Economics 101
Spring 2017
Answers to Homework #2
Due Thursday, February 23, 2017

Directions:

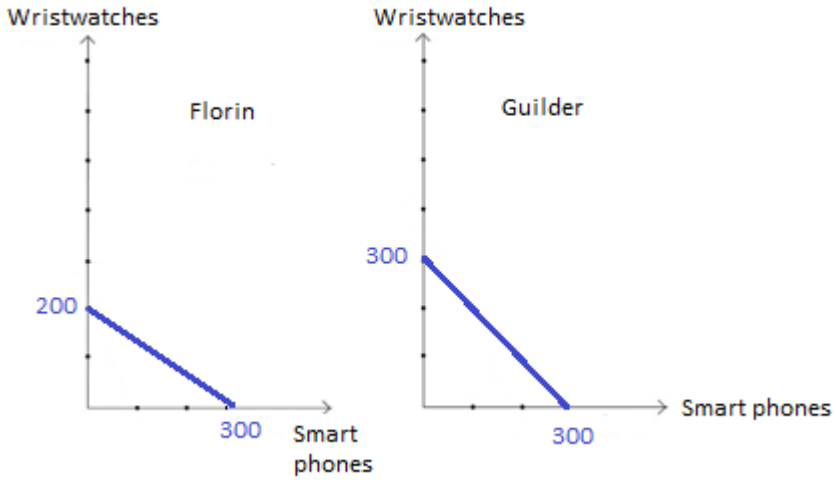
- The homework will be collected in a box **before** the large lecture.
- Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade.
- Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

Please realize that you are essentially creating "your brand" when you submit this homework. Do you want your homework to convey that you are competent, careful, and professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!

Part I: Opportunity Cost, Production Possibility Frontier, Comparative Advantage, Absolute Advantage

1. Consider two fictional countries, Florin and Guilder, who both produce smart phones and wristwatches. It takes Florin 4 hours to produce 100 smart phones and 6 hours to produce 100 wristwatches. It takes Guilder 3 hours to produce 100 smart phones and 3 hours to produce 100 wristwatches. Labor laws differ between the two countries; workers in Florin can work 12 hours per day and workers in Guilder can work 9 hours per day. Florin and Guilder do not trade goods with each other due to a long-standing disagreement between the leaders of the two countries.

    a. Given the above information, draw the Production Possibility Frontier (PPF) per day graph for both Florin and Guilder, with smart phones on the X-axis and wristwatches on the Y-axis.



    b. What is the opportunity cost of producing an additional 100 smart phones for Florin? What is the opportunity cost of producing an additional 100 smart phones for Guilder?

    The opportunity cost of producing an additional 100 smart phones for Florin is 66.67 wristwatches (-2/3 opportunity cost * 100 wristwatches). The opportunity cost of producing an additional 100 smart phones for Guilder is 100 wristwatches (-1 opportunity cost *100 wristwatches).

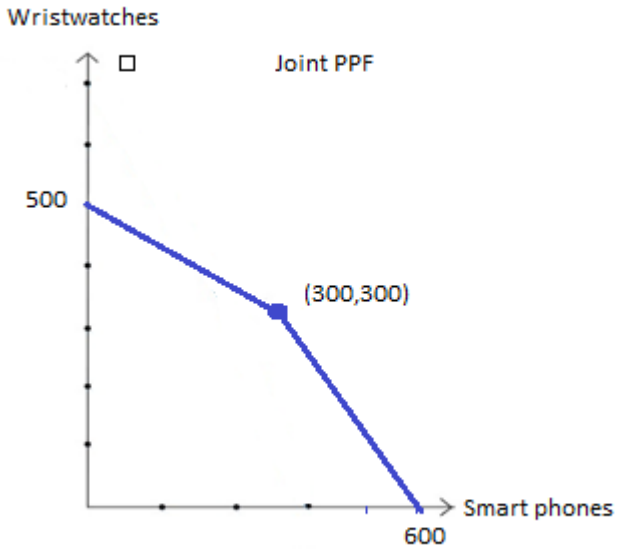
c. Given the above information, who has the absolute advantage in the production of smart phones? Who has the absolute advantage in the production of wristwatches?

Guilder has the absolute advantage in both smart phones and wrist watches. This is because Guilder can produce both goods more efficiently than Florin. For smart phones, Guilder can produce 100 smart phones in 3 hours, but it takes Florin 4 hours to produce that much. Similarly for wristwatches, Guilder can produce 100 wristwatches in 3 hours, where it takes Florin 6 hours to produce that much.

d. Which country has the comparative advantage in the production of smart phones? Which country has the comparative advantage in the production of wristwatches?

The comparative advantage can be determined by examining the slope, or opportunity cost, of the two PPF graphs. The slope for Florin is (-2/3), and for Guilder it is (-1). Therefore Florin has the comparative advantage in the production of smart phones because it has a smaller opportunity cost (2/3 < 1). Guilder has the comparative advantage in the production of wristwatches because it has the smaller inverse slope (1< 3/2).

e. Through careful diplomacy, the countries decide to open their borders to trade. Draw the Joint PPF graph, representing the joint production possibility frontier for both Florin and Guilder, with smart phones on the X-axis and wristwatches on the Y-axis. Label the coordinates of any kink points. How much of each good is each country producing at the kink point?



At the kink point, Guilder is producing the maximum of their comparative advantage, 300 wristwatches, and Florin is producing the maximum of their comparative advantage, 300 smart phones.

f. Write down the slope-intercept form of the Joint PPF.

Let W stand for wristwatches and S stand for smart phones. Then when $0 \leq S \leq 300$, i.e., on the upper segment, the slope is $m = (3 - 5)/(3 - 0) = -2/3$ and the y-intercept is 500. Therefore the equation for this line segment is
$W = (-2/3)\, S + 500$

When $300 \leq S \leq 600$, i.e., on the lower line segment, the slope is $m = (0 - 3)/(6 - 3) = -1$. So the lower line segment has form $W = -S + b$. Plugging in (600, 0), we can solve for the vertical intercept b, which is 600. So the lower line segment has form $W = -S + 600$.

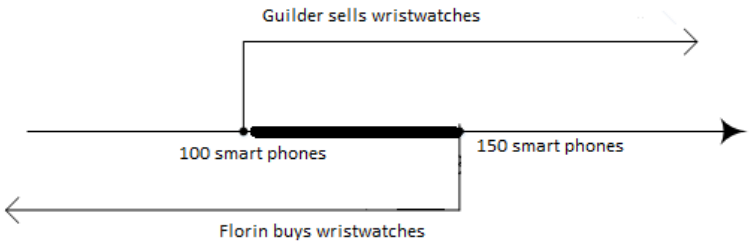
g. Consider the point (400,200) on the Joint PPF. How many smart phones and how many wristwatches is Florin producing at this point? How many smart phones and how many wristwatches is Guilder producing?

The point (400,200) lies on the lower line segment of the Joint PPF graph. Therefore Florin is producing the maximum amount of their comparative advantage in smart phones (S = 300), and Guilder is producing the rest, S = 100. Then Guilder is producing W = 200 wristwatches.

	# produced by Florin	# produced by Guilder	Total
Smart phones	300	100	400
Wristwatches	0	200	200

h. What is the acceptable range of trading prices for 100 wristwatches in terms of smart phones for the two countries to trade with each other?

To answer this question, let's first consider the opportunity costs of wristwatches for both countries.
For Florin to produce 100 wristwatches, their opportunity cost is (3/2)*100 = 150 smart phones.
For Guilder to produce 100 wristwatches, their opportunity cost is (1)*100 = 100 smart phones.
Therefore the trading range of prices is between 100 and 150 smart phones. We know that Guilder is selling wristwatches because they have the comparative advantage in wristwatches. Florin therefore will be buying.



i. If Florin and Guilder do not trade with one another, is it possible for Florin to produce 150 smart phones and 100 wristwatches while Guilder produces 150 smart phones and 200 wristwatches? If the two countries trade with one another, is it possible for each country to produce this combination of smart phones and wristwatches?

This question is asking if the points listed are on or below the PPF graphs (feasible) or outside of the PPF graph (infeasible).

First, without trade: We want to see if (150, 100) is feasible for Florin and (150, 200) for Guilder. To determine this, you plug the x-value into the equations for the two PPF graphs (without trade) and calculate the y-value.
For Florin: $W = (-2/3)(150) + (200) = 100$. Therefore this level of production is feasible.
For Guilder: $W = (-1)(150) + 300 = 150$. Therefore the point (150, 200) is infeasible, it falls outside the production possibility frontier.

Next, with trade: We want to know is (150 + 150, 100 + 200) = (300,300) is feasible in the Joint PPF graph. It happens to be the kink point, so no additional work is needed. This is a feasible bundle since it "sits" on the joint PPF.

Part II: Demand and Supply Shifts

2. Analyze the following scenarios and determine the following: (i). is there an effect on demand, supply, or both, (ii.) does this information cause a movement along the demand or supply curve, or does it cause a shift, and (iii) assuming each market is initially in equilibrium, what is the effect on the equilibrium price and quantity with this change?

   a. Consider the market for taxicabs in Los Angeles. Suppose the government imposes a ban on private downtown parking.
   Once a ban on private parking is imposed, more car owners will use taxis instead of their own cars to ride downtown. The demand for taxicab rides shifts right, because a taxicab is a substitute for private downtown parking. (i.) This impacts the demand curve for taxi cab rides. (ii.) The information causes a rightward shift of the demand curve. (iii.) Equilibrium price and quantity increase.

   b. A recently published study indicates that drinking more than three cups of coffee a day causes cancer. Consider the market for coffee. Then consider the market for tea.
   People who drink more than three cups of coffee a day will cut down on the amount of coffee they drink after the study is published, so demand for coffee falls. Because tea is a close substitute for coffee, demand for tea will increase. (i.) This impacts the demand curve for both coffee and tea. (ii.) The information will cause the demand curve for coffee to shift left. It will cause the demand curve for tea to shift right. (iii.) Equilibrium price and quantity for coffee will fall. Equilibrium price and quantity for tea will rise.

   c. Samsung has improved the speed at which they can create a Galaxy smart phone in their factory. Consider the market for Galaxy phones.
   With the improvement in speed, Samsung can produce more Galaxy phones at any given price, and supply shifts right. (i.) This impacts the supply curve. (ii.) The information causes the supply curve to shift right. (iii.) Equilibrium price decreases, and equilibrium quantity increases.

   d. The price of stainless steel falls due to a technology advancement. Consider the market for stainless steel surgical equipment.
   Stainless steel is a key input to the production of surgical equipment. If the price of an input falls, then the supply curve will shift right as it is cheaper to produce the same number of units. (i.) This impacts the supply curve. (ii.) The information causes the supply curve to shift right. (iii.) Equilibrium price decreases, and equilibrium quantity increases.

   e. Consider the market for self-driving cars. Suppose that a recent crash of a self-driving car causes consumers to be suspicious about the quality of the technology in the car. Suppose at the same time, the cost to produce a self-driving car increases.
   The recent crash changes consumer perceptions or expectations about the safety of the car, causing the demand curve to shift left. At the same time, a cost to producing the self-driving car increases, so the supply curve shifts left. This is a case of indeterminancy. (i) This impacts both the demand and supply curves (ii.) The information will cause the demand curve to shift left, and supply curve to shift left. (iii.) Equilibrium quantity decreases. Equilibrium price is indeterminant, and depends on the relative size of the shifts.

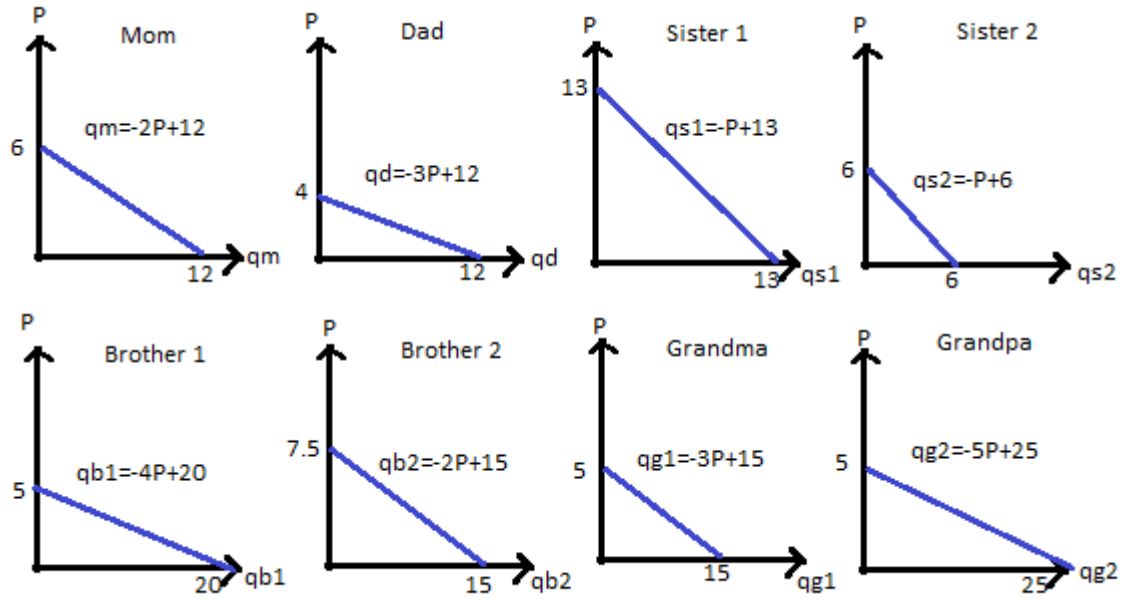
f. Consider the market for iPads. The price of a competitor tablet, the Kindle, increases. At the same time, wages increase for employees working at iPad factories.
A Kindle is a close substitute for an iPad. When the price of a substitute rises, the demand for the good increases, and the demand curve shifts right. At the same time, an input to the production of iPads becomes more expensive. This causes the supply curve to shift left. This is a case of indeterminancy. (i.) This impacts both the demand and supply curves. (ii.) The information will cause the demand curve to shift right, and supply curve to shift left. (iii.) Equilibrium price increases, and equilibrium quantity is indeterminant, depending on the relative size of the shifts.

Part III: Market Summation

3. The Johnson family consists of 8 people. Each person has their own preferences about how many ice cream pints to buy. Assume that each individual's demand curve is linear. The individual demand information for ice cream pints is listed in the table below:

Price	Mom	Dad	Sister1	Sister2	Brother1	Brother2	Grandma	Grandpa	Aggregate
1	10	9	12	5	16	13	12	20	97
2	8	6	11	4	12	11	9	15	76
3	6	3	10	3	8	9	6	10	55
4	4	0	9	2	4	7	3	5	34
5	2	0	8	1	0	5	0	0	16

a. Fill in the Aggregate column in the table above. See above
b. Draw the demand curves for each family member on eight separate graphs. Determine the equation for each of the eight demand curves. Write your equations in x-intercept form.



The table above gives several coordinates on the demand curve for each family member. To find the equation of the line for each member, find the slope m = (Y2 - Y1)/(X2 - X1) and the intercept by plugging in one of the coordinates. Write the equation in slope-intercept form: P = mX + b. Then rearrange your equation to get the equation in x-intercept form, i.e. the variable on the x-axis is on the left hand side of the equation. See the graphs above for the equation of each line.

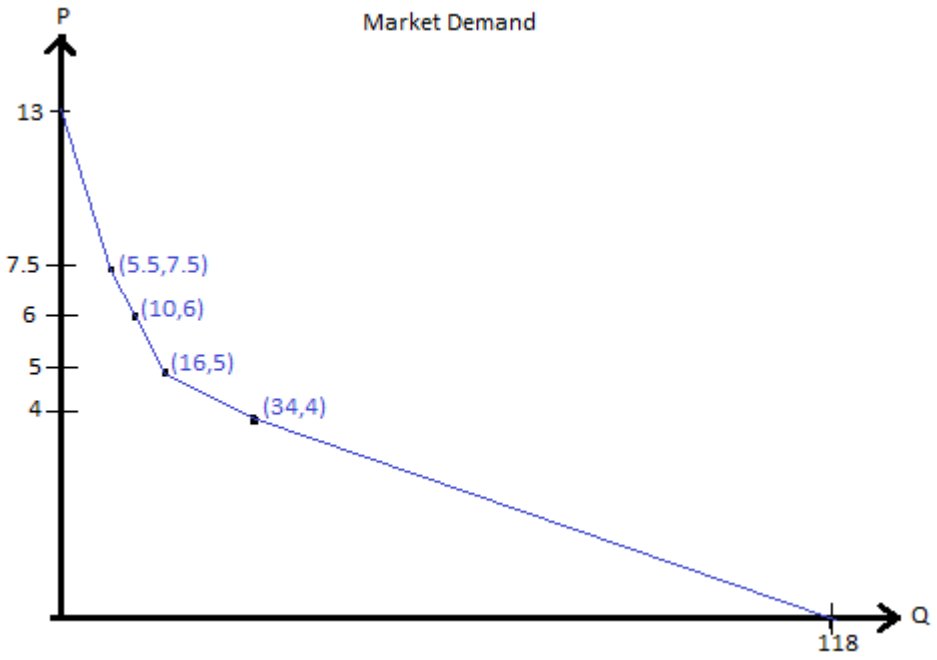
Note: For individual demand curves, the quantities are denoted with a lowercase q, followed by an abbreviation of their name. In part c, uppercase Q denotes the market quantity, or the summation of all family members.

c. The family has decided they want to create one family, or aggregate, demand curve to represent their willingness to pay for ice cream pints as a group. Graph the aggregate demand curve, clearly labeling any kink points. How many kink points are there in the aggregate demand graph? Why?
We begin this analysis with a table. Notice that each family member has a different demand at different price levels. The quantity demanded at each price level is summarized below:

Price Interval	**Who is willing to buy**	**Quantity Demanded**	**Equation**
P > 13	No one	Q = 0	Q = 0
7.5 < P < 13	S1	Q = qs1	Q = -P + 13
6 < P < 7.5	S1 + B2	Q = qs1 + qb2	Q = (-P + 13) + (-2P + 15) = -3P + 28
5 < P < 6	S1 + B2 + M + S2	Q = qs1 + qb2 + qm + qs2	See calc (1) below Q = -6P + 46
4 < P < 5	S1 + B2 + M + S2 + B1 + G1 + G2	Q = qs1 + qb2 + qm + qs2 + qb1 + qg1 + qg2	See calc (2) below Q = -18P + 106
0 < P < 4	S1 + B2 + M + S2 + B1 + G1 + G2 + D	Q = qs1 + qb2 + qm + qs2 + qb1 + qg1 + qg2 + qd	See calc (3) below Q = -21P + 118

Calc (1): Q = (-3P + 28) + (-2P + 12) + (-P + 6) = -6P + 46
Calc (2): Q = (-6P + 46) + (-4P + 20) + (-3P + 15) + (-5P + 25) = -18P + 106
Calc (3): Q = (-18P + 106) + (-3P + 12) = -21P + 118

To graph this table and the associated kink points, first notice that the y-intercept will be P = 13, the highest price that any of the family members are willing to pay. The first kink point, is at P = 7.5, as more family members enter the market. The next kink point is at P = 6, after that P = 5, and finally P = 4 (the interval points in the table above). To determine the associated quantities at each kink point (the x-coordinate of the kink point), simply plug the price into the equation in the fourth column above.
Kink1, when P = 7.5, Q = -(7.5) + 13 = 5.5
Kink2, when P = 6, Q = -3(6) + 28 = 10
Kink3, when P = 5, Q = -6(5) + 46 = 16
Kink4, when P = 4, Q = -18(4) + 106 = 34
Finally, at P = 0, the x intercept is Q = (-21)(0) + 118 = 118



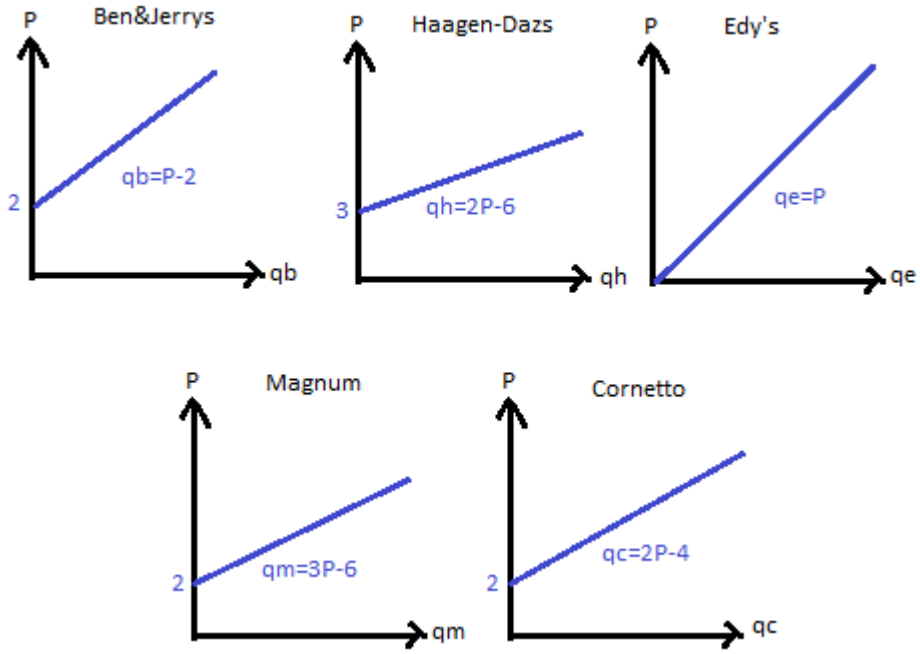
There are 4 kink points on the aggregate or family demand graph. This is because even though there are 8 individuals, there are only five unique y-intercepts (prices) at which the family members begin to demand goods. Starting at a price of $13, only Sister 1 begins demanding ice cream. When the price decreases to 7.5, Brother 2 jumps into the market. At a price of 6, both Mom and Sister 2 start demanding ice cream. At a price of 5, Brother 1, Grandma and Grandpa begin demanding goods. And finally at a price of 4, frugal Dad begins to demand ice cream.

4. Now consider the supply side of the market. Suppose there are 5 perfectly competitive firms who sell ice cream to the Johnson family. The price and quantity supplied for each of the five firms are listed in the table below where price is the price per pint and the quantities are measured in pints:

Price	Ben&Jerry's	Haagen-Dazs	Edy's	Magnum	Cornetto	Aggregate Supply
4	2	2	4	6	4	18
5	3	4	5	9	6	27
6	4	6	6	12	8	36
7	5	8	7	15	10	45

a. Fill in the Aggregate column in the table above. See above

b. Draw the supply curves on a separate graph for each firm. There will be five graphs. Determine the equation for each of the five supply curves, and write your answer in x-intercept form.



The table above gives several coordinates on the demand curve for each firm. To find the equation of the line for each firm, find the slope m = (Y2 - Y1)/(X2 - X1) and the intercept by plugging in one of the coordinates. Write the equation in slope-intercept form: P = mX + b. Then rearrange your equation to get the equation in x-intercept form, i.e. the variable on the x-axis is on the left hand side of the equation. See the graphs above for the equation of each line.

c. Derive the aggregate supply curve, by combining the five individual supply curves, and graph it in the same graph as the aggregate demand curve above. Label any kink points.

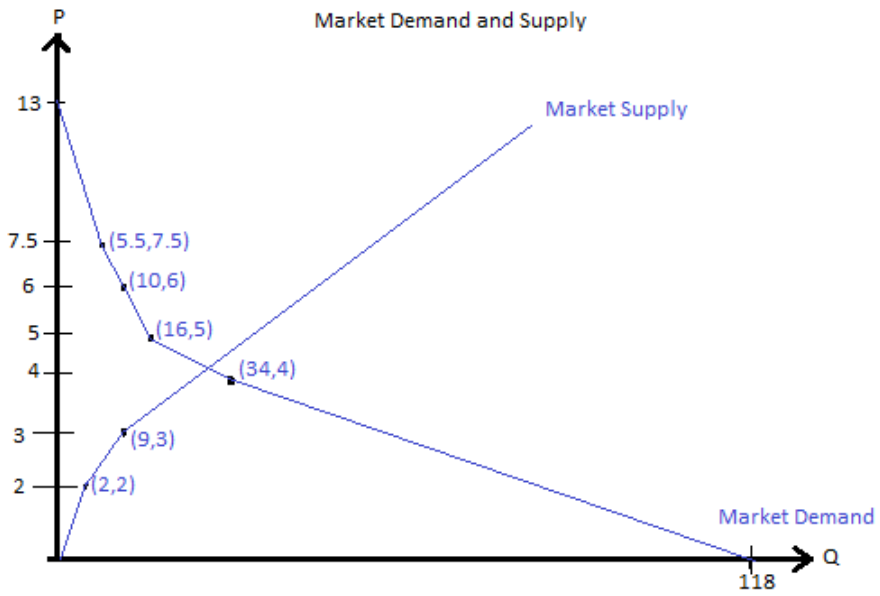
Similar to the aggregate demand question above, we begin this analysis with a table. Notice that each firm has a different supply at different price levels. The quantity supplied at each price level is summarized below:

Price Interval	Who is willing to sell	Quantity Supplied	Equation
$0 < P < 2$	E	Q = qe	Q = P
$2 < P < 3$	B + E + M + C	Q = qb + qe + qm + qc	See calc (4) below Q = 7P - 12
$P > 3$	B + E + M + C + H	Q = qb + qe + qm + qc + qh	See calc (5) below Q = 9P - 18

Calc (4): Q = (P) + (P - 2) + (3P - 6) + (2P - 4) = 7P - 12
Calc (5): Q = (7P - 12) + (2P - 6) = 9P - 18

To find the kink points, first notice that the y-intercept will be P = 0, the lowest intercept of the individual supply curves. The first kink point, is at P = 2, the next smallest intercept of the individual supply curves. The next kink point is at P = 3, the last intercept. To determine the associated quantities at those kink points, the x-coordinate, simply plug the price into the equation in the fourth column above.

Kink1, when P = 2, Q = 2
Kink2, when P = 3, Q = 7(3) – 12 = 9



d. What is the equilibrium price and quantity in the market for ice cream?

To find the equilibrium price and quantity, we set the aggregate demand curve equal to the aggregate supply curve. Clearly, the equilibrium occurs in the third segment of the supply curve, so we use the aggregate supply equation Q = 9P - 18. For the demand equation, we use the equation for the line segment between a price of 4 and price of 5. Therefore, the aggregate demand equation is Q = -18P + 106.

9P – 18 = -18P + 106
27P = 124
P = 4.59
To find Q, Q = 9(4.59) - 18 = 23.33 pints of ice cream

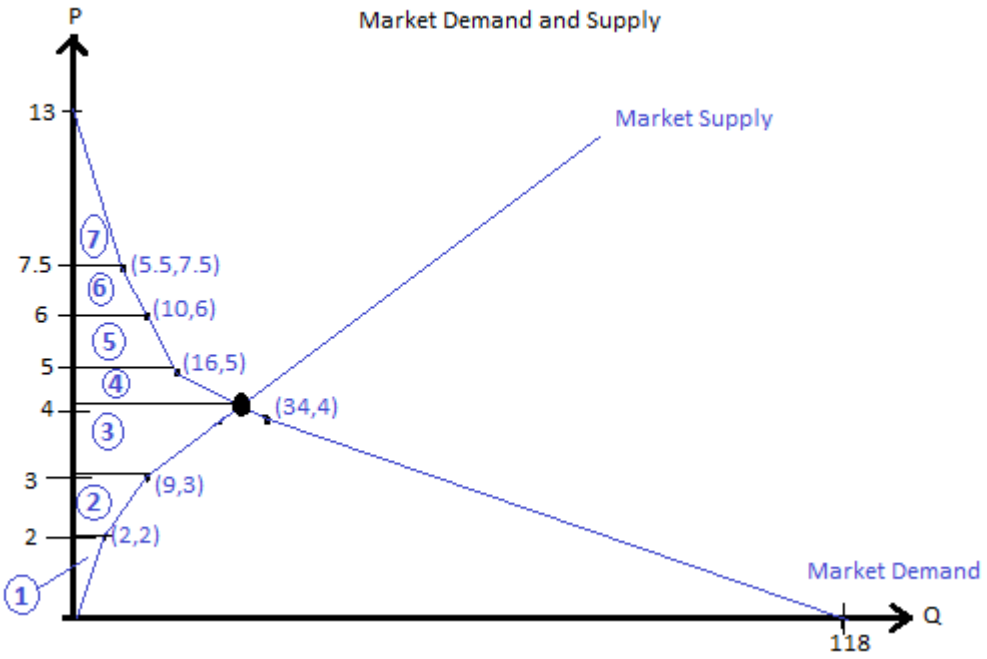
e. (Challenging!) What is the consumer surplus? What is the producer surplus? What is the total surplus?

To determine consumer and producer surplus, we can divide the area into smaller trapezoids divided by the kink points/equilibrium point. See the graph below for illustration.

Producer surplus:
(1): 2*2/2 = $2
(2): 0.5*(2 + 9)(1) = $5.5
(3): 0.5*(9 + 23.33)(4.59-3) = $25.7
(1) + (2) + (3) = $33.20

Consumer Surplus:
(4): 0.5*(23.33 + 16)(5-4.59) = $8.06
(5): 0.5*(16 + 10)(1) = $13
(6): 0.5*(10 + 5.5)(1.5) = $11.63
(7): 0.5*(13-7.5)(5.5) = $15.13
(4) + (5) + (6) + (7) = $47.81

Total Surplus = Producer surplus + Consumer surplus = 33.20 + 47.81 = $81.01



Part IV: Price Ceilings and Price Floors

5. The supply and demand equations for New York City apartment rentals are as follows (measured in $1,000):

Supply of apartments: $P = 2Q_s + 2$
Demand for apartments: $P = 12 - 3Q_d$

a. Suppose the United States government imposes a price ceiling at $5. Is there a shortage or a surplus? Identify how big the shortage or surplus is given this price ceiling.
This is an effective price ceiling because it is set below the equilibrium price. It creates a shortage in the market.
First solve for the equilibrium:
$2Q + 2 = 12 - 3Q$
$Q = 2$
$P = 2(2) + 2 = 6$
So the equilibrium is at (2,6)

To find the amount of the shortage:
At a price of 5, quantity demanded is (7/3) and quantity supplied is (3/2). Therefore the shortage is $Q_d - Q_s = 5/6$ units

b. Now suppose the government imposes a price ceiling at $8. Is there a shortage or surplus? Identify how big the shortage or surplus is given this price ceiling.
In the previous question we found that the equilibrium price is $6. Therefore the price ceiling is above the equilibrium, so it is ineffective. There is no shortage or surplus.

c. If the government wants to impose a price intervention in this market that creates a surplus of 3 units, would they implement a price ceiling or a price floor? What implemented price control would create this surplus?

To create a surplus, the government would impose an effective price floor. To determine the floor amount, we need to find the place on the graph where supply is greater than demand by 3 units. Solve the following equation:
$Q_S - Q_D = 3$
$(1/2P - 1) - (-1/3P + 4) = 3$
$P = 9.60$
So, if the government imposes a price floor of $9.60 in this market this will result in a surplus of 3 units of apartment housing.

d. Explain in words the difference between a price ceiling and a price floor. Give an example of both a price ceiling and price floor that exists in a market in the United States.
A price ceiling is a maximum price, set by the government, in which a trade can occur in the market. A price floor is a minimum price, again set by the government, in which a trade can occur. A price ceiling is only effective if it is below the equilibrium price. Similarly, a price floor is only effective if above the equilibrium price. There are many examples of price ceilings and floors in the United States. One example of a price ceiling is rent control in New York City. An example of a price floor is the minimum wage law.

Part V: Agricultural Price Supports and Price Guarantees

6. Suppose the supply and demand for potatoes are given by the following equations where P is the price per ton of potatoes and Q is the number of tons of potatoes:

Supply of potatoes: $Q_S = 1/3P - 6$
Demand for potatoes: $Q_D = 36 - (1/3)P$

a. What are the equilibrium price and quantity for potatoes?
To find equilibrium price and quantity, set the demand equation equal to supply and solve for P and Q.

$(1/3)P - 6 = 36 - (1/3)P$
P = $63 per ton of potatoes, Q = 15 tons

b. The government is concerned about the potato market and wants to implement a price support program, where the government sets the price at $72 and agrees to purchase any additional potatoes that are not sold. In addition, the government plans to store any potatoes they purchase and incur a storage cost of $1,000 for the warehouse rental. Given this program, how many potatoes do consumers buy? How many potatoes do farmers sell? How many potatoes are purchased by the government, and what is the cost to the government?
Plug P = 72 into the demand curve and the supply curve. The quantity supplied at this price is: (1/3)(72) - 6 = 18 tons. The quantity supplied at this price is: 36 - (1/3)(72) = 12 tons. Therefore the excess supply is 18 - 12 = 6 tons, which the government will purchase under a price support program. Consumers buy 12 tons of potatoes and the government buys 6 tons of potatoes, at a price of $72per ton of potatoes. The farmers sell 18 total tons.

The cost to the government is (6 tons * $72) + 1,000 = $1,432 under this program.

c. One government official remembers learning about agricultural price support and guarantee programs in their college economics course, and proposes that a price guarantee program would be a cheaper alternative to the program proposed in part (b). The government official wants to keep the price at $72 but instead offer a subsidy to the farmers. How many potatoes do the farmers sell with this program? What is the price to the consumers with this program? What is the cost of this program to the government?

At a quantity of 18 tons of potatoes, consumers would be willing to pay a price of $54 (plug 18 into the demand equation). Therefore the consumers purchase 18 tons of potatoes at a price of $54, and the government pays a subsidy of (72 - 54) = $18 per ton to guarantee the $72 price to the famers. The cost to the government is ($18*18 tons) = $324.

d. Is the government official correct? What program does the government prefer?
The government prefers the program that has a lower cost. Therefore the government prefers the price guarantee program. The government official is correct in her analysis.

e. What program do the consumers prefer? What program do the farmers prefer?
Consumers clearly prefer the price guarantee program as well, because they can purchase a higher quantity at a lower price than in the price support program. Said another way, consumers have a higher consumer surplus under the guarantee program. Farmers' consumer surplus is the same in both programs, so they are indifferent between the two programs.

Part VI: Thought Experiment on Time Management

After Professor Kelly's discussion in lecture regarding weekly time management, you are curious to understand where all of your time goes and how you can find more time to study for your economics class. You realize that resources are scarce, you only have 168 hours in a week, and you want to optimize your life by getting more study time, more social time, and enough time to sleep each week.

Instructions: For Homework 2, fill in the second column below with your weekly expected number of hours for each activity. Add activities to the table for items not listed: the list is not complete....for example, there is no exercise item on the activity list-so feel free to amend/change the list to more closely reflect the activities where you spend your time. Then, each day of the following week, record the amount of time you actually spend on each activity. Finally, record the difference between expectations and reality once the week is over. Note: you do not need to turn in this table, this is meant as an aid to help you track information.

In Homework 3, you will see a question asking about your reflections on this assignment. How can you better manage your time each week? What activities are "time-wasting", that you can devote less time towards in order to be a more productive student?

Activity	Weekly Expectation	Actual: Day 1	Actual: Day 2	Actual: Day 3	Actual: Day 4	Actual: Day 5	Actual: Day 6	Actual: Day 7	Difference: Actual - Expectation
Sleep									
School credits									
Study time									
Eating meals									
Transportation									
Social Time									
Time on social media, non school related websites									
Working at a job									
Student Orgs									
Religious Activities									
Total	**168 hrs**	**24 hrs**	**24 hrs**	**24 hrs**	**24 hrs**	**24 hrs**	**24 hrs**	**24 hrs**	**0**