

Math-in-CTE Lesson Plan

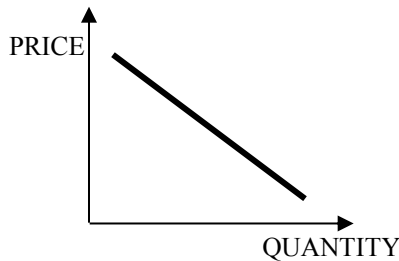
Lesson Title: Supply and Demand	Lesson Number: BU05
Occupational Area: Business and Marketing	
CTE Concept(s): Supply and Demand	
Math Concepts: Slope, graphing	
Lesson Objective:	After completion of this lesson, the student should be able to: Define: Supply and Demand; Create: Demand and Supply graphs; Calculate: Elasticity of demand, given a table of values of price and quantity.
Supplies Needed:	Supply and Demand Worksheet
Link to Accompanying Materials:	Business/Marketing BU05 Downloads

THE "7 ELEMENTS"	TEACHER NOTES (and answer key)						
<p>1. Introduce the CTE lesson.</p> <p>Economists and consumers in a free enterprise or market economy must decide how resources should be allocated toward their best use. In our Free Enterprise system consumers are free to choose, meaning that they can choose what they want to buy from a variety of items. One factor that has an influence on what they choose is price. Generally, the lower the price of an item, the more willing the consumer is to purchase that item. When selling an item, the opposite is true: the higher the price, the more you're willing to sell because you make more profit on each sale.</p> <p>Demand is defined as the amount of an item that consumers are willing and able to purchase at various prices. For example, if I had a case of your favorite type of soda here in the classroom. How many of you would be willing to purchase a can for: \$.10? \$.25? \$.50? \$.75? \$1.00?</p>	<p>Introduce the concept of how free enterprise systems determine the price consumers are willing to pay for products.</p> <p>Write the price and quantity amounts on the board, as a table of values (known as a "demand schedule" in the business world): one column for price, another column for quantity of students willing to pay the price. Explain to the students that you are making a table of values. Save this information on the board for use in a moment.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">PRICE</th> <th style="padding: 5px;">QUANTITY</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">\$0.10</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;">etc.</td> <td style="padding: 5px;"></td> </tr> </tbody> </table>	PRICE	QUANTITY	\$0.10		etc.	
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2. Assess students' math awareness as it relates to the CTE lesson.

One of the important parts of demand is the elasticity of a product. This is the same as slope.

1. What is slope?
2. How do you calculate slope?
3. Given two points (ordered pairs), calculate the slope. (1, 3) (4, 7)
4. Explain in words, what this graph shows?



ANSWERS:

1. Slope (m): steepness of a line
2. $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$
3. $m = \frac{7 - 3}{4 - 1} = \frac{4}{3}$
4. As the quantity increases, the price decreases.

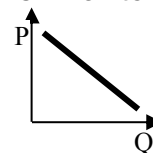
3. Work through the math example embedded in the CTE lesson.

Let's go back to the soda example and look at the table of values we made. Let's plot these points on a graph. Let the price be on the vertical or y-axis and the quantity on the horizontal or x-axis.

As you can see from the graph, there is an **inverse relationship** between price and quantity. Meaning as one quantity goes up, the other goes down. Will the slope of this line be negative or positive?

DEMAND GRAPH

Draw a graph on the board. The graph will hopefully look similar to this one:



Slope will be negative.

Make a table of values again.

How many cans do you predict I would sell if I raised the price to \$1.50 per can?

Supply is defined as the amount of an item that suppliers or business are willing to provide or sell at various prices. Let's use our soda example again. This time, however, you're selling the soda rather than buying. Your cost per can is \$.25. How many would you be willing to sell a can of soda for: \$.10? \$.25? \$.50? \$.75? \$1.00?

Let's plot these points. Use the Price on the vertical or y-axis and the quantity on horizontal or x-axis.

As you can see from the graph, there is a direct relationship between price and quantity, meaning that the higher the price, the greater the quantity you would be willing to provide or sell. Will the slope of this line be negative or positive?

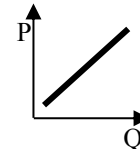
According to the Law of Supply and Demand, the supply of a good will increase when demand is great and fall when demand is low.

There are numerous factors that affect the demand for an item. Each factor will help to determine the ELASTICITY of demand for an item, which is the level of responsiveness of a change in quantity demanded to a change in price. The formula for elasticity of demand is $\frac{P_2 - P_1}{Q_2 - Q_1}$.

The demand of an item is considered INELASTIC if the slope is close to zero. If a given change in price causes a **smaller** proportionate

SUPPLY GRAPH

The graph should look something like this one:



Slope is positive.

Discuss how this is similar to slope. Since price is on the y-axis and quantity on the x-axis, we can look at this as rise over run.

elasticity of demand:

$$\frac{12 - 10}{25 - 35} = -\frac{2}{10} = -.20$$

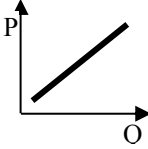
Inelastic

Elastic: Beanie Babies

Inelastic: Gas, Milk

<p>change in quantity demanded, then the demand for the good or service is said to be inelastic.</p> <p>The demand of an item is considered ELASTIC if the slope is less than negative one (-1). If a given change in price causes a larger proportionate change in quantity demanded, then the demand for the good or service is said to be elastic.</p> <p>EX: Let's say your favorite place to buy CDs used to charge \$10, but now charge \$12 for a CD. They used to sell 35 CDs a week when the price was \$10, now they sell 25 CDs a week. Is this an example of elastic or inelastic demand?</p> <p>What are some examples of products that you would stop buying if the price increased by 25%? (Elastic demand)</p> <p>What are some examples of products that you would continue to buy if the price increased by 25% (Inelastic demand)</p> <p>Discuss the factors that affect Demand and Elasticity of Demand (Consumer preferences, consumer buying power, availability of substitute products, price of substitute item)</p>	
<p>4. Work through <i>related, contextual math-in-CTE</i> examples.</p> <p>Find the elasticity of demand. Is it elastic or inelastic?</p> <ol style="list-style-type: none"> The price of your favorite type of shirt from Gap was \$22, and the Gap sold 28 per week. Now the price is \$25 for the shirt, and the Gap is selling 16 per week. Last year your mom bought orange juice for \$5 a gallon, and 	$1. \frac{25 - 22}{16 - 28} = -\frac{3}{12} = -.25 \text{ inelastic}$ $2. \frac{6 - 5}{43 - 45} = -\frac{1}{2} = -.5 \text{ inelastic}$

<p>bought 45 gallons for the year. This year the price is \$6 a gallon for the same type of orange juice, and she only bought 43 gallons.</p> <p>3. $P_1 = \\$31$ $Q_1 = 15$; $P_2 = \\$42$, $Q_2 = 12$</p> <p>You can also manipulate the elasticity formula, if you're given the elasticity or slope amount, to find a missing price or quantity amount. For example, if $P_1 = \\$31$, $Q_1 = 65$, $Q_2 = 62$, and the elasticity or slope amount equals -0.667, what is P_1? Plug the values into the formula and solve for the missing item.</p>	<p>3. $\frac{42 - 31}{12 - 15} = -\frac{11}{3} \approx -3.67$ elastic</p> <p>$\frac{P_2 - 31}{62 - 65} = -.667$</p> <p>$\frac{P_2 - 31}{-3} = -.667$</p> <p>Multiply both sides by -3</p> <p>$P_2 - 31 = 2$</p> <p>Add 31 to both sides</p> <p>$P_2 = 33$</p>																																			
<p>5. Work through <i>traditional math</i> examples.</p> <p>Find the slope for the line passing through the following two points.</p> <p>1. (8, 2) and (16, 5)</p> <p>2. (25, 5) and (23, 6)</p> <p>3. (45, 50) and (30, 60)</p>	<p>1. $\frac{5 - 2}{16 - 8} = \frac{3}{8} = .375$</p> <p>2. $\frac{6 - 5}{23 - 25} = -\frac{1}{2} = -.5$</p> <p>3. $\frac{60 - 50}{30 - 45} = -\frac{10}{15} \approx -.667$</p>																																			
<p>6. Students demonstrate their understanding.</p> <p>See Attached Worksheet</p>	<p>ANSWERS:</p> <p>#4</p> <table border="0"> <tr><td>5</td><td>7</td><td>20</td><td>10</td><td>-0.2</td></tr> <tr><td>2</td><td>3</td><td>35</td><td>33</td><td>-0.5</td></tr> <tr><td>10</td><td>20</td><td>50</td><td>40</td><td>-1</td></tr> <tr><td>35</td><td>48</td><td>15</td><td>10</td><td>-2.6</td></tr> <tr><td>18</td><td>19</td><td>30</td><td>15</td><td>-0.06667</td></tr> </table> <p>#5</p> <table border="0"> <tr><td>21</td><td>23</td><td>85</td><td>82</td><td>-0.66667</td></tr> <tr><td>4.5</td><td>5.5</td><td>10</td><td>7</td><td>-0.33333</td></tr> </table>	5	7	20	10	-0.2	2	3	35	33	-0.5	10	20	50	40	-1	35	48	15	10	-2.6	18	19	30	15	-0.06667	21	23	85	82	-0.66667	4.5	5.5	10	7	-0.33333
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	<p>12 13 20 19 -1 3.75 6 30 22 -0.28125 25 30 40 38 -2.5</p>
<p>7. Formal assessment. Unit Test Questions:</p> <ol style="list-style-type: none"> 1. Explain in words what is happening to the graph: 2. Is the graph an example of supply or demand? 3. Your favorite pair of jeans used to cost \$35, the store isn't sure how many pairs they would sell per day at this rate. The store has raised the price to \$38, and now sells 27 pairs of jeans per day. If you know that the elasticity of demand (slope) is -1.5, how many pairs of jeans did the store sell at the lower price? 4. Is this an example of elastic or inelastic demand? 	<ol style="list-style-type: none"> 1. As the quantity increases, the price increases. 2. Supply graph.  <ol style="list-style-type: none"> 3. $\frac{38 - 35}{27 - Q_1} = -1.5$ $\frac{3}{27 - Q_1} = -1.5$ $3 = -1.5(27 - Q_1)$ $3 = -40.5 + 1.5Q_1$ Distributive Property $43.5 = 1.5Q_1$ $\frac{43.5}{1.5} = \frac{1.5Q_1}{1.5}$ $29 = Q_1$ 4. Elastic