NSS Exploring Economics 1 (3rd Edition)
Answers to Exercises

Chapter 5 Price elasticity of demand and supply

Questions

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Test yourself 5.1

When the price of a pen is $4, the quantity demanded is 40 units. After the price drops from $4 to $3, the quantity demanded increases to 80 units. Calculate the price elasticity of demand for pens.

Test yourself 5.2

Refer to Fig. 5.1 on previous page.

a. Suppose the market moves from Point B to Point A. Calculate the value of demand elasticity.

Percentage change in Q_d	
Percentage change in P	
E_d	

b. Are the demand elasticities in Table 5.1 and (a) the same?

Test yourself 5.3

Suppose the value of demand elasticity is 1.5, and the price has increased from $4 to $5.

a. What will the percentage change in the quantity demanded be?
b. What about the change in the amount of quantity demanded? What information do you need to find out the change in the amount of quantity demanded?

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Test yourself 5.4

Suppose the prices of high-end apartments and private cars have both increased by 30%. As a result, the quantity demanded of high-end apartments has decreased by 39%, while the quantity demanded of private cars has decreased by 48%.

a. Classify the types of demand for the two products according to their demand elasticities.
b. Compare their demand elasticities.

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Test yourself 5.5

What happens to total revenue if the price of a good with perfectly inelastic demand decreases?

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Misconceptions 5.1

Determine whether the following statements are correct.

a. Regardless of the price, Terry spends the same amount of money on coffee every month. This implies that Terry's demand for coffee is perfectly inelastic.
b. When the price of tea decreases, other things being equal, John's total expenditure on tea also decreases. This implies that John's demand elasticity for tea is greater than 0 and smaller than 1 (without regard to its negative sign).

Misconceptions 5.2

Unit price ($)	12	13	14	15	16
Total revenue ($)	36	39	42	45	48

The above table shows Firm A's total revenue from selling apple juice. Suppose the demand does not change. Determine whether each of the following statements is correct.

a. The demand for apple juice is perfectly inelastic.
b. The demand for apple juice is perfectly elastic.
c. The demand elasticity for apple juice is greater than 0 but smaller than 1.
d. The demand elasticity for apple juice is equal to 1.

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Test yourself 5.6

Refer to Fig. 5.12. Calculate the price elasticities of demand.

Price range	E_d	Type of elasticity of demand
a. Between $5 and $6 (high-price range)		
b. Between $3 and $4 (middle-price range)		
c. Between $1 and $2 (low-price range)		

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Test yourself 5.7

Explain if the following statements are true or false.

a. The demand for meat tends to be more elastic than the demand for pork.
b. The demand for new hi-tech products tends to be more elastic than the demand for food.
c. The demand for electricity tends to be less elastic than the demand for soft drinks.

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Test yourself 5.8

Use the methods suggested in Table 5.4 and Fig. 5.22 to discuss how a decrease in demand affects total revenue under different types of supply elasticity.

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Test yourself 5.9

Suppose a country is self-sufficient in timber and its supply of timber is fixed. But then a fire destroys half of the country's forest. What will happen to the total income of forest owners?

Test yourself 5.10

Explain if the following statements are true, false or uncertain.

a. The supply of land is less elastic than that of labour.
b. The supply of accountants is less elastic than that of waiters.

Exercises
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Multiple Choice Questions

Choose the best answer.

Study the following information and answer questions 1 and 2.

Mei loves to eat Chinese desserts. Every week, she goes to a dessert shop to enjoy five bowls of sweet red bean soup. Recently, the price of sweet red bean soup has increased by 10%. As a result, Mei eats only three bowls of sweet red bean soup per week.

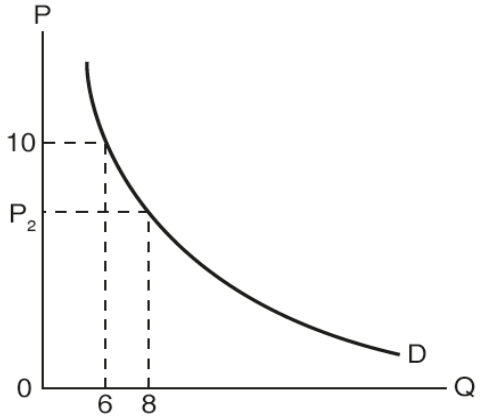
1.
Mei's demand elasticity for sweet red bean soup is equal to _____.
A. 5
B. 0.5
C. 0.4
D. 4

2.
Mei's demand for sweet red bean soup is _____.
A. perfectly elastic
B. inelastic
C. elastic
D. perfectly inelastic

3.
Jamie drinks two cans of Coke every day, regardless of the price of Coke. His demand for Coke is _____.
A. perfectly elastic
B. perfectly inelastic
C. unitarily elastic
D. None of the above

4.

In the diagram below, if the demand is unitarily elastic, P_2 is ____.



A. $3.5

B. $5

C. $7.5

D. $8

5.

Study the following table about Firm A's total revenue from selling Good X. Suppose there is no change in the demand for Good X.

Unit price ($)	20	21	22	23	24
Total revenue ($)	10,000	9,450	8,800	8,050	7,200

From the above information, we can conclude that:

(1) the demand for Good X is inelastic.

(2) Good X is likely a necessity.

(3) the demand elasticity for Good X is greater than 1.

(4) Good X may have many close substitutes.

A. (1) and (2) only

B. (1) and (4) only

C. (2) and (3) only

D. (3) and (4) only

6.

Study the following table about the total revenue in the market for Good Y. Suppose there is no change in the supply of Good Y.

	Week 1	Week 2	Week 3	Week 4	Week 5
Quantity sold (units/week)	10	20	30	40	50
Total revenue ($)	3,000	6,000	9,000	12,000	15,000

From the above information, which of the following conclusions can be drawn?

(1) The demand for Good Y is perfectly inelastic.

(2) The supply of Good Y is perfectly elastic.

(3) The demand elasticity for Good X is greater than 1.

(4) The demand for Good Y has increased.

A. (1) and (2) only

B. (1) and (3) only

C. (2) and (3) only

D. (2) and (4) only

7.

The Hong Kong Football Association has suggested a $20 decrease in football match ticket prices to attract more spectators, even though this would lower its total revenue. The Association assumes that the elasticity of demand for football match tickets is _____.

A. greater than 1

B. equal to 1

C. less than 1

D. equal to 0

8.

Mary will spend all of her monthly income to buy diamonds regardless of the price. In this situation, Mary's demand for diamonds is _____.

A. perfectly inelastic

B. inelastic

C. unitarily elastic

D. perfectly elastic

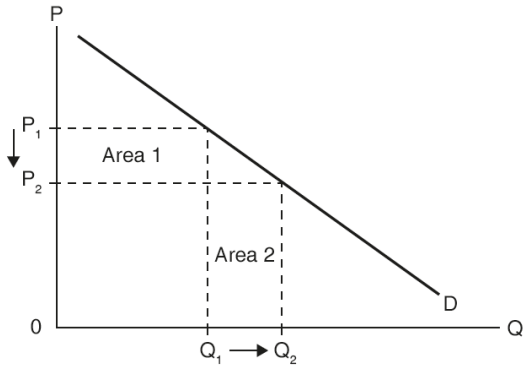
9.

A typhoon has destroyed 20% of Crop A. However, farmers who grew Crop A are happy about the disaster as they earned more from selling the remaining crops. This shows that the demand for Crop A is most likely _____.

A. unitarily elastic
B. inelastic
C. elastic
D. The type of demand elasticity cannot be determined

10.

Study the diagram about the market for Good X below. Suppose the price of Good X decreases from P_1 to P_2. Which of the following conclusions can be drawn?



(1) If Area 1 is greater than Area 2, the total expenditure on Good X will decrease.
(2) If the demand for Good X is elastic, Area 1 will be smaller than Area 2.
(3) Area 1 will be greater than Area 2 only if the supply of Good X is elastic.
(4) When Area 1 is equal to Area 2, the demand for Good X is perfectly elastic.

A. (1) and (2) only
B. (1) and (3) only
C. (2) and (4) only
D. (3) and (4) only

11.*

Suppose the traffic flow in a tunnel has reached its full capacity and there is always congestion. The tunnel company can increase its total revenue by adjusting the toll to the equilibrium level if the demand for the tunnel service is _____.

A. inelastic
B. elastic
C. unitarily elastic
D. All of the above are possible

12.*

Suppose Good X and Good Y are complements of each other and their demands are elastic. A rise in the supply of Good X will _____ the total revenue from selling Good X and will _____ the total revenue from selling Good Y.

A. increase ... increase
B. increase ... decrease
C. decrease ... increase
D. decrease ... decrease

13.

Which of the following independent events will most likely reveal that Mary's demand for donuts is perfectly inelastic?

A. After the price of donuts decreases, Mary spends the same amount of money on donuts every week.
B. After the price of donuts increases by 5%, Mary decides to cut her expenditure on donuts by 10%.
C. After the price of donuts decreases by 10%, Mary lowers her expenditure on donuts by 10%.
D. After the price of donuts increases by 10%, Mary lowers her quantity of donuts bought by 10%.

14.

Study the following pairs of goods. In which pairs of goods will the demand for the former most likely be more elastic than the demand for the latter?

A. Apple and apple juice
B. Sugar and salt
C. Hamburger and electricity
D. Bread and apple jam

15.

In Hong Kong, people consume local vegetables and imported vegetables from the mainland. Suppose that bad weather in the mainland affects the supply of vegetables to Hong Kong. Which of the following about Hong Kong people's total expenditure on vegetables is correct?

A. Their total expenditure on local vegetables will rise.
B. Their total expenditure on local vegetables will fall.
C. Their total expenditure on mainland vegetables will rise.
D. Their total expenditure on mainland vegetables will fall.

16.

The demand for a good tends to be more elastic if

A. only a few substitutes are available.
B. consumers spend only a small portion of their income on the good.
C. the good is not a necessity.
D. the good has no alternative uses.

17.

The price will remain unchanged when demand increases if

A. demand is inelastic.
B. supply is perfectly inelastic.
C. supply is perfectly elastic.
D. demand is unitarily elastic.

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Short questions

1.

Determine the types and the values of demand or supply elasticity in each of the following independent events.

a. The demand for potatoes has increased. As a result, the price of potatoes increases by 10% and the quantity transacted changes by 5%. (3 marks)
b. The supply of tomatoes has increased. As a result, the price of tomatoes decreases from \$15 per kg to \$14 per kg. The total revenue from selling tomatoes decreases from \$30,000 to \$29,400. (Your answer should be corrected to 2 d.p.) (4 marks)
c. The price of Turkish ice cream has increased. As a result, both the price and quantity transacted of gelato change by 10%. (5 marks)
d. Owning cats is becoming more popular. As a result, the price of cat food increases by 10% and the quantity transacted changes by 30%. (4 marks)

2.

In Country A, the demand for rice is inelastic.

a. Give **TWO** possible reasons why the demand for rice is inelastic. (2 marks)
b. What are the effects on farmers' income when farming technology improves over time? Based on the situation in (a), explain your answer, using a supply-demand diagram. (4 marks)

3.

Which of the following industries has the lowest supply elasticity? Which has the highest supply elasticity? Explain. (4 marks)

I. Information technology industry
II. Fast food industry
III. Clothing industry

4.

Suppose the available quantity of residential units in a new housing estate is fixed. To attract more buyers, the developer has set the price below the equilibrium level, resulting in excess demand.

Compared with the case where the price is set at the equilibrium level, what effect does this pricing policy have on the total revenue of the developer? Use a diagram to help explain your answer. (4 marks)

5.

Fei Shao is a famous singer in Country X. He plans to give a concert with a fixed number of seats. He finds that some of his concert tickets are unsold and he knows that the demand for his concert is inelastic. To increase the total revenue, should Fei Shao lower the price of concert tickets to achieve equilibrium? Use a diagram to help explain your answer. (8 marks)

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Structured questions

1.

In order to reduce the number of customers during rush hours, a rail company has imposed a 10% peak hour surcharge. However, the number of customers during rush hours decreases only by 2%.

a. From the above information, determine whether the demand for rail service during rush hours is elastic or inelastic. Briefly explain your answer without calculating the value of E_d. (2 marks)

b. How does the surcharge affect the rail company's total revenue? Explain your answer with the aid of a diagram. (4 marks)

c. Why is it difficult for the rail company to increase its capacity during rush hours to meet the higher demand? Provide **TWO** reasons. (4 marks)

2.

In Country A, people must have bread for their breakfast. There are many types of bread, including croissants, pineapple buns and red bean buns. All the three types of bread sell for $5.

a. Explain whether bread or croissants have more elastic demand. (2 marks)

*b. The sales volume of croissants is greater than the sales volume of pineapple buns. 'The demand for croissants must be less elastic than the demand for pineapple buns.' Do you agree? Explain your answer with the aid of a diagram. (Hint: You can use an extreme case to prove your answer.) (7 marks)

c. Genetically modified (GM) red beans can be stored longer. Suppose bakeries in Country A start to use GM red beans to make red bean buns. Explain how this affects the supply elasticity of red bean buns. (3 marks)

Answer

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Test yourself 5.1

The price elasticity of demand for pens:

$$= \frac{\%\triangle Q_d}{\%\triangle P} = \frac{\frac{80-40}{(40+80)/2}}{\frac{3-4}{(3+4)/2}} = \frac{\frac{40}{60}}{\frac{-1}{3.5}}$$

= 2.33 (to 2 decimal places) (negative size neglected)

Test yourself 5.2

a.

Percentage change in Q_d	$\frac{4-6}{(4+6)/2} \times 100\% = -40\%$
Percentage change in P	$\frac{\$5-\$4}{(\$5+\$4)/2} \times 100\% = +22.2\%$ (corr. to 1 d.p.)
E_d	$\frac{-40\%}{+22.2\%} = -1.8$ (corr. to 1 d.p.)

b. Yes. Although the resulting percentage changes in Q_d and P have different signs, the absolute values of the percentage changes are the same. As a result, the demand elasticities are the same.

Test yourself 5.3

a. $E_d = \frac{\%\triangle Q_d}{\%\triangle P}$

$-1.5 = \%\triangle Q_d / 22.2\%$

$\%\triangle Q_d = -33.3\%$

(Note that the negative sign cannot be neglected.)

b. Unknown. To find out the change in the amount of quantity demanded, we need to know either the original amount of quantity demanded or the final amount of quantity demanded.

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Test yourself 5.4

a. E_d of high-end apartments = 39% / 30% = 1.3
   E_d of private cars = 48% / 30% = 1.6
   Both of their demand elasticities are greater than 1, so their demands are both elastic.
b. The demand elasticity of private cars is higher than that of high-end apartments. Therefore, the demand for private cars is more elastic than the demand for high-end apartments.

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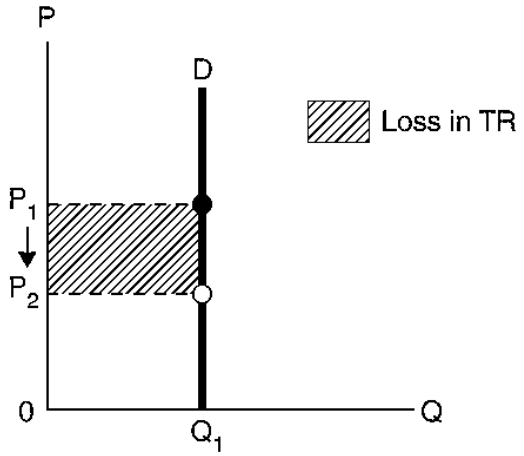
Test yourself 5.5

When the demand for a good is perfectly inelastic, any change in its price will have no effect on its quantity demanded. As shown in the diagram, there is only a loss in total revenue caused by the decrease in price. As a result, the total revenue must decrease.



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Misconceptions 5.1

a. Incorrect. As the total expenditure does not change with the price change, Terry's demand for coffee should be unitarily elastic.
b. Incorrect. John's demand elasticity for tea may be equal to 0.

Misconceptions 5.2

Part (a) is correct. As the quantity demanded (transacted) is constant at 3 units, the demand for apple juice is perfectly inelastic. The demand elasticity is equal to 0. Hence, parts (b) to (d) are incorrect.

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Test yourself 5.6

Price range	E_d	Type of elasticity of demand
a. Between \$5 and \$6 (high-price range)	3.67 (to 2 d.p.) (negative sign neglected)	Elastic demand
b. Between \$3 and \$4 (middle-price range)	1 (negative sign neglected)	Unitarily elastic demand
c. Between \$1 and \$2 (low-price range)	0.27 (to 2 d.p.) (negative sign neglected)	Inelastic demand

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Test yourself 5.7

a. False. The demand for meat tends to be less elastic than the demand for pork as there are fewer substitutes for meat as a whole.
b. True. This is because new hi-tech products are not necessities or expenditures on them usually take up a large proportion of a person's income.
c. True. This is because electricity is a necessity or there are no close substitutes available, while soft drinks are not necessities and have more substitutes.

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Test yourself 5.8

$1 < E_S < \infty$	P↓	Q↓	TR↓
$0 < E_S < 1$	P↓	Q↓	TR↓
$E_S = 1$	P↓	Q↓	TR↓
$E_S = 0$	P↓	Q remains unchanged	TR↓
$E_S = \infty$	P remains unchanged	Q↓	TR↓

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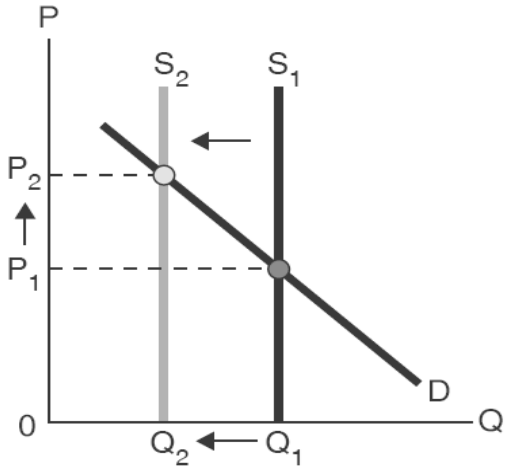
Test yourself 5.9

This leads to a decrease in the supply of timber (S_1 → S_2). The price of timber increases and the quantity transacted decreases. The total income will increase, decrease or remain unchanged, depending on the elasticity of demand for timber between P_1 and P_2.



Test yourself 5.10

a. True. This is because the amount of land (natural resources) is independent of price, and hence its supply is perfectly inelastic.

b. True. This is because accountants require more professional skills, and hence they take more time for training.

Exercises

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Multiple Choice Questions

1. A

2. C

3. B

4. C

Since the demand is unitarily elastic, the total revenue at P_2 is the same as the total revenue at \$10. The total revenue at \$10 is \$60 (= \$10 × 6), so P_2 is \$7.5 (= \$60/8).

5. D

As the total revenue decreases with the increase in the price, the demand for Good X is elastic, i.e., demand elasticity is greater than 1. In addition, when Good X has many close substitutes, its demand tends to be elastic.

6. D

The price of Good Y stays at \$300 for all five weeks. As the supply of Good Y does not change, the increase in the quantity transacted must be caused by an increase in the demand. The price remains unchanged with the increase in the demand. Thus, the supply of Good Y must be perfectly elastic.

7. C

When the demand is inelastic the percentage decrease in price will be greater than the percentage increase in quantity demanded, hence there is a fall in total revenue.

8. C

Mary's total expenditure on diamonds remains unchanged regardless of the change in price. This implies that her demand for diamonds is unitarily elastic.

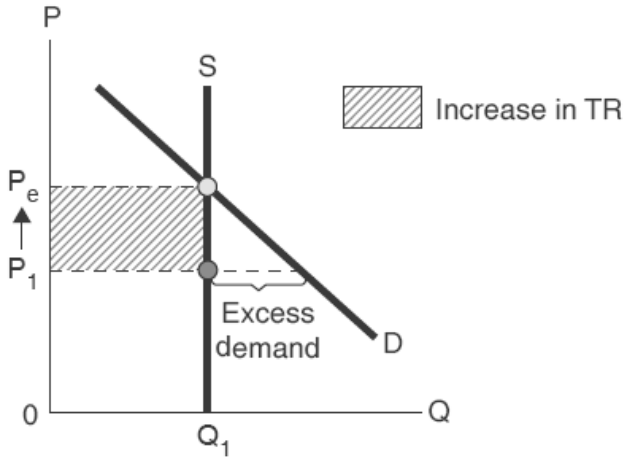
Mary's demand for diamonds is not perfectly inelastic. A perfectly inelastic demand implies that when the price is higher, quantity demanded remains unchanged. This implies an increase in the total expenditure on the good. However, Mary's expenditure on diamonds is fixed by her monthly income.

9. B

10. A

11. D

When the traffic flow has reached its full capacity and traffic congestion exists, this implies that the price is below the equilibrium level and there is excess demand. Since the quantity transacted remains unchanged at Q_1, raising the price to the equilibrium level will increase the total revenue, regardless of the price elasticity of demand.



12. A

The rise in the supply of Good X will lead to a decrease in its price. Given that the demand for Good X is elastic, a decrease in the price of Good X will increase the total revenue for Good X. When Good X and Good Y are complements, a decrease in the price of Good X will lead to a rise in the demand for Good Y. A rise in demand will definitely increase the total revenue for Good Y.

13. C

Options A and D: unitarily elastic

Option C: As the percentage change in the price is equal to the percentage change in the expenditure, the percentage change in quantity demanded (transacted) for donuts is zero. Thus, it is perfectly inelastic.

14. C

Option A is not the answer. Apples have fewer substitutes than apple juice. The demand for apple juice tends to be more elastic than the demand for apples.

Option B: It is not certain which one has more elastic demand.

Option C: Hamburgers are not a necessity and have more substitutes while electricity is a necessity and has fewer substitutes. Thus, the demand for hamburgers tends to be more elastic.

Option D: Bread has fewer substitutes. When people want to eat bread, they can choose other jams or bread spreads. Thus, the demand for apple jam tends to be more elastic.

15. A

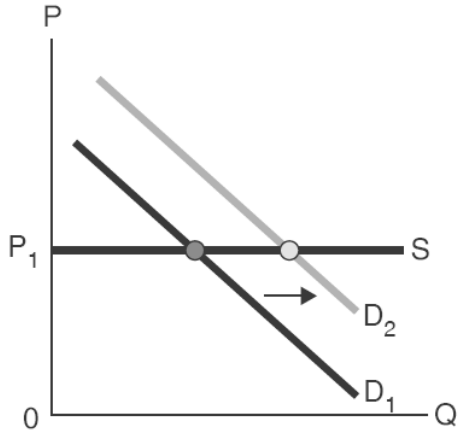
The fall in the supply of imported vegetables will increase their prices. As local vegetables and imported vegetables are substitutes, the demand for local vegetables will increase. Thus, total expenditure on local vegetables will rise. However, whether total expenditure on imported vegetables will rise or fall depends on their elasticity of demand.

16. C

Option D is incorrect. When a good has no alternative uses, the demand for it tends to be more inelastic.

17. C

Perfectly elastic supply is represented by a horizontal supply curve. This implies that the equilibrium price will remain unchanged whether demand increases or decreases.



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Short questions

1.

a. As there is an increase in the demand, we can calculate the supply elasticity. The supply elasticity is equal to 0.5 (= 5%/10%). Thus, the supply of potatoes is inelastic. (3 marks)

b. As there is an increase in the supply, we can calculate the demand elasticity. The percentage change in the price is equal to 6.90% (= 1/14.5) (corr. to 2 d.p.). Since the quantity demanded increases from 2,000 units (= 30,000/15) to 2,100 units (= 29,400/14), the percentage change in the quantity demanded is equal to 4.88% (= 100/2,050) (corr. to 2.d.p.). The demand elasticity is 0.71 (= 4.88%/6.90%) (corr. to 2 d.p.). Thus, the demand for tomatoes is inelastic. (4 marks)

c. Turkish ice cream and gelato are close substitutes. When the price of Turkish ice cream increases, the demand for gelato increases. Thus, we can calculate the supply elasticity of gelato. As both the price and quantity supplied of gelato increase by 10%, the supply elasticity of gelato is equal to 1. Thus, the supply of gelato is unitarily elastic. (5 marks)

d. As more people keep cats, the demand for cat food increases. The supply elasticity for cat food is equal to 3 (= 30%/10%). The supply of cat food is elastic. (4 marks)

2.

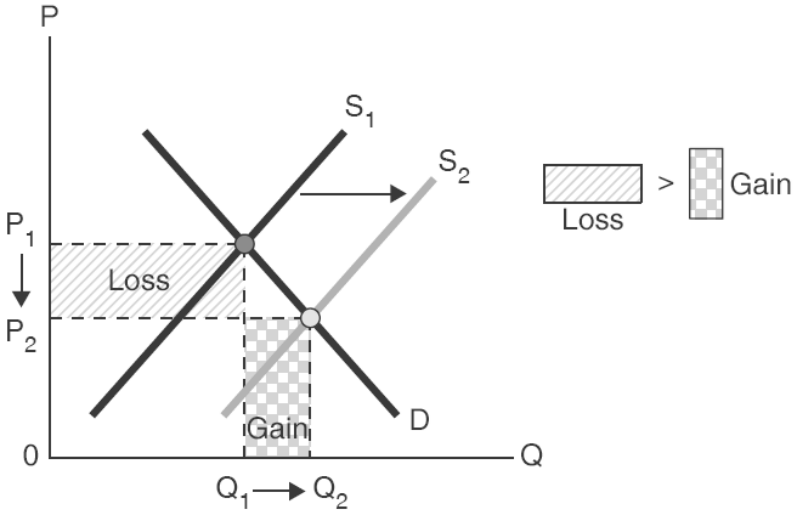
a.
- Rice is a necessity in Country A.
- Consuming rice is a habit in Country A.
- The expenditure on rice takes up a small proportion of people's income in Country A.

(Any TWO of the above or other reasonable answers. 1 mark × 2 = 2 marks)

b. An improvement in farming technology will increase the supply of rice. (1 mark)
Given that the demand for rice is inelastic in (a), the total income of farmers will decrease. (1 mark)

<u>Indicate on the diagram:</u>

- A rightward shift in the supply curve (1 mark)
- Loss in TR > Gain in TR (1 mark)



3.

The information technology industry has the lowest supply elasticity since it requires mainly skilled workers (IT professionals). (2 marks)

The fast food industry has the highest supply elasticity since it requires mainly unskilled workers (or it is easy for new firms to enter the industry). (2 marks)

(Accept other possible reasons.)

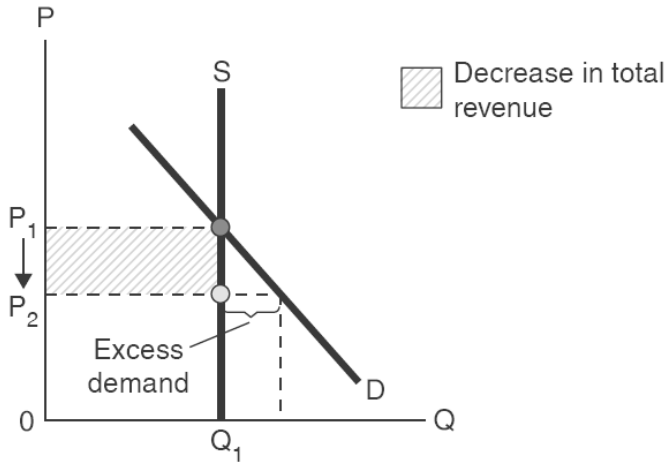
4.

Under the new pricing policy, the price decreases from P_1 to P_2 but the quantity transacted remains unchanged at Q_1. (1 mark)

The total revenue of the developer will decrease from $P_1 \times Q_1$ to $P_2 \times Q_1$. (1 mark)

Indicate on the diagram:

- A vertical supply curve (1 mark)
- A decrease in total revenue (1 mark)



5.

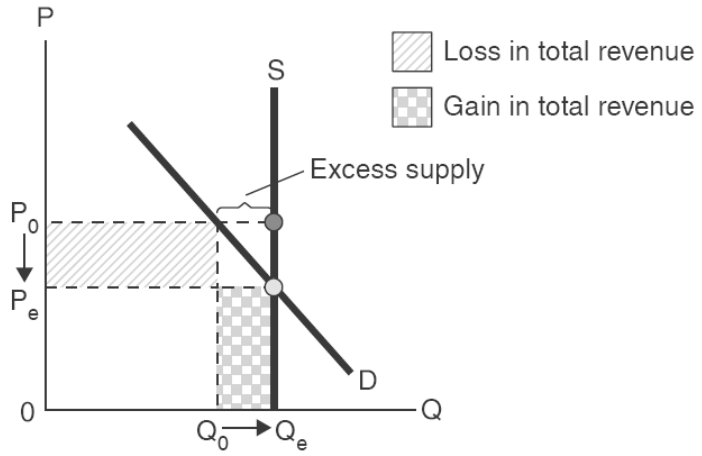
As the demand for his concert ticket is inelastic, the percentage decrease in the price will be greater than the percentage increase in the quantity sold. (2 marks)

The loss in revenue from lowering the price will be greater than the gain in revenue from increasing the quantity sold. (2 marks)

Thus, Fei Shao should not lower his ticket price. (1 mark)

Indicate on the diagram:

- A vertical supply curve (1 mark)
- An excess supply at the original price (1 mark)
- Loss in total revenue > Gain in total revenue (1 mark)



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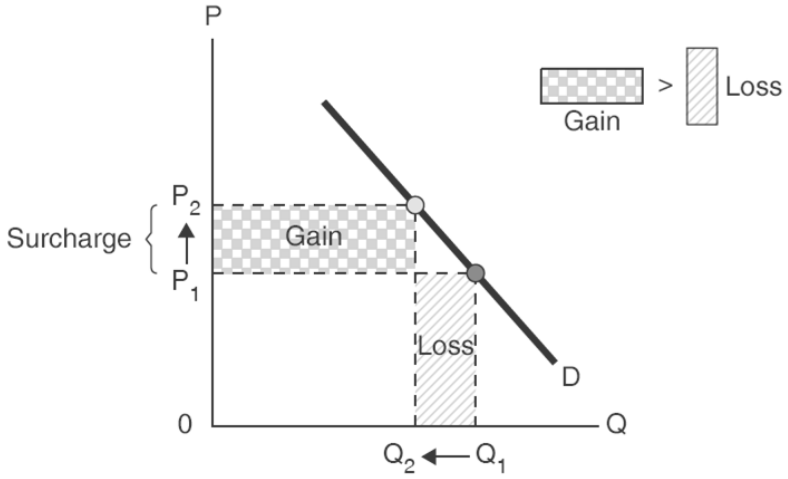
Structured questions

1.

a. The demand is inelastic, (1 mark)
because the percentage change in quantity demanded is smaller than the percentage change in price. (1 mark)

b. The surcharge increases the rail company's total revenue. (1 mark)
This is because the percentage increase in price is greater than the percentage decrease in quantity demanded. (1 mark)
<u>Indicate on the diagram:</u>
Gain in total revenue > Loss in total revenue (2 marks)



c.
- It takes time to increase capacity.
- The employment of skilled workers (engineers and technicians) is required to increase capacity.
(Accept other reasonable answers. 2 marks × 2 = 4 marks)

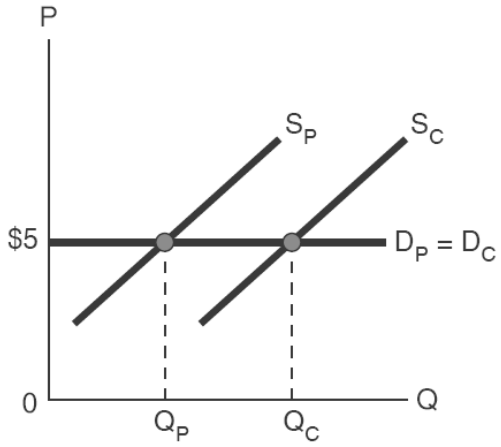
2.

a. The demand elasticity for croissants is greater, since other close substitutes (e.g., pineapple buns and red bean buns) are available. (2 marks)
OR
The demand elasticity for bread as a whole is smaller, since bread is a necessity (or people in Country A have a habit of eating bread for breakfast). (2 marks)

b. Disagree. (1 mark)
The quantities sold depend on the intersection points of demand and supply curves. When both the demand for croissants and the demand for pineapple buns are perfectly elastic, the quantity sold of croissants can be greater than the quantity sold of pineapple buns if the supply of croissants is greater than the supply of pineapple buns.
(Accept other correct cases.) (2 marks)

Indicate on the diagram:

- Both the prices of croissants and pineapple buns are at $5. (1 mark)
- The quantity of croissants sold is greater than the quantity of pineapple buns sold. (1 mark)
- A case shows that the demand for croissants is not less elastic than the demand for pineapple buns. The following is ONE of the cases. (2 marks)



c. As GM red beans can be stored for a longer time, the reserve capacity of the production of red bean buns would increase. (2 marks)
Thus, the supply of red bean buns would become more elastic. (1 mark)