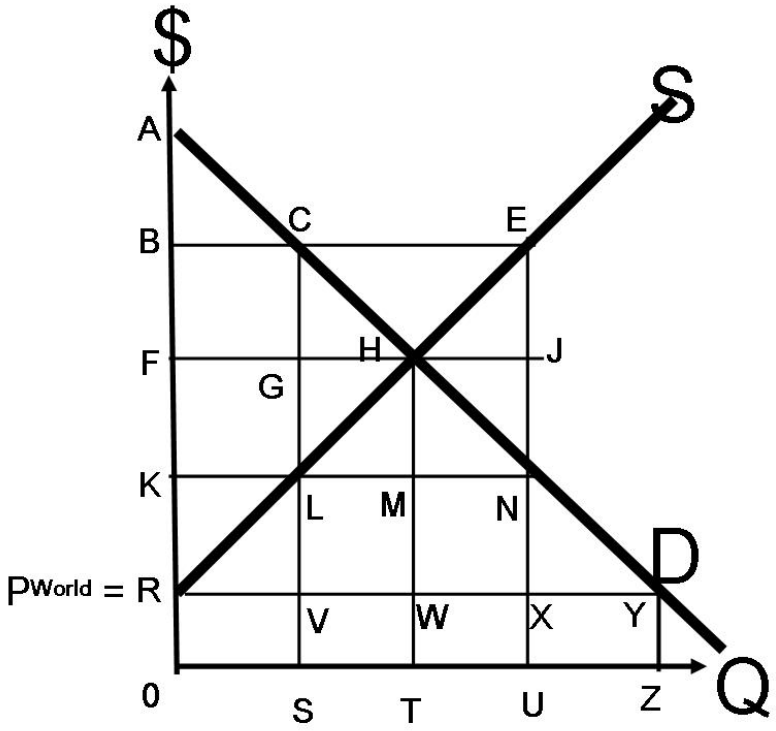
27) This question is slightly tricky. Start with the original set-up, giving 12 allowances to consumers in the rich country and 6 allowances to consumers in the poor country. Remember owning an allowance permits a consumer to use one gallon of oil. So consumption in the rich country is originally 12 gallons, and in the poor country is originally 6 gallons. Now figure out what is the price of the allowance in the rich country and poor country with this initial distribution. The quick and dirty way to find price of the allowance is simply to take the size of the wedge between supply and demand at the level of consumption in the economy (note this method loses a lot of the economic intuition behind *why* the price can be found in this way. You should refer to your class notes if needed.) So with the initial distribution the price of the allowance in the rich country is 4 dollars and in the poor is 2 dollars, and initial price of 2 dollars to purchase the good from suppliers (given by the value of the supply curve at the quantity consumed).

If you know that the price of the allowance in equilibrium will be equalized across the two countries, then it is straightforward to see that the equilibrium price will be 3 dollars. The intuition is good to work through, however. Consumers in the poor country will realize that their allowances are so cheap that there will be a consumer in the rich country that will be willing to buy one of their allowances for the price of $2 dollars. Consider the individual represented on the demand curve at the quantity of 13. He currently is not consuming (consumption is only 12 units). His reservation value (the most he is willing to pay to consume a unit of oil) is $5. So certainly, he would be willing to buy the allowance from the poor consumer at a price of $2 and then buy a unit of consumption at the price of $2 because the total cost of $4 is lower than his valuation of consumption.

We now have a new situation in which the poor consumers are now only consuming 5 units and the rich are consuming 13 units. We can see at these consumption levels, the price of an allowance in the poor country is 3 dollars and in the rich country is 3 dollars. There are no more allowance trades that can be made between the poor and rich countries' consumers. So the equilibrium price of the allowance is 3 dollars. The answer is D.

28) Barack always want a ratio of one egg to two slices of bacon, so egg and bacon are perfect complements. Mitt cares about protein only, so regardless of the ratio of egg vs bacon his MRS is always 3 eggs to 7 slices of bacon, and egg and bacon are perfect substitutes. The answer is C.

29) As to Barack egg and bacon are perfect complements, there is no substitution effect. Any change in demand due to price changes is due entirely to the income effect. The answer is C.



30) With a tariff RK the new price in Econland will be K. At this price domestic producers are willing to supply an amount OS and domestic consumers are willing to purchase about OU. SU amount is hence imported. Recall that tariffs are like a tax levied *only* on imports. The total tariff revenue is amount of imports into the tariff amount. This is given by the area LNXV – the height of the rectangle (LV) is the tariff amount and the breadth (LN) is the amount imported. The answer is D.

31) From the figure:

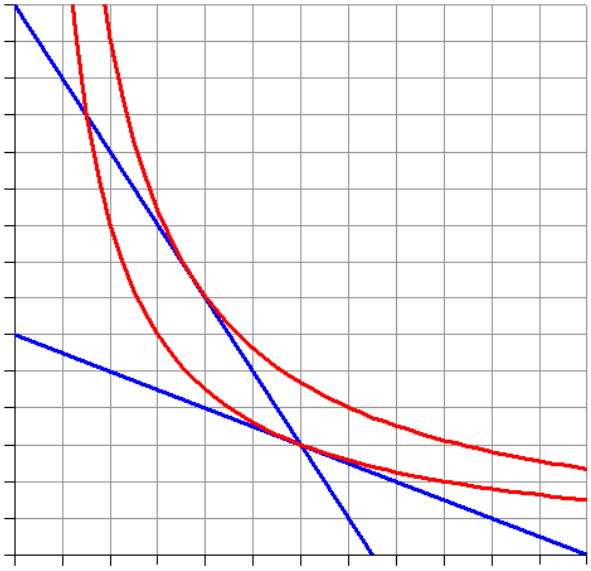
Pre Tariff		**Post Tariff**	
CS	ΔARY	CS	ΔAKN
PS	0	PS	ΔKLR
GS	0	GS	LNXV
TS	ΔARY	TS	ΔARY - ΔRLV - ΔNYX

Thus the change in total surplus is - (ΔRLV+ ΔNYX). The CS decreases by amount KNYR. From this decrease ΔKLR ends up being a gain in PS and LNXV becomes a GS (tariff revenues that we calculated in Q.30). ΔRLV and ΔNYX are lost altogether in the form of production and consumption side inefficiencies respectively. The answer is D**.** However, the question explicitly stated that total surplus is defined as consumer surplus plus producer surplus, therefore, B was also an acceptable answer. (Total surplus will always include government revenue, since the government is part of Econland. But this problem defined total surplus different than how we are used to doing in the class, so we will accept both B and D as answers).

32) This statement is true, because the consumer surplus when tariff is RK is the triangle AKN, and the consumer surplus when there is a quota of length LN is also AKN. For the consumers, the only thing that matters is the price after the government intervention. And in both cases, the price is K, which means the consumer surplus will be the same. The answer is A.

33) We see that Econland is actually better off if the world price falls to zero. Consumers will benefit greatly, since they will basically be the only ones in the economy with any surplus, and the producers will suffer, as they will not get any producer surplus. However, total surplus will be greater than when there was no free trade. The answer is B.

34) The government subsidizes for food, meaning that this will cause Sally to consume more food than she normally would. If the government were to give her cash instead, she would be happier if she ends up consuming less food because this would mean she could consume at a higher indifference curve. From lecture, we saw that the picture looks something like this:



The answer is C.

35) Tragedy of the commons refer to overuse of common resources. Common resources are those that can be used by anyone but if someone uses it, someone else can't use it. In other words, common resources are those that are nonexcludable and rivalrous. The answer is D.