Practice Set 2 – KEY

Consumer Choice & Demand

This set contains problems for your own practice. It is highly recommended to work on the problems on your own. Do not just read the provided solutions. Instead, try to solve the problems and use the solutions only when you cannot continue on your own. Reading problems that someone else has solved has the same value for your preparation like watching someone else running a marathon on TV and then expecting to be able to run it, too. If you have questions on this set, please ask your section's teaching assistant.

1. Nicolette's price and weekly quantity correspondence for bubble tea is given in the following table.

Price	$1	$2	$3	$4	$5	$6	$7
Cups per week	8	6	5	4	3	2	1

(a) Does Nicolette's demand follow the *law of demand*?

The law of demand states that price and quantity demanded should not be positively related. Here they are inversely related, so the law of demand holds.

(b) How much will her *demand* increase if the price decreases from $5 to $4?

This question does not make any sense. Her demand is the entire table, not a specific value from the table. We can only say that If price decreases from $5 to $4, her quantity demanded will increase from 3 to 4 cups. As we mentioned in the lecture: "Demand and quantity demanded are two entirely different concepts. Demand is a relationship; quantity demanded is a variable in this relationship".

(c) How would an *increase* in Nicolette's *demand* be represented in the table above?

An increase in demand simply means that for the same price, Nicolette would buy more than before. On the table this would be represented with higher values of quantity demanded for the same prices. For instance,

Price	*$1*	*$2*	*$3*	*$4*	*$5*	*$6*	*$7*
Cups per week	*10*	*7*	*6*	*5*	*4*	*3*	*2*

(d) Nicolette also likes Frappuccino. Could a decrease in the price of Frappuccino from $5 to $4, affect her demand for bubble tea?

Yes, because this would make Nicolette increase her quantity demanded of Frappuccino, and she would probably have less bubble tea independently of the price of bubble tea. That is, the table for bubble tea could for example become:

Price	*$1*	*$2*	*$3*	*$4*	*$5*	*$6*	*$7*
Cups per week	*7*	*5*	*4*	*3*	*1*	*0*	*0*

Notice that the decrease in the price of Frappuccino does not cause Nicolette to entirely replace bubble tea with Frappuccino, she just substituted some bubble tea with Frappuccino because Frappuccino is now relatively cheaper.

(e) Name 3 factors that could cause Nicolette's *demand* for bubble tea to *decrease*.

(i) Her income. If she had less to spend, perhaps she would choose to decrease her consumption of bubble tea. (ii) Her preferences. If she decided to consume more healthy beverages, she would decrease her consumption no matter what the price is. (iii) Prices of related goods. For instance, If the price of Frappuccino decreased, as explained above.

2. Marianna was surveyed on two different dates regarding her purchasing habits for mosquito repellent spray.

Price	\$1	\$1.5	\$2	\$2.5	\$3	\$3.5	\$4
Bottles (13/4/2024)	5	4	3	3	2	2	1
Bottles (22/6/2024)	5	4	4	3	2	2	1

Can we say that her demand for mosquito repellent spray has increased?

Yes, we can, because for the same price of \$2, in April she was buying 3 bottles and in June she was buying 4 bottles. In general, any change in the information in the table constitutes a change in demand. On the other hand, a change in the quantity demanded because of the price would be represented by moving from one column of the table to another but without changing anything in the table.

3. Dwight's demand for beetroot is given by $p = 100 - 4q$, where p is the price in dollars and q is the quantity in lbs.
   (a) Does Dwight's demand follow the law of demand?

   It does because p and q are not positively related (they have a minus sign between them).

   (b) Provide a possible demand equation where Dwight's demand has increased.

   Could be $p = 101 - 4q$. With the initial equation, Dwight would pay \$96 for 1 lb. With the new equation he is willing to pay \$97 for 1 lb; OR $p = 100 - 3q$. With the initial equation, Dwight would pay \$96 for 1 lb. With the new equation he is willing to pay \$97 for 1 lb;

   (c) Provide a possible demand equation where Dwight's demand has decreased.

   Any equation with a constant below 100 or a gradient more negative than -4, would show decreasing demand.

4. What kind of good would you expect to exhibit an almost *vertical* demand curve?

   A vertical demand curve would imply that the consumer buys the same quantity of the good, no matter what the price of the good is. This means that the good is an essential necessity for the consumer such as emergency surgery, lifesaving medication, or a product of immense addiction such as heroin.

5. What kind of good would you expect to exhibit an almost *horizontal* demand curve?

   A horizontal demand curve would imply that the consumer will buy the product only when it is offered at a specific price. That is, there is a prevailing expectation in the market for what the price of the good should be, and no consumer would buy this good from sellers who sell it above the prevailing price; or no seller would offer the good below that price. A usual example is price-controlled goods, where the government sets their price and no one can buy those goods at a different price (for example: rent in NYC, bottled water in Greece, stamps in Singapore etc.).

6. It is mathematically proven that for every linear demand function $p = a - bq$, where p is the price, q is the quantity and a, b are given constants, the elasticity of demand at any quantity q, is given by

$$\varepsilon_d = 1 - \frac{a/b}{q}.$$

   (a) For the demand equation $p = 120 - 4q$, calculate the elasticity of demand at $q = 20$.

   Here $a = 120$ and $b = 4$. Then, $\frac{a}{b} = 30$; thus, $\varepsilon_d = 1 - \frac{30}{20} = -0.5$.

   (b) For the demand equation $p = 120 - 4q$, calculate the quantity for which $\varepsilon_d = -1$.

   It should be $1 - \frac{30}{q} = -1$ or $\frac{30}{q} = 2$ or $2q = 30$ or $q = 15$.

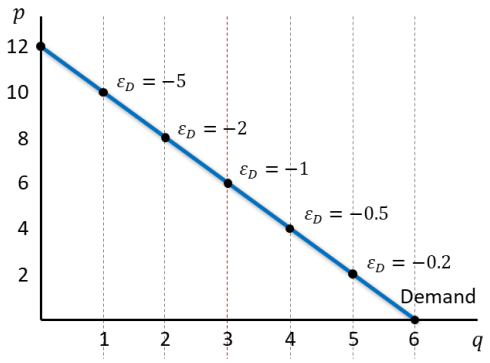
   This formula for elasticity will be super convenient to calculate elasticity of demand. Use it!

7. True or false? An inelastic linear demand curve should be inelastic at every of its points; and an elastic linear demand curve should be elastic at every of its points.

False. Any linear demand curve with negative gradient contains an elastic and an inelastic portion. We can use the formula from task 6 to prove it.

$$\varepsilon_d = 1 - \frac{a/b}{q}.$$

For quantity $q = 0.5 \cdot \frac{a}{b}$ elasticity of demand will be -1. Then, for smaller quantities the demand will be elastic ($\varepsilon_d < -1$); and for larger quantities it will be inelastic ($\varepsilon_d > -1$). For instance, along the demand equation $p = 12 - 2q$, elasticity of demand is shown in the figure. For $q < 3$ demand is elastic, and for $q > 3$, it becomes inelastic.



8. True or false? The elasticity of a linear demand is the gradient of the demand.

False. For any linear demand function of the form $p = a - bq$, the gradient is $-b$ and elasticity is

$$\varepsilon_d = 1 - \frac{a/b}{q}.$$

Thus, $\varepsilon_d \neq -b$.

OPTIONAL PROOF FOR THE FORMULA FROM TASK 6 (Only for students with knowledge of calculus)

For any linear demand function of the form $p = a - bq$, its first derivative $p' = \frac{dp}{dq} = -b$. Then, elasticity of demand is:

$$\varepsilon_d = \frac{dq}{dp} \cdot \frac{p}{q}.$$

The first ratio (dq/dp) is the inverse of p', thus

$$\varepsilon_d = -\frac{1}{b} \cdot \frac{p}{q}.$$

From the demand, we can substitute $p = a - bq$

$$\varepsilon_d = -\frac{1}{b} \cdot \frac{a - bq}{q} = \frac{-a + bq}{bq} = 1 - \frac{a/b}{q}. \quad [QED]$$

You are kindly requested to report any *typos, mistakes* or *proposals* for the improvement of this practice set key at kmarinakis@smu.edu.sg.