Economics 102
Spring 2014
Answers to Homework #1
Due 2/12/14

Directions: The homework will be collected in a box **before** the 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. Please remember the section number for the section **you are registered,** because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

1. In the country of Shangri-La, the only type of business is the production of mountain climbing ropes. The total production of the country in each year is given by:

Year	Ropes Produced
2010	500
2011	750
2012	1000
2013	900

Answer the following questions about the production of mountain climbing ropes.
a. What is the percentage change in ropes produced between 2010 and 2011? What is the percentage change between 2011 and 2012? Are they the same? Why or why not?
b. What is the percentage change between 2012 and 2013?
c. How many ropes must Shangri-La produce in 2014 if they want to increase production by 15% from what it was in 2013?

Answers

a. $g_{2010} = \frac{750-500}{500} = 50\%$ and $g_{2011} = \frac{1000-750}{750} = 33\%$

The percentage growth between 2010 and 2011 (50%) was higher than the growth between 2011 and 2012 (33%). Despite the fact that the change in ropes produced was 250 in both years, in 2010 the base level of production was lower.

b. $g_{2012} = \frac{900-1000}{1000} = -10\%$

c. $.15 = \frac{x-900}{900} \Leftrightarrow x = 1035$

2. Find the y-intercepts and x-intercepts of the following linear demand curves where P is the price per unit and Q is the quantity of output. Then graph each of these demand curves on a separate graph. Measure Price (P) on the vertical axis and measure Quantity (Q) on the horizontal axis.
a. P=20-0.5Q

b. P=5
c. 2.5Q+5P=100
d. Q=100

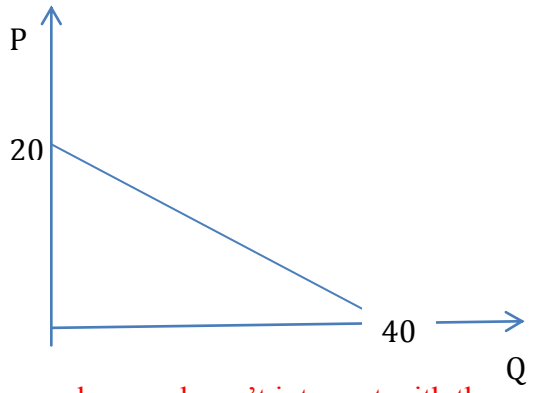
Answer:

a. To find the intercept with y axis (price), we plug Q=0 into the demand curve:

$$P = 20 - 0.5Q = 20 - 0.5 \cdot 0 \Rightarrow P = 20$$

To find the intercept with y axis (price), we plug P=0 into the demand curve:

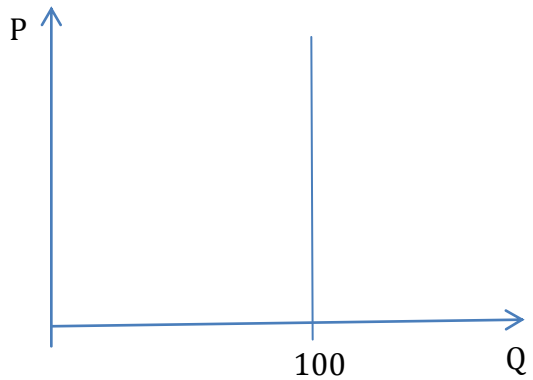
$$P = 20 - 0.5Q \Rightarrow 0 = 20 - 0.5Q \Rightarrow Q = 40$$



b. The demand curve doesn't intersect with the x axis. It's easy to see that the y intercept is 5.

c. The demand curve is the same demand curve given in part (a). To see that, divide both sides by 5 and rearrange the equation.

d. The demand curve doesn't intersect with the y axis. It's easy to see that the x intercept is 100.



3. Suppose Econ 102 consists of 5 problem sets each of them accounting for 10% of the final grade, one midterm that counts 20% and an exam that counts the remaining 30%. Assume the scores on each assignment, midterm, and exam could range from 0-100. The table below presents the corresponding scores for 3 students in the class.

	Melissa	Michael	Serena
Problem set 1 (10%)	70	100	
Problem set 2 (10%)	80	40	50
Problem set 3 (10%)	80	40	50
Problem set 4 (10%)	90	50	60
Problem set 5 (10%)	50	50	40
Midterm (20%)	90	80	50
Exam (30%)	80	80	50
Class grade			

a. Compute the final class grade for Melissa.
b. What is the average score on Problem Set 2? Compute your answer to two places past the decimal.
c. What is Serena's score on problem set 1 if her class grade at the end of the semester is 50?

Answer:

a. Melissa's final class grade = .1(Score on Problem Set 1) + .1(Score on Problem Set 2) + .1(Score on Problem Set 3) + .1(Score on Problem Set 4) + .1(Score on Problem Set 5) +.2(Score on Midterm) + .3(Score on Exam) = .1(70) + .1(80) + .1(80) + .1(90) + .1(50) + .2(90) + .3(80) = 7 + 8 + 8 + 9 + 5 + 18 + 24 = 79

b. Average Score on Problem Set 2 = (Sum of Scores on Problem Set 2)/(Number of Scores) = (80 + 40 + 50)/3 = 170/3 = 56.67

c. Serena's score on problem set 1 can be calculated by using the same general formula you used in (a) and rearranging the terms to solve for the unknown score. Thus, Serena's final class grade = .1(Score on Problem Set 1) + .1(Score on Problem Set 2) + .1(Score on Problem Set 3) + .1(Score on Problem Set 4) + .1(Score on Problem Set 5) +.2(Score on Midterm) + .3(Score on Exam) or 50 = .1(Score on Problem Set 1) + .1(50) + .1(50) + .1(60) + .1(40) + .2(50) + .3(50).
Solving this equation:
50 = .1(Score on Problem Set 1) + 5 + 5 + 6 + 4 + 10 + 15
50 = .1(Score on Problem Set 1) + 45
5 = .1(Score on Problem Set 1)
Score on Problem Set 1 = 50

4. Assume Parkview and Glenview are two countries. Both countries produce books and pizzas. Suppose that these two countries only use labor to produce these two goods (this is just a simplifying assumption to make our work easier). Parkview is a large country that has 500 hours of labor available while the smaller Glenview only has 200 hours of labor available. The

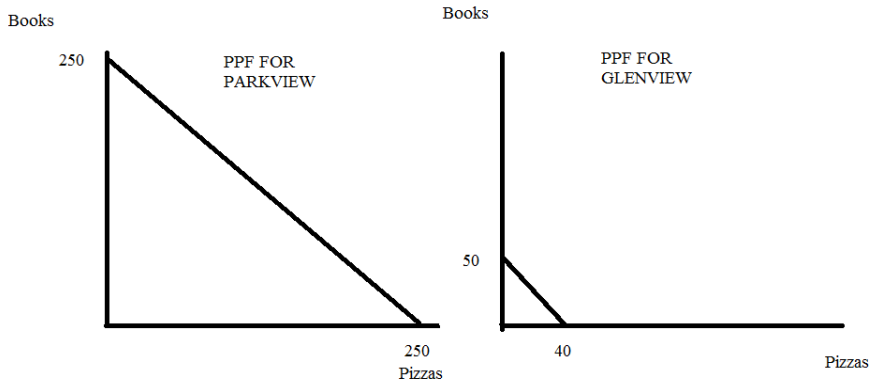
following table tells you how many hours of labor are needed in each country to produce one book or one pizza.

	Hours of Labor Needed to Produce One Book	Hours of Labor Needed to Produce One Pizza
Parkview	2 hours of labor	2 hours of labor
Glenview	4 hours of labor	5 hours of labor

a. Using the given information in the above table and in the introduction, draw the production-possibility frontiers (PPF) for both Parkview and Glenview (on two separate graphs). Measure the number of books produced on the Y axis and the number of pizzas produced on the X axis.
b. What is Parkview's opportunity cost of producing one book?
c. What is Parkview's opportunity cost of producing one pizza?
d. What is Glenview's opportunity cost of producing one book?
e. What is Glenview's opportunity cost of producing one pizza?
f. Which country has the absolute advantage in producing books?
g. Which country has the absolute advantage in producing pizzas?
h. Which country has the comparative advantage in producing books?
i. Which country has the comparative advantage in producing pizzas?
j. What range of trading prices would be acceptable to both countries in terms of books for one pizza?
k. What range of trading prices would be acceptable to both countries in terms of pizzas for 5 books?
l. Suppose now that the two countries agree to team up and combine their production. Draw the combined PPF for the two countries. Write an equation for each segment of the combined PPF and clearly identity the range for that segment. In your equations P should stand for the quantity of pizzas and B should stand for the quantity of books.

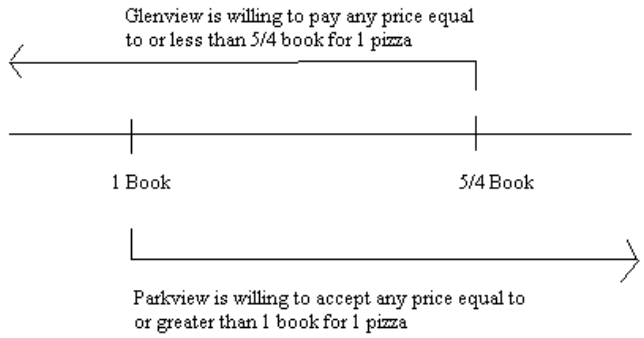
Answer:

a. To find the PPF for both countries, we want to find the maximum number of books and pizzas each country would produce if the country produced only one product. If Parkview produces only books they could produce 500/2 = 250 books from their available resources and if Parkview produces only pizzas they could produce 500/2 = 250 pizzas from their available resources. If Glenview produces only books they could produce 200/4 = 50 books from their available resources and if Glenview produces only pizzas they could produce 200/5 = 40 pizzas from their available resources. Plot these points on the vertical and horizontal axes and connect them to obtain the PPF for each country.



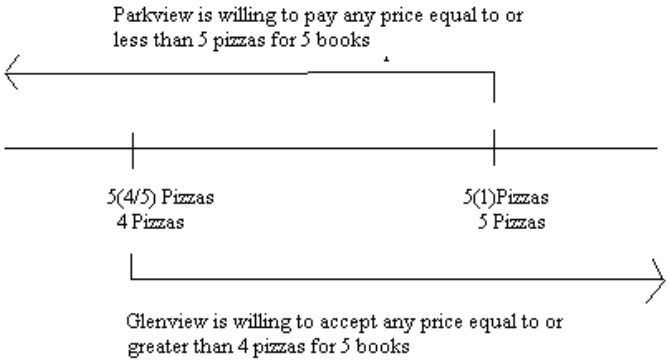
b. For Parkview the opportunity cost of producing one book is one pizza.
c. For Parkview the opportunity cost of producing one pizza is one book.
d. For Glenview the opportunity cost of producing one book is 4/5 pizza.
e. For Glenview the opportunity cost of producing one pizza is 5/4 pizza.
f. If both countries have the same amount of resources (for example, 500 units of labor) then Parkview can still produce absolutely more books and more pizza than Glenview. Parkview therefore has the absolute advantage in the production of books. When both countries have 500 units of labor available for production, then Parkview can produce a maximum of 250 books while Glenview can produce a maximum of 125 books.
g. If both countries have the same amount of resources (for example, 500 units of labor) then Parkview can still produce absolutely more books and more pizza than Glenview. Parkview therefore has the absolute advantage in the production of pizzas. When both countries have 500 units of labor available for production, then Parkview can produce a maximum of 250 pizzas while Glenview can produce a maximum of 100 pizzas.
h. Glenview has the comparative advantage in the production of books since the opportunity cost of producing a book in Glenview is 4/5 of a pizza which is less than the opportunity cost of producing a book in Parkview. Recall from answer (b) that the opportunity cost of producing one book in Parkview is one pizza.
i. Parkview has the comparative advantage in the production of pizzas since the opportunity cost of producing a pizza in Parkview is 1 book which is less than the opportunity cost of producing a pizza in Glenview. Recall from answer (e) that the opportunity cost of producing one pizza in Glenview is 5/4 books.
j. The range of trading prices in terms of books that one pizza will trade for falls between 1 book (the lowest acceptable price to Parkview for producing a pizza since Parkview's opportunity cost of producing a pizza is one book) and 5/4 book (the highest price Glenview is willing to pay for a pizza since this represents the opportunity cost of Glenview producing a pizza). The number line below illustrates this idea.

Trading range of prices for 1 Pizza

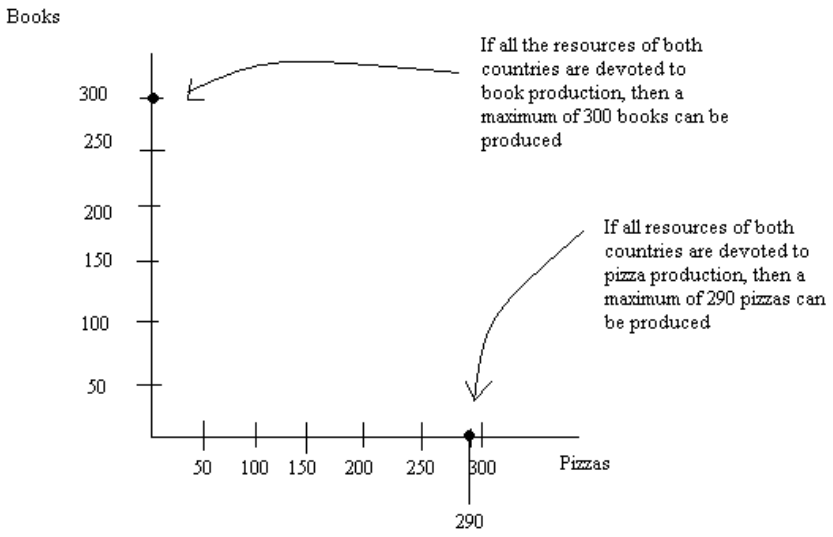


k. The range of trading prices in terms of pizzas that 5 books will trade for falls between 4 pizzas (the lowest acceptable price to Glenview for producing 5 books since Glenview's opportunity cost of producing 1 book is 4/5 pizza) and 5 pizzas (the highest price Parkview is willing to pay for 5 books since this represents the opportunity cost of Parkview producing 5 books). The number line below illustrates this idea.

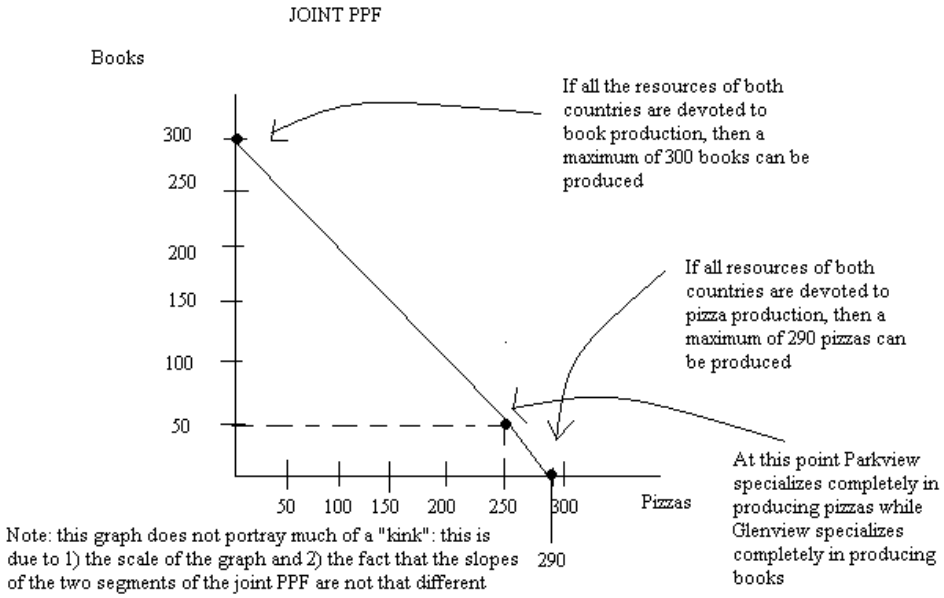
Trading Range of Prices for 5 Books



l. To construct the joint PPF for these two countries start by finding the end points of the PPF. If both countries devote all of their resources to producing books, the total number of books that can be produced will be equal to 250 + 50 or 300 books. Recall that Parkview can produce a maximum of 250 books from their resources while Glenview can produce a maximum of 50 books from their resources. If both countries devote all of their resources to producing pizzas, the total number of pizzas that can be produced will be equal to 250 + 40 or 290 pizzas. The figure below illustrates these two end points.



We need to now find the "kink" point in this joint PPF. This kink point will represent the production that is possible if the two countries specialize completely according to their comparative advantage. This implies that Parkview will devote all of its resources to the production of pizza since Parkview has the comparative advantage in the production of pizza, and that Glenview will devote all of its resources to the production of books since Glenview has the comparative advantage in the production of books. Thus, Parkview will produce 250 pizzas and Glenview will produce 50 books. Now, we just need to plot this point in our joint PPF graph and connect our endpoints to this point. The figure below illustrates this idea.



Now, all that is left for us to do is to write the equations for the two segments of this joint PPF. In the range of 0 books to 50 books, this equation can be found by first calculating the slope (m = -50/40 = -5/4, which is the slope of Glenview's PPF by the way); then using the general slope intercept form of the equation and this slope to get Y = mX + b or B = (-5/4)P + b where "b" is the y-intercept. To

find the y-intercept take a point that you know is on this segment of the PPF (this could be the point (290,0) or the point (250,50)), plug this point into the equation and then solve for "b". Thus, 50 = (-5/4)(250) + b or 50 = (-312.5) + b or b = 362.5. To verify that this is correct, you could check the slope using the two endpoints of this line: thus, slope = -362.5/290 = -1.25 = -5/4. So, the "lower segment" in the above joint PPF can be written as the equation B = (-5/4)P + 312.5 for the range of book production between 0 books and 50 books.

The "top segment" is found in a similar way, although this is an easier segment to find since you can "see" the y-intercept is 300 and you can calculate the slope is -250/250 or -1 (which is the slope of Parkview's PPF by the way). Thus, the equation for this segment is given as B = -P + 300 for the range of book production between 50 books and 300 books.

5. Suppose that there are two individuals, Emily and Mitchell, and these two individuals only produce belts and shirts. We will assume that the only input required to produce these two goods is labor. Both individuals have linear PPFs. You are given the following information about the amount of labor that is needed by each individual to produce belts and shirts.

	Hours of Labor Needed to Produce One Belt	Hours of Labor Needed to Produce One Shirt
Emily	5 hours of labor	2 hours of labor
Mitchell	10 hours of labor	50 hours of labor

You are also given the following information about the current level of production of belts and shirts. You should assume that both individuals are producing at an efficient level of production: that is, they are both producing at points that are on their PPFs.

	Current Level of Belt Production	Current Level of Shirt Production
Emily	320	200
Mitchell	50	30

a. Given the above information, how many hours of labor is Emily devoting to the production of belts? Explain in words how you found your answer (please use complete sentences and make an effort to express this idea clearly, yet concisely).
b. Given the above information, how many hours of labor does Emily have available to devote to the production of belts and shirts? Explain in words how you found your answer (please use complete sentences and make an effort to express this idea clearly, yet concisely).
c. Given the above information, how many hours of labor is Mitchell devoting to the production of shirts? Explain in words how you found your answer (please use complete sentences and make an effort to express this idea clearly, yet concisely).
d. Given the above information, how many hours of labor does Mitchell have available to devote to the production of belts and shirts? Explain in words how you found your answer (please use complete sentences and make an effort to express this idea clearly, yet concisely).

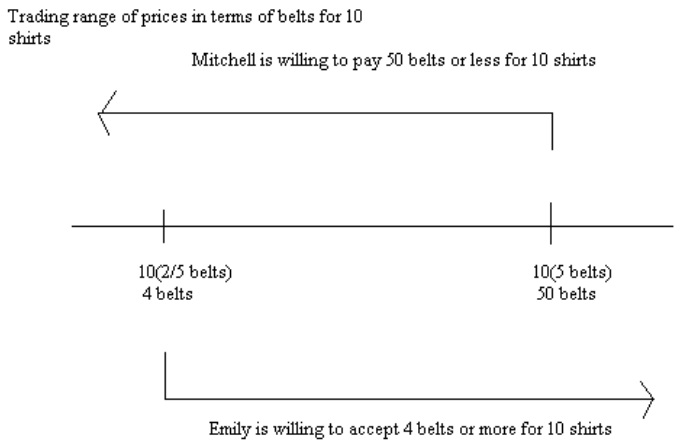
e. If Emily only produces belts, what is the maximum amount of belts she can produce given the amount of labor she has available? Explain in words how you found your answer.
f. If Emily only produces shirts, what is the maximum amount of shirts she can produce given the amount of labor she has available? Explain in words how you found your answer.
g. If Mitchell only produces belts, what is the maximum amount of belts he can produce given the amount of labor he has available? Explain in words how you found your answer.
h. If Mitchell only produces shirts, what is the maximum amount of shirts he can produce given the amount of labor he has available? Explain in words how you found your answer.
i. Which individual has the comparative advantage in the production of belts? Explain your answer.
j. Which individual has the comparative advantage in the production of shirts? Explain your answer.
k. In order to increase the overall production of belts and shirts from the current level of production, what would you suggest that Mitchell and Emily do? Assume that they are willing to trade with one another.
l. What will be the acceptable range of trading prices for 10 shirts in terms of belts?
m. What will be the acceptable range of trading prices for 100 belts in terms of shirts?

a. Emily is currently producing 320 belts and 200 shirts; we are also told that this point is on Emily's PPF. From the table we can see that Emily must devote 5 hours of labor to produce one belt: we can use this information to calculate how much labor she is using to produce 320 belts. Mathematically, we can write this as Total number of labor hours devoted to belt production = (320 belts)(5 hours of labor/belt) = 1600 hours of labor. Emily is devoting 1600 hours of labor to belt production when she produces 320 belts.
b. From (a) we know that Emily is devoting 1600 hours of labor to belt production. We can calculate the amount of labor she is devoting to shirt production in a similar manner: Hours of labor devoted to shirt production = (200 shirts)(2 hours of labor/shirt) = 400 hours of labor. Thus, the total amount of labor hours Emily has available to produce belts and shirts is equal to 2000 hours of labor.
c. Mitchell is currently producing 30 shirts and 50 belts; we are also told that this point is on Mitchell's PPF. From the table we can see that Mitchell must devote 50 hours of labor to produce one shirt: we can use this information to calculate how much labor he is using to produce 30 shirts. Mathematically, we can write this as Number of hours devoted to shirt production = (30 shirts)(50 hours of labor/shirt) = 1500 hours of labor. Mitchell is devoting 1500 hours of labor to shirt production when he produces 30 shirts.
d. From (c) we know that Mitchell is devoting 1500 hours of labor to shirt production. We can calculate the amount of labor he is devoting to belt production in a similar manner: Hours of labor devoted to belt production = (50 belts)(10 hours of labor/belt) = 500 hours of labor. Thus, the total amount of labor hours Mitchell has available to produce belts and shirts is equal to 2000 hours of labor.
e. The maximum number of belts Emily can produce given that she has a total of 2000 hours of labor available is 400 belts. To find this answer you can divide the total number of hours of labor available by the number of hours of labor it takes Emily to make a belt: thus, (2000 hours of labor)/(5 hours of labor/belt) = 400 belts.

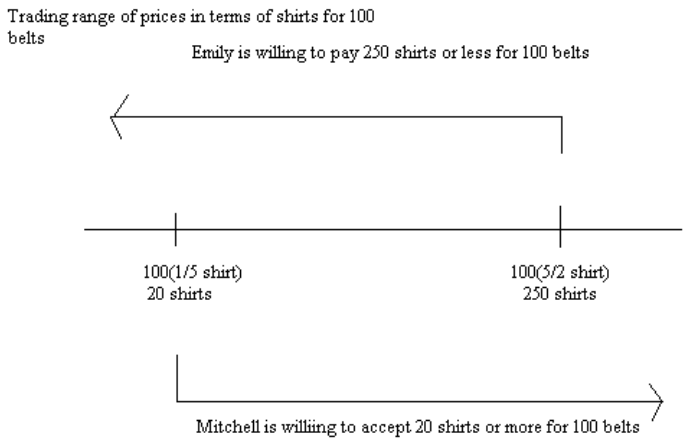
f. The maximum number of shirts Emily can produce given that she has a total of 2000 hours of labor available is 1000 shirts. To find this answer you can divide the total number of hours of labor available by the number of hours of labor it takes Emily to make a shirt: thus, (2000 hours of labor)/(2 hours of labor/shirt) = 1000 shirts.
g. The maximum number of belts Mitchell can produce given that he has a total of 2000 hours of labor available is 200 belts. To find this answer you can divide the total number of hours of labor available by the number of hours of labor it takes Mitchell to make a belt: thus, (2000 hours of labor)(10 hours of labor/belt) = 200 belts.
h. The maximum number of shirts Mitchell can produce given that he has a total of 2000 hours of labor available is 40 shirts. To find this answer you can divide the total number of hours of labor available by the number of hours of labor it takes Mitchell to make a shirt: thus, (2000 hours of labor)(50 hours of labor/shirt) = 40 shirts.
i. Mitchell has the comparative advantage in the production of belts since his opportunity cost of producing a belt is smaller than Emily's opportunity cost of producing a belt. Mitchell's opportunity cost of producing a belt is 1/5 shirt while Emily's opportunity cost of producing a belt is 5/2 shirt.
j. Emily has the comparative advantage in the production of shirts since her opportunity cost of producing a shirt is smaller than Mitchell's' opportunity cost of producing a shirt. Emily's opportunity cost of producing a shirt is 2/5 belt while Mitchell's opportunity cost of producing a shirt is 5 belts.
k. Mitchell should produce more belts which is his comparative advantage and Emily should produce more shirts. For example, consider changing the production levels as follows:

	Current Level of Belt Production versus New Level of Belt Production	Current Level of Shirt Production
Emily	320 vs. 300	200 vs. 250
Mitchell	50 vs. 80	30 vs. 24
Total Production	370 vs. 380	230 vs. 274

l. The acceptable range of trading prices for 10 shirts in terms of belts will be between 4 belts and 50 belts. The number line below illustrates this idea:



m. The acceptable range of trading prices for 100 belts in terms of shirts will be between 20 shirts and 250 shirts. The number line below illustrates this idea:



6. Let's return to Emily and Mitchell and their situation described in problem 5.
a. Emily (and you after your analysis in problem 4) recognizes that she can produce more shirts and more belts than Mitchell. So she decides to no longer interact with Mitchell and simply produce shirts and belts in isolation from him. Given that Emily and Mitchell are no longer trading is it possible for Emily to produce 100 shirts and 560 belts? Explain your answer. In your answer, write an equation for Emily's PPF and then use this equation to help prove your answer.
b. If Emily and Mitchell specialize and trade with one another is it possible for them to produce 100 shirts and 560 belts. In your answer make reference to the joint PPF for these two individuals.
c. After Emily makes her decision suppose that Mitchell comes to Emily and proposes that he will produce 200 belts while Emily produces 200 belts and 500 shirts. Then Mitchell will give Emily 100 belts in exchange for 250 shirts. Is this a reasonable price for trade for these two individuals? Explain your answer. If this trade occurs, how many shirts and belts will Emily have and how many shirts and belts will Mitchell have?

a. Emily working by herself has a PPF that can be described by the equation: $B = 400 - (2/5)S$. So, if Emily produces 100 shirts, this PPF equation tells us she will only be able to produce 360 shirts. Working by herself it is impossible for Emily to produce 100 shirts and 560 belts.
b. Let's contrast our answer in (a) with one that considers Mitchell and Emily's joint PPF. If we consider the joint PPF, the equation for the joint PPF in the range between 200 belts and 600 belts is given by the equation: $B = 600 - (2/5)S$. So, if Emily and Mitchell both produce a total of 560 belts, then their total shirt production is equal to 100 shirts. Working together it is possible for these two individuals to produce 560 belts and 100 shirts.
c. Let's start with the easy part of the question: the first table below gives the initial level of production while the second table gives the proposed level of consumption once trade occurs.

	Initial Level of Belt Production	Initial Level of Shirt Production
Emily	200	500
Mitchell	200	0
Total Production	400	500

	The Level of Belt Consumption After Proposed Trade	The Level of Shirt Consumption After Proposed Trade
Emily	300	250
Mitchell	100	250
Total Consumption	400	500

The harder question, is whether Emily will agree to Mitchell's proposal. We know that the two individuals are able to produce the level of belt and shirt production that Mitchell proposes. But, will they both agree to the proposed trade. From Emily's point of view her comparative advantage is the production of shirts: the opportunity cost to Emily to produce a shirt is 2/5 belt. This implies that Emily is willing to trade 250 shirts for 250(2/5 belt) of 100 belts. Mitchell's proposal certainly satisfies Emily since he proposes giving her 100 belts in exchange for 250 shirts. But, what about Mitchell? Is he happy with this proposed trade? For Mitchell his opportunity cost of producing a shirt is 5 belts. Thus, Mitchell's opportunity cost of producing 250 shirts is 250(5 belts) or 1250 belts. Mitchell is quite pleased with the idea of trading a mere 100 belts for 250 shirts since this is considerably lower than his opportunity cost of producing these shirts. In fact, you might even notice that Mitchell is not able by himself to produce 250 shirts: so this proposed trade, creates a scenario that is clearly an improvement on Mitchell's fortunes as a sole producer.

7. Suppose the price of a mixer is $100 in 2001. The annual growth rate of the price of a mixer is 10%. Given this information, please answer the following questions:
a. What is the price of a mixer in 2004 if the price of mixer consistently grows at an annual rate of 10% from 2001 to 2004?
b. Suppose the price keeps increasing from 2001 onwards at the same constant annual rate. Compare the total growth rates from 2001 to 2007, g_1 , and that from 2001 to 2004, g_2. Is $g_1$the same as, or smaller, or larger than 2*g_2?

Answer:
a. Since the price keeps growing for 3 years, the growth rate is
$(1 + 10\%)^{2004-2001} = (1 + 10\%)^3 = 1.331$
So the price of mixer in 2004 is
$100 * (1 + 10\%)^3 = 133.1$
b.
$g_1 = (1 + 10\%)^{2007-2001} = 1.771561$
$g_2 = (1 + 10\%)^{2004-2001} = 1.331$
then g_1 is smaller than 2*g_2.