I. Price Elasticity of Demand

A. Law of demand tells us that consumers will respond to a price decrease by buying more of a product (other things remaining constant), but it does not tell us how much more.

B. The degree of responsiveness or sensitivity of consumers to a change in price is measured by the concept of price elasticity of demand.

1. If consumers are relatively responsive to price changes, demand is said to be elastic.

2. If consumers are relatively unresponsive to price changes, demand is said to be inelastic.

3. Note that with both elastic and inelastic demand, consumers behave according to the law of demand; that is, they are responsive to price changes. The terms elastic or inelastic describe the degree of responsiveness. A precise definition of what we mean by "responsive" or "unresponsive" follows.

4. **CONSIDER THIS … A Bit of a Stretch**

   The Ace bandage stretches a lot when force is applied (elastic); the rubber tie-down (not to be confused with a rubber band) moves stretches little when force is applied (inelastic).

C. Price elasticity coefficient and formula:

Quantitative measure of elasticity, E_d = percentage change in quantity/ percentage change in price.

1. Using two price-quantity combinations of a demand schedule, calculate the percentage change in quantity by dividing the absolute change in quantity by one of the two original quantities. Then calculate the percentage change in price by dividing the absolute change in price by one of the two original prices.

2. Estimate the elasticity of this region of the demand schedule by comparing the percentage change in quantity and the percentage change in price. Do not use the ratio formula at this time. Emphasize that it is the two percentage changes that are being compared when determining elasticity.

3. Show that if the other original quantity and price were used as the denominator that the percentage changes would be different. Explain that a way to deal with this problem is to use the average of the two quantities and the average of the two prices.

4. Using averages – the midpoint formula

   a. Using traditional calculations, the measured elasticity over a given range of prices is sensitive to whether one starts at the higher price and goes down, or the lower price and goes up. The midpoint formula calculates the average elasticity over a range of prices to alleviate that problem.

   b. The midpoint formula for elasticity is:

   E_d = [(change in Q)/(sum of Q's/2)] divided by [(change in P)/(sum of P's/2)]

      c.   Have the students calculate each of the percentage changes separately to determine whether the demand is elastic or inelastic. After the students have determined the type of elasticity, then have them insert the percentage changes into the formula.

      d.   Students should practice the exercise in Table 6.1. (Key Question 2)

5.   Emphasis: The percentages changes are compared, not the absolute changes.

      a.   Absolute changes depend on choice of units. For example, a change in the price of a $10,000 car by $1 and is very different than a change in the price a of $1 can of beer by $1. The auto's price is rising by a fraction of a percent while the beer rice is rising 100 percent.

      b.   Percentages also make it possible to compare elasticities of demand for different products.

6.   Because of the inverse relationship between price and quantity demanded, the actual elasticity of demand will be a negative number. However, we ignore the minus sign and use absolute value of both percentage changes.

7.   If the coefficient of elasticity of demand is a number greater than one, we say demand is elastic; if the coefficient is less than one, we say demand is inelastic. In other words, the quantity demanded is "relatively responsive" when Ed is greater than 1 and "relatively unresponsive" when Ed is less than 1. A special case is if the coefficient equals one; this is called unit elasticity.

8.   Note: Inelastic demand does not mean that consumers are completely unresponsive. This extreme situation called perfectly inelastic demand would be very rare, and the demand curve would be vertical.

9.   Likewise, elastic demand does not mean consumers are completely responsive to a price change. This extreme situation, in which a small price reduction would cause buyers to increase their purchases from zero to all that it is possible to obtain, is perfectly elastic demand, and the demand curve would be horizontal.

D. Graphical analysis:

1.   Illustrate graphically perfectly elastic, relatively elastic, unitary elastic, relative inelastic, and perfectly inelastic. (Figures 6.1 and 6.2)

2.   Using Figure 6.2, explain that elasticity varies over range of prices.

      a.   Demand is more elastic in upper left portion of curve (because price is higher, quantity smaller).

      b.   Demand is more inelastic in lower right portion of curve (because price is lower, quantity larger).

3.   It is impossible to judge elasticity of a single demand curve by its flatness or steepness, since demand elasticity can measure both elastic and inelastic at different points on the same demand curve.

E. Total-revenue test is the easiest way to judge whether demand is elastic or inelastic. This test can be used in place of elasticity formula, unless there is a need to determine the elasticity coefficient.

1. Elastic demand and the total-revenue test: Demand is elastic if a decrease in price results in a rise in total revenue, or if an increase in price results in a decline in total revenue. (Price and revenue move in opposite directions).

2. Inelastic demand and the total-revenue test: Demand is inelastic if a decrease in price results in a fall in total revenue, or an increase in price results in a rise in total revenue. (Price and revenue move in same direction).

3. Unit elasticity and the total-revenue test: Demand has unit elasticity if total revenue does not change when the price changes.

4. The graphical representation of the relationship between total revenue and price elasticity is shown in Figure 6.2.

5. Table 6.2 provides a summary of the rules and concepts related to elasticity of demand.

F. There are several determinants of the price elasticity of demand.

1. Substitutes for the product: Generally, the more substitutes, the more elastic the demand.

2. The proportion of price relative to income: Generally, the larger the expenditure relative to one's budget, the more elastic the demand, because buyers notice the change in price more.

3. Whether the product is a luxury or a necessity: Generally, the less necessary the item, the more elastic the demand.

4. The amount of time involved: Generally, the longer the time period involved, the more elastic the demand becomes.

G. Table 6.3 presents some real-world price elasticities. Use the determinants discussed to see if the actual elasticities are equivalent to what one would predict.

H. There are many practical applications of the price elasticity of demand.

1. Inelastic demand for agricultural products helps to explain why bumper crops depress the prices and total revenues for farmers.

2. Governments look at elasticity of demand when levying excise taxes. Excise taxes on products with inelastic demand will raise the most revenue and have the least impact on quantity demanded for those products.

3. Demand for cocaine is highly inelastic and presents problems for law enforcement. Stricter enforcement reduces supply, raises prices and revenues for sellers, and provides more incentives for sellers to remain in business. Crime may also increase as buyers have to find more money to buy their drugs.

   a. Opponents of legalization think that occasional users or "dabblers" have a more elastic demand and would increase their use at lower, legal prices.

   b. Removal of the legal prohibitions might make drug use more socially acceptable and shift demand to the right.

II.   **Price Elasticity of Supply**

    A. The concept of price elasticity also applies to supply. The elasticity formula is the same as that for demand, but we must substitute the word "supplied" for the word "demanded" everywhere in the formula.

        E_S = percentage change in quantity supplied / percentage change in price

    As with price elasticity of demand, the midpoints formula is more accurate.

    B. The ease of shifting resources between alternative uses is very important in price elasticity of supply because it will determine how much flexibility a producer has to adjust his/her output to a change in the price. The degree of flexibility, and therefore the time period, will be different in different industries. (Figure 6.4)

        1. The market period is so short that elasticity of supply is inelastic; it could be almost perfectly inelastic or vertical. In this situation, it is virtually impossible for producers to adjust their resources and change the quantity supplied. (Think of adjustments on a farm once the crop has been planted.)

        2. The short-run supply elasticity is more elastic than the market period and will depend on the ability of producers to respond to price change. Industrial producers are able to make some output changes by having workers work overtime or by bringing on an extra shift.

        3. The long-run supply elasticity is the most elastic, because more adjustments can be made over time and quantity can be changed more relative to a small change in price, as in Figure 6.4c. The producer has time to build a new plant.

    C. Applications of the price elasticity of supply.

        1. Antiques and other non-reproducible commodities are inelastic in supply, sometimes the supply is perfectly inelastic. This makes their prices highly susceptible to fluctuations in demand.

        2. Gold prices are volatile because the supply of gold is highly inelastic, and unstable demand resulting from speculation causes prices to fluctuate significantly.

III.   **Cross elasticity and income elasticity of demand:**

    A. Cross elasticity of demand refers to the effect of a change in a product's price on the quantity demanded for another product. Numerically, the formula is shown for products X and Y.

        E_{xy} = (percentage change in quantity of X) / (percentage change in price of Y)

        1. If cross elasticity is positive, then X and Y are substitutes.

        2. If cross elasticity is negative, then X and Y are complements.

        3. Note: if cross elasticity is zero, then X and Y are unrelated, independent products.

    B. Income elasticity of demand refers to the percentage change in quantity demanded that results from some percentage change in consumer incomes.

        E_i = (percentage change in quantity demanded) / (percentage change in income)

        1. A positive income elasticity indicates a normal or superior good.

        2. A negative income elasticity indicates an inferior good.

        3. Those industries that are income elastic will expand at a higher rate as the economy   grows.

IV.   Consumer and Producer Surplus

   A. Consumer Surplus

      1. Definition – the difference between the maximum price a consumer is (or consumers are) willing to pay for a product and the actual price.

      2. The surplus, measurable in dollar terms, reflects the extra *utility* gained from paying a   lower price than what is required to obtain the good.

      3. Consumer surplus can be measured by calculating the difference between the maximum willingness to pay and the actual price for each consumer, and then summing those differences.

      4. Consumer surplus is measured and represented graphically by the area under the demand   curve and above the equilibrium price. (Figure 6.5)

      5. Consumer surplus and price are inversely related – all else equal, a higher price reduces   consumer surplus.

   B. Producer Surplus

      1. Definition – the difference between the actual price a producer receives (or producers   receive) and the minimum acceptable price.

      2. Producer surplus can be measured by calculating the difference between the minimum acceptable price and the actual price for each unit sold, and then summing those differences.

      3. Producer surplus is measured and represented graphically by the area above the supply curve and below the equilibrium price. (Figure 6.6)

      4. Producer surplus and price are directly related – all else equal, a higher price increases   producer surplus.

V.   Efficiency Revisited and Efficiency Losses

   A. Efficiency is attained at equilibrium, where the combined consumer and producer surplus is maximized. (Figure 6.7)

      1. Consumers receive utility up to their maximum willingness to pay, but only have to pay the equilibrium price.

      2. Producers receive the equilibrium price for each unit, but it only costs the minimum acceptable price to produce.

      3. Allocative efficiency occurs at quantity levels where three conditions exist:

         a. $MB = MC$

         b.   Maximum willingness to pay = minimum acceptable price.

         c.   Combined consumer and producer surplus is at a maximum.

   B. Efficiency (Deadweight) Losses

      1. Underproduction reduces both consumer and producer surplus, and efficiency is lost   because both buyers and sellers would be willing to exchange a higher quantity.

      2. Overproduction causes inefficiency because past the equilibrium quantity, it costs society more to produce the good than it is worth to the consumer in terms of willingness to pay.