Practice problems for Price Elasticity of Demand
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1. **Using the elasticity definition**:
   - Suppose that people respond to a 15% increase in movie ticket prices by cutting back their movie attendance by 8%. What is the price elasticity of demand for movie tickets? Is demand elastic, inelastic or unit elastic?

   - Suppose that people respond to a 30% increase in the price of gasoline by decreasing gasoline purchases by 20%. What is the price elasticity of demand for gasoline? Is demand elastic, inelastic or unit elastic?

   - Suppose that when the price of tennis shoes decreases by 30%, sales increase by 40%. What is the price elasticity of demand for tennis shoes? Is demand elastic, inelastic or unit elastic?

2. **Point elasticity calculations**:
Imagine that the estimated demand curve for avocados is $P = 6 - 1/6\ Q_D$. With this demand curve, we know the following price and quantity combinations:

Price	Quantity	Point elasticity	Elastic, inelastic or unit elastic?
$1	30		
$2	24		
$3	18		
$4	12		
$5	6		

Calculate the price elasticity of demand at these five prices using the point elasticity formula ($E_D = 1/slope * P/Q$)

3. **Arc elasticity calculations**:
You own a pizza parlor. Suppose you have market data showing that when the price of a slice of pizza is $3, 60 slices are sold and when the price of a slice of pizza is $2, 80 slices are sold. What is the price elasticity of demand for pizza slices?

4. **Elasticity and total revenue**:
   a. You observe the following relationship between price and quantity for large cheese pizzas: At a price of $12, 40 pizzas per day are sold. At a price of $14, 35 pizzas per day are sold.
      - Calculate your total revenue from pizza sales at each of these prices.
      - Based on the change in total revenue when price is increased to $14, is demand probably elastic or inelastic?
      - Use the arc elasticity formula to calculate the implied price elasticity of demand.

   b. You're the manager and have been asked to increase total revenue for your company. What recommendations would you make for price changes in the following situations (raise, lower, don't change, need more information)?
   - The current price of your product is $75. There are many competitors in your industry so demand for your own product is elastic – estimated to be 3.2. What do you do?
   - The current price of your product is $60. There are few competitors in your industry and demand for your own product is inelastic – estimated to be 0.34. What do you do?
   - Your staff economist estimates the elasticity of demand for your product to be between 0.82 and 1.56. Your current price is $52. What do you do?

ANSWERS – Don't peek until you've worked all the problems!

1. Using the definition:
   - Suppose that people respond to a 15% increase in movie ticket prices by cutting back their movie attendance by 8%.   **$E_d = 8 / 15 = 0.53$ = inelastic demand**
   - Suppose that people respond to a 30% increase in the price of gasoline by decreasing gasoline purchases by 20%.   **$E_d = 20 / 30 = 0.66$ = inelastic demand**
   - Suppose that when the price of tennis shoes decreases by 30%, sales increase by 40%.
     $E_d = 40 / 30 = 1.33$ = elastic demand

2. Point elasticity calculations:
Imagine that the estimated demand curve for avocados is $P = 6 – 1/6\ Q_D$. With this demand curve, we know the following price and quantity combinations:

Price	Quantity	Point elasticity	Elastic, inelastic or unit elastic?
$1	30	0.20	Inelastic
$2	24	0.50	Inelastic
$3	18	1.0	Unit elastic
$4	12	2.0	Elastic
$5	6	5.0	Elastic

The point elasticity formula is $E_D = 1/\text{slope} * P/Q$
The slope of this demand curve is -1/6 so the (absolute value of the) inverse of the slope is 6.
For this demand curve, the point elasticity calculation is $E_D = 6* P/Q$
When P = $1, $E_D = 6* 1/30 = 0.20$ = inelastic demand
When P = $2, $E_D = 6* 2/24 = 0.50$ = inelastic demand
When P = $3, $E_D = 6* 3/18 = 1.0$ = unit elastic demand
When P = $4, $E_D = 6* 4/12 = 2.0$ = elastic demand
When P = $5, $E_D = 6* 5/6 = 5.0$ = elastic demand

3. Arc elasticity calculations:
You own a pizza parlor. Suppose you have market data showing that when the price of a slice of pizza is $3, 60 slices are sold and when the price of a slice of pizza is $2, 80 slices are sold.

To calculate "arc elasticity" we need to find the change in Q (i.e. $Q_2 – Q_1$), the change in P (i.e. $P_2 – P_1$) and the average values of Q and P:

Arc elasticity formula = Change in Q / average Q   / Change in P / average P
Change in Q = 80-60=20
Average Q = (80+60)/2 = 140/2 = 70
Change in P = (2 – 3) = -1
Average P = (2 + 3)/2 = 2.5

$E_D=| (20/70) / (-1/2.5)| = 0.2857/0.4 = 0.714$ = inelastic demand

4. Elasticity and total revenue:
   a. You observe the following relationship between price and quantity for large cheese pizzas: At a price of $12, 40 pizzas per day are sold. At a price of $14, 35 pizzas per day are sold.
      - Calculate your total revenue from pizza sales at each of these prices.
   TR at $12 = $12*40 = $480;   TR at $14 = $14 * 35 = 490

- Based on the change in total revenue when price is increased to $14, is demand probably elastic or inelastic?

Since total revenue increases here when the price is increased from $12 to $14, demand is relatively inelastic.

- Use the arc elasticity formula to calculate the implied price elasticity of demand.

Arc elasticity = (Change in Q)/(Average Q) / (Change in P)/(Average P)

Change in Q = (35 – 40) =- 5

Average Q = (35+40)/2 = 37.5

Change in P = (14-12) = 2

Average P = (12+14)/2 = 13

E_d =| (-5/37.5) / (2/13) | = 0.1333/0.1538 = 0.867 = inelastic demand

b. You're the manager and have been asked to increase total revenue for your company. What recommendations would you make for price changes in the following situations (raise, lower, don't change, need more information)?

- The current price of your product is $75. There are many competitors in your industry so demand for your own product is elastic – estimated to be 3.2. What do you do?
When demand is elastic, you can increase total revenue by lowering your price.

- The current price of your product is $60. There are few competitors in your industry and demand for your own product is inelastic – estimated to be 0.34. What do you do?
When demand is inelastic, you can increase total revenue by increasing your price.

- Your staff economist estimates the elasticity of demand for your product to be between 0.82 and 1.56. Your current price is $52. What do you do?

This is a pretty big range of uncertainty! These estimates range from inelastic to fairly elastic (and include the unit elastic value of 1.0, at which a change in price doesn't change revenue.