Comparative Advantage and Finding the Equation of a Line

When there are multiple people (or groups, or countries) that can produce and trade goods amongst themselves, we can predict who will produce what based on "comparative advantage."

First, it's important to distinguish between *absolute advantage* and *comparative advantage*. Absolute advantage is the ability to produce a higher quantity of one good than the other person. Comparative advantage is the ability to produce one good at a lower opportunity cost than the other person.

> **Example 1:** Countries A and B both produce X-ray machines and Yak meat. Determine which country has the absolute advantage in X and in Y? Who has the comparative advantage in each good?

	Output per Worker	
Good	A	B
X	8	6
Y	4	2

Whenever two countries can engage in trade, compared to a situation where they only consume what they produce (*autarky)*, both countries will be at least as well of as they were without trade.

> **Example 2:** Suppose that Country A initially consumes X=4 and Y=2 before trade. Country B consumes X=3 and Y=1. Generate one possible outcome with trade so that both countries are better off.

If the two countries are willing to trade, we can determine the range of prices at which they will trade by considering the opportunity cost of production for each country. If the price of a good is *above* the opportunity cost of producing it, a country is *willing to sell the good but unwilling to purchase it*. If the opportunity cost is *below* the opportunity cost of producing it, a country is *willing to purchase the good but unwilling to sell it*. Therefore, in order for trade to be possible, the price of each good must be *between the opportunity costs of production for both countries.*

> **Example 3:** At which prices would countries A and B be willing to trade good X? Good Y?

We can show graphically the combination of goods each country can produce by plotting the *production possibility frontier (PPF)*.

If we want to graph the PPF of Country A, use a graph measuring the quantity produced of one good (X) on the horizontal axis and the quantity produced of the other good (Y) on the vertical axis. Then, plot quantity produced if Country A uses all its resources to produce Y. This will be a Y-intercept of 4. Now repeat the process for X.

We can connect the two points and that gives us the graph of all possible combinations of X and Y production so that Country A is using all its production inputs (*efficiency*).

Tutorial: Finding the equation of a line

Given two (X,Y) points, we can always find the equation of a line

Doing so requires two steps: finding the slope and then determining the y-intercept

$$Slope = m = \frac{Rise}{Run} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

The y-intercept can be found using two methods: point-slope or slope-intercept

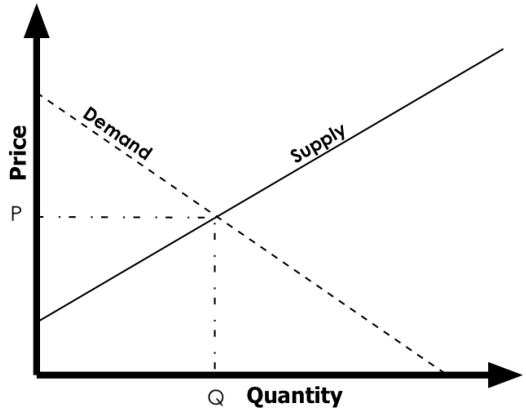
$$Point\ Slope: (y - y_1) = m(x - x_1)$$
$$Slope\ Intercept: y = mx + b$$

Example 4: What is the equation for the PPF of Country A? Country B?

When trade is possible, the PPF is no longer just a straight line. To graph the PPF of two trading countries, first plot the point where both countries only produce one good (e.g. both produce only X). Then, plot the point where both countries only produce the other good. Now, plot the point where each country is producing only the good in which they have the comparative advantage. Connecting each axis point with the third point gives you the PPF.

Example 5: For Countries A and B from Example 1, plot the PPF of the economy if the countries can trade.

Supply and Demand and Solving Systems of Equations



In microeconomics, the **demand curve** is a downward sloping line relating the quantity of a good demanded to the price of that good

- In microeconomics the demand curve is downward sloping due to the **law of demand**

The **supply curve** is an upward sloping curve relating the quantity of a good supplied to the price of that good

- The supply curve is upward sloping due to the **law of supply**

When there is a change in the price (in general the variable on the Y-axis), this results in a *movement along* the supply/demand curve, leading to a *change in quantity supplied/demanded*. In contrast, a *shift* in the supply/demand curve refers to a change in supply/demand at each price

Tutorial: Shifts in lines

Given an equation of two (or more) variables, finding the new equation of a line after a shift (increase/decrease) in one of the variable can be done in two steps

Step 1: Solve for the appropriate variable

The equation should be solved for whichever variable is increasing/decreasing; for instance, if a questions says that "Y is increasing for each X" then the equation should be solved for Y

Step 2: Add/Subtract the amount of the shift from the resulting equation

In following this step, be sure to add the shift to the "equation" side, and not the "variable" side

Example 6: Suppose initially that the demand for apples can be modeled with the following equation: $P = 16 - 2Q$. Now suppose that at each price the quantity demanded for apples increases by 12. What is the new demand for apples?

In any market, the **equilibrium** is found at the point where the market clears; that is where the demand is equal to the supply. This is almost always found at the point where the supply curve intersects with the demand curve.

Tutorial: Solving a system of equations

In Econ 101/102, we often deal with systems of two equations with two unknown variables. Given such a system of equations, there are two steps necessary to solve for the unknown variables

Step 1: Reduce the two equations to one equation with one variable

This can be done in two ways. If the two equations are both solved for the same variable, they can be set equal to each other and this will allow you to solve for the remaining variable. Otherwise, you can take one solved equation and plug it in for the corresponding variable in the second equation, allowing you to solve for the remaining variable.

Step 2: Solve for the remaining variable

After solving for one of the variables, you plug this value into either of the two equations to find the second variable.

Example 7: Given the following supply and demand equations, solve for the equilibrium

$$P = 50 - Q$$

$$Q = \frac{1}{2}P - 10$$

Aggregating Supply and Demand

There are two cases to consider when aggregating supply and demand: identical firms and non-identical firms

Case 1: *Identical firms*

This is typically the case when dealing with supply curves. In this case there are *n* identical firms, each with the same supply equation. In order to aggregate in this case, there are two steps to follow

Step 1: Solve the individual supply/demand equation for q

When you finish this step, the equation should be in the following form:

$$q = mP + b$$

Step 2: Multiply the resulting equation by n

When you finish, the aggregate supply/demand equation will be written as

$$nq = Q = n(mP + b)$$

Example 8: Suppose there are 10 identical firms with the following supply curve: P = 8 + 2q. Find the aggregate supply curve.

Case 2: Non-identical Firms

This is typically the case for demand curves. In this case you are given several different demand curves, and asked to add them in order to get the aggregate supply/demand curve. At each price, you add the quantity supplied/demanded. However, note that supply/demand cannot be negative, and as a result, the aggregate supply/demand curve will typically have "kink" points. The goal in this case is to identify the kink points and then connect them to find the equation of the line.

Example 9: Al (A), Barbara (B), and Charlie (C) are the three members of a market. Al's demand function is $P=10-Q^A$, Barbara's demand function is $P=12-2Q^B$, and Charlie's demand function is $P=8-Q^C$. Illustrate the aggregate demand curve.

Practice Problems:
Use the following information to answer the next three (3) questions.

Jacky and Dona each have linear PPFs in the production of good X and good Y. Each day Jacky can produce 4 units of X and 4 units of Y or, alternatively, he can produce 2 units of X and 5 units of Y. In any two-day period Dona can produce 4 units of X or, alternatively, 12 units of Y. Assume Jacky and Dona each work 4 days a week.

1. What is the maximum number of units of good X Jacky can produce in one week?
   a) 16 units of good X
   b) 48 units of good X
   c) 24 units of good X
   d) 12 units of good X

2. Given the above information, which of the following statements is true?
   a) Jacky has comparative advantage in producing Y.
   b) Jacky and Dona can produce together at least 52 units of Y a week.
   c) The point (X, Y) = (8, 44) is efficient.
   d) In one week Jacky can produce more units of Y than can Dona.
   e) Answers (a), (b), (c) and (d) are all not true.

3. What is the equation for Dona's PPF?
   a) $Y = 24 - 3X$
   b) $X = 24 - 3Y$
   c) $Y = 16 - 1/3(X)$
   d) $Y = 8 - 1/3(X)$

4. Given that there is trade between Jacky and Dona, what is the acceptable range of prices in terms of good X for 2 units of good Y?
   a) Between 1/3 unit of X and 2 units of X
   b) Between ½ unit of X and 3 units of X
   c) Between 2/3 unit of X and 4 units of X
   d) Between 2/3 unit of X and 1 unit of X
   e) Between 1/3 unit of X and ½ unit of X

5. Given the information above, illustrate the joint PPF for Jacky and Dona and provide its equation

6. Suppose the price of cheese curds rise from $1 to $2. What would we expect to occur in the market for cheese curds?
   a) Quantity demanded rises
   b) Quantity demanded falls
   c) Increase in demand
   d) Decrease in demand

7. Suppose the cost of grapes increase. What would we expect to occur in the market for wine?
   a) Quantity supplied rises
   b) Quantity supplied falls
   c) Increase in supply
   d) Decrease in supply

8. Suppose that consumer interest in the Playstation 3 increases. At the same time, the price of the plastic used to make the Playstation 3 falls. How would this affect the price of the Playstation 3?
   a) Price would increase
   b) Price would decrease
   c) No change in price
   d) Unknown

9. In the previous example, how would that scenario affect the equilibrium quantity in the market for the Playstation 3?
   a) Quantity would increase
   b) Quantity would decrease
   c) Quantity would remain the same
   d) Unknown

10. Suppose initially the demand curve is P = 2Q. For each price there is an increase in demand by 10 units. What is the new demand curve?

11. Given the following supply and demand system, solve for the equilibrium

$$P = 40 - 2Q$$
$$P = 8 + 2Q$$

   a. Q = 10, P = 20
   b. Q = 12, P = 16
   c. Q = 8, P = 24
   d. Q = 4, P =16

12. Suppose there are 20 identical firms with the following supply curve: P = 4q – 16. What is the aggregate supply curve?

13. Suppose there are three groups of consumers with the following demand for Pizza:
Consumer Group 1's Demand: P = 10 – Q1
Consumer Group 2's Demand: P = 20 – Q2
Consumer Group 3's Demand: P = 8 – Q3
Given the market supply is P = Q – 3, what is the equilibrium price and quantity in the market for Pizza?
   a) P = 9 and Q = 12
   b) P = 10 and Q = 7
   c) P = 11 and Q = 5
   d) P = 8 and Q = 15