Past-paper walk-through

Other Elasticities ▪ 2.5

eXercise

Questions in this set

- 2025 Set 2 Q3
- 2024 Set 1 Q1
- 2023 Set 1 Q3
- 2019 Set 1 Q2
- 2016 Q1

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 3

2025 Set 2 ▪ Q3

3. The table provided shows the marginal utility for Lucy when she consumes Good X and Good Y.

Quantity of Good X	Marginal Utility of Good X (utils)	Quantity of Good Y	Marginal Utility of Good Y (utils)
1	20	1	28
2	16	2	24
3	12	3	16
4	8	4	8
5	4	5	–4
6	–2	6	–8

Question 3

A. If Good X and Good Y are free, how many units of each good will maximize Lucy's total utility?

B. Calculate Lucy's total utility if she consumes 2 units of Good X and 2 units of Good Y. Show your work.

C. Suppose instead that the price of each unit of Good X is $2 and the price of each unit of Good Y is $4. Lucy has a budget of $20 to spend on the two goods.

i. If Lucy purchases 2 units of Good X, what is the maximum quantity of Good Y Lucy can purchase?

ii. What is Lucy's optimal combination of Good X and Good Y? Explain your answer using marginal analysis and numbers.

Question 3

D. Suppose the price elasticity of demand for Good X is -2.0, the price elasticity of demand for Good Y is -0.8, and the cross-price elasticity of demand between Good X and Good Y is $+1.6$. Are goods X and Y complementary goods, substitute goods, normal goods, or inferior goods? Explain.

STOP

END OF EXAM

Solution 3

(a)

Mark scheme

- If Good X and Good Y are both free, Lucy maximizes her total utility by consuming each good up to the point where its marginal utility reaches zero (satiation) — 5 units of Good X and 4 units of Good Y.

Solution 3

(b)

Mark scheme

- Lucy's total utility from consuming 2 units of Good X and 2 units of Good Y is 88 utils. Show your work: Total utility from consuming 2 units of Good X = 20 utils + 16 utils = 36 utils (the sum of the marginal utilities of the 1st and 2nd units of X). Total utility from consuming 2 units of Good Y = 28 utils + 24 utils = 52 utils (the sum of the marginal utilities of the 1st and 2nd units of Y). Total utility from 2 units of X and 2 units of Y = 36 utils + 52 utils = 88 utils.

Solution 3

(c)(i)

Mark scheme

- With Good X priced at \$2/unit and Good Y priced at \$4/unit and a \$20 budget, if Lucy buys 2 units of Good X she spends \$2 $\times 2 = \$4$, *leaving* $\$16$ *of her budget. The maximum quantity of Good Y she can then purchase is* $\$16/\$4 = 4$ *units of Good Y.*

Solution 3

(c)(ii)

Mark scheme

- Lucy's optimal (utility-maximizing) combination is 4 units of Good X and 3 units of Good Y. Using marginal analysis: at this combination, the marginal utility per dollar spent on the last unit of Good X equals the marginal utility per dollar spent on the last unit of Good Y — 4 utils/\$ (= 8 utils / \$2) for Good X and 4 utils/\$ (= 16 utils / \$4) for Good Y — and this combination spends Lucy's entire \$20 budget: \$2 $\times 4 \mathit{unitsofGoodX} + \$4 \times 3 \mathit{unitsofGoodY} = \$8 + \$12 = \$20$.

Solution 3

(d)

Mark scheme

- Goods X and Y are substitute goods. The cross-price elasticity of demand between Good X and Good Y is positive (+1.6): a positive cross-price elasticity means an increase (decrease) in the price of Good X causes an increase (decrease) in the demand for Good Y, which is the defining property of substitute goods (rather than complements, which have negative cross-price elasticity).

Question 1

2024 Set 1 ▪ Q1

1. Soja Farm is a typical profit-maximizing firm that produces and sells soybeans in a constant-cost, perfectly competitive market that is in long-run equilibrium. The market equilibrium price of soybeans is \$14 per bushel.

   (a) Draw correctly labeled side-by-side graphs for the soybean market and for Soja Farm, and show each of the following.

   (i) The market equilibrium price and quantity, labeled \$14 and Q_M, respectively
   (ii) Soja Farm's profit-maximizing price and quantity, labeled P_F and Q_F, respectively
   (iii) Soja Farm's average total cost curve consistent with a long-run equilibrium, labeled ATC

   (b) If Soja Farm is the only firm in the market that chooses to increase its price of soybeans to \$15 per bushel, will Soja Farm's total revenue increase by \$1, remain the same, or decrease to \$0 ? Explain.

   (c) Soybeans are used as an input in the production of tofu. Tofu now becomes a more popular food option among consumers. On your graphs in part (a), show the short-run effect of the increased popularity of tofu on each of the following.

   (i) The new market equilibrium price and quantity of soybeans, labeled P_2 and Q_2, respectively
   (ii) Soja Farm's new profit-maximizing quantity, labeled Q*

Question 1

(d) Given the increase in popularity of tofu in part (c), what will happen to the number of firms in the soybean market in the long run? Explain.

(e) Suppose a 25% increase in the market price of quinoa causes a 5% decrease in the quantity demanded of quinoa and a 10% increase in the quantity demanded for tofu.

(i) Is the demand for quinoa elastic, inelastic, or unit elastic? Explain using numbers.
(ii) Calculate the cross-price elasticity of demand between quinoa and tofu. Show your work.

Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

Solution 1

(a) Mark scheme

- Draw side-by-side graphs (4 points, 1 each): (1) Market graph: downward-sloping demand D_1 and upward-sloping supply S, with the equilibrium labeled at price $14 and quantity Q_M. (2) Firm graph: Soja Farm (a price-taking, perfectly competitive firm) has a horizontal demand/marginal-revenue curve d_1 = MR_1 drawn at the market price, labeled P_F (=14, the height carried over from the market graph). (3) A rising marginal cost (MC) curve is added to the firm graph, crossing $d_1 = MR_1$ at the profit-maximizing quantity Q_F (where $MR = MC$). (4) An average total cost (ATC) curve is added, drawn tangent to the firm's demand curve exactly at Q_F (zero long-run economic profit),

Solution 1

with the MC curve passing through the minimum point of ATC. Each of the four elements earns its own point; grade holistically against these four labeled features.

Solution 1

(b)

Mark scheme

- Soja Farm's total revenue would decrease to $0(notmerelyfallby1)$. Because Soja Farm is one price-taking firm among many in a perfectly competitive market, it faces a perfectly elastic (horizontal) demand curve at the market price of $14.Ifitaloneraisesitspriceto15$, all of its customers would simply buy soybeans from the many other sellers still charging the market price of $14, soSojaFarmwouldsellzerounitsandearn0$ in revenue.

Solution 1

(c)

Mark scheme

- Two points, one per graph: (i) On the market graph, demand shifts rightward from D_1 to D_2 (tofu's rising popularity raises demand for its input, soybeans), producing a new, higher equilibrium price labeled P_2 and a new, higher equilibrium quantity labeled Q_2 (both to the right/above the original 14/Q_M point). (ii) On the firm's graph, the higher market price shifts the firm's horizontal demand/MR curve upward to $d_2 = MR_2$ at P_2, and the new profit-maximizing quantity is labeled Q^*, found where $MR_2 = MC$ (to the right of the original Q_F).

Solution 1

(d)

Mark scheme

- The number of firms in the soybean market will increase in the long run. At the new higher price P_2, existing firms like Soja Farm earn positive (above-normal) economic profits (price exceeds ATC at Q^*). These economic profits attract new firms to enter the soybean market, which is characteristic of long-run adjustment in a perfectly competitive industry.

Solution 1

(e)(i)

Mark scheme

- Demand for quinoa is inelastic. Explanation (either is sufficient): the price elasticity of demand for quinoa has an absolute value of $|\%\Delta Q\_d \ / \ \%\Delta P| = 5\% \ / \ 25\% = 0.2$, which is less than 1, so demand is inelastic; equivalently, the 5% decrease in quantity demanded of quinoa is smaller (proportionally) than the 25% increase in the price of quinoa, meaning quantity demanded responds less than proportionally to the price change.

Solution 1

(e)(ii)

Mark scheme

- Cross-price elasticity of demand between quinoa and tofu = (% change in quantity demanded of tofu) / (% change in price of quinoa) = 10% / 25% = 0.4. (The positive value confirms quinoa and tofu are substitutes.)

Question 3

2023 Set 1 ▪ Q3

The graph provided shows the demand (d), marginal revenue (MR), average total cost (ATC), average variable cost (AVC), and marginal cost (MC) curves for Hansel Hangout, a typical profit-maximizing firm in a perfectly competitive market producing Good X.

[Graph with y-axis "Price, Cost ()"*showinggridlinevalues*$8, 9, 11, 14, 20, 21, 26$*and*$x-$*axis*"*Quantity*"*showinggridlinevalues*$4, 6, 8, 10$.*Curvesshown*, *labeledlefttorightalongtherightside*
MC(*risingmarginalcostcurve*), *ATC*(*averagetotalcostcurve*, $U-$
shaped, *intersectingMCatapproximatelyquantity*8, *price*$20-$
21), *AVC*(*averagevariablecostcurve*, $U-$
shaped, *lyingbelowATC*, *withitsminimumnearquantity*$4-$
6*aroundprice*$8-9$), *andahorizontallin*ed $=$ MR*drawnatprice*14.*Dashedguidelinesconnect* :
price26*uptotheMCcurvenearquantity*10; *price*21*and*20*nearquantity*8*whereMCcrossesATC*; *price*

Question 3

= MR$ crosses MC (near quantity 8) and also down to where it crosses AVC (near quantity 10); price 11 and 9 and 8 down near quantity 4 where AVC has its minimum.]

(a) Calculate Hansel Hangout's total fixed cost. Show your work.

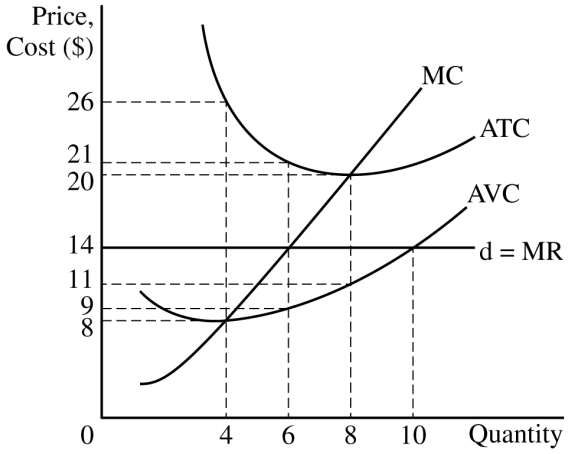
(b) Identify the price and Hansel Hangout's profit-maximizing quantity of Good X.

(c) Calculate Hansel Hangout's economic profit at the quantity identified in part (b). Show your work.

(d) As the market for Good X adjusts to the long-run equilibrium, what will happen to the price of Good X? Explain.

(e) Assume the cross-price elasticity of demand between Good X and Good C is positive. Given the change in the long-run price of Good X in part (d), will the quantity demanded of Good C increase, decrease, or remain the same? Explain.

Question 3



Solution 3

(a)

Mark scheme

- Total Fixed Cost = (Average Total Cost − Average Variable Cost) × Quantity. Using the $Q = 4$ row: TFC = $(26{-}8) \times 4 = 18{\times}4 =$72. (Equivalently, from $Q = 6$: $(21{-}9) \times 6 = 72$; *orfrom*Q=8: $(20 - 11){\times}8 =$72.)

Solution 3

(b)

Mark scheme

- Price = \$14 and Hansel Hangout's profit-maximizing quantity of Good X is 6 units (the quantity from the data table where marginal revenue equals marginal cost, i.e., price equals marginal cost for this price-taking firm).

Solution 3

(c)

Mark scheme

- Economic Profit = (Price − Average Total Cost) × Quantity = (\$14 − \$21) × 6 = (−\$7) × 6 = −\$42. (Equivalently, Total Revenue − Total Cost = (\$14 × 6) − (\$21 × 6) = \$84 − \$126 = −\$42.)

Solution 3

(d)

Mark scheme

- The market price of Good X will increase in the long run. Explanation: because firms are earning negative economic profit (a loss) at the current price, some firms will exit the market, shifting the market supply curve to the left (decrease in supply), which raises the market equilibrium price toward the zero-economic-profit long-run equilibrium.

Solution 3

(e)

Mark scheme

- The quantity demanded of Good C will increase. Explanation: a positive cross-price elasticity of demand between Good X and Good C indicates the two goods are substitutes in consumption; since the long-run price of Good X increases (from part (d)), demand for Good C increases (the demand curve for C shifts right), causing an increase in the quantity demanded of Good C.

Question 2

2019 Set 1 ▪ Q2

2. The following is a table showing Dana's marginal benefit from purchasing bottles of water and good X from a grocery store.

Quantity of Water (in bottles)	Marginal Benefit of Water (in dollars)		Quantity of Good X (in units)	Marginal Benefit of Good X (in dollars)
1	24		1	24
2	18		2	18
3	12		3	12
4	6		4	6
5	3		5	3

(a) What is Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X? Show your work.

(b) Assume the price of a unit of good X is $5. Calculate the total consumer surplus if Dana purchases 3 units of good X. Show your work.

Question 2

(c) Now assume the price of a bottle of water is $3 and the price of a unit of good X is $6. Dana spends her entire budget of $30 on bottles of water and good X.

(i) Explain why Dana does not maximize her benefit when she purchases 2 bottles of water and 4 units of good X. Use marginal analysis to explain your answer.

(ii) What are the optimal quantities of good X and bottles of water at these prices?

(iii) Suppose the price of a unit of good X drops to $3. Calculate Dana's cross-price elasticity of demand for bottles of water with respect to the price of good X, and state whether the two goods are substitutes or complements. Show your work.

Question 2

Solution 2

(a)

Mark scheme

- Dana's total benefit from purchasing 2 bottles of water and 1 unit of good X is 66. *Work* : *sumthemarginalbenefitsofeachunitconsumed* :24 + 18(*thetwobottlesofwater*)+24 (the one unit of good X) = 66, *equivalently*42 (water) + 24(*goodX*) =66.

Solution 2

(b)

Mark scheme

- Dana's total consumer surplus from purchasing 3 units of good X at a price of \$5 each is \$39. Work: sum (marginal benefit − price) for each of the 3 units: $(\$24 - \$5) + (\$18 - \$5) + (\$12 - \$5) = \$19 + \$13 + \$7 = \$39$, equivalently total benefit \$54 minus total expenditure $\$15 = \$39$.

Solution 2

(c)(i)

Mark scheme

- Dana does not maximize her benefit at 2 bottles of water and 4 units of good X because the marginal benefit per dollar spent on water exceeds the marginal benefit per dollar spent on good X: MB_water / P_water > MB_X / P_X, i.e. $18/3 > 6/6$ (6 > 1, or 6 1). Because the last dollar spent on water yields more benefit than the last dollar spent on good X, Dana is not at the utility-maximizing bundle (which requires MB_water/P_water = MB_X/P_X).

Solution 2

(c)(ii)

Mark scheme

- At these prices (water 3, *goodX*6, budget 30), *theoptimal*(*benefit* − *maximizing*)*bundleis*3*unitsofgoodXand*4*bottlesofwater*—*thissatisfiesthebudgetconstrain* + 4×3 =18 + 12 =30) and equalizes marginal benefit per dollar across the two goods.

Solution 2

(c)(iii)

Mark scheme

- With the price of good X falling to \$3, Dana's cross-price elasticity of demand for bottles of water with respect to the price of good X is -0.5, and water and good X are complements. Work: (% change in quantity of bottles of water) / (% change in price of good X) $= 25\%$ / $(-50\%) = -0.5$. (Using the midpoint/arc-elasticity formula is also acceptable: $(1/4.5)$ / $(-3/4.5)$ -0.33.) A negative cross-price elasticity indicates the two goods are complements; the answer must be consistent with the quantity of water stated in part (c)(ii).

Question 1

2016 ▪ Q1

MICROECONOMICS
Section II
Total Time—60 minutes
Reading Period—10 minutes
Writing Period—50 minutes

Directions: You are advised to spend the first 10 minutes reading all of the questions and planning your answers. You will then have 50 minutes to answer all three of the following questions. You may begin writing your responses before the reading period is over. It is suggested that you spend approximately half your time on the first question and divide the remaining time equally between the next two questions. Include correctly labeled diagrams, if useful or required, in explaining your answers. A correctly labeled diagram must have all axes and curves clearly labeled and must show directional changes. Use a pen with black or dark blue ink.

1. The markets for bananas, muffins, and coffee are interrelated, and each market is perfectly competitive.

Question 1

(a) In the market for bananas, the equilibrium price is $1.00 per pound, and the equilibrium quantity is 1,000 pounds per week. Suppose the government imposes a price floor on bananas at $1.20 per pound, causing the quantity supplied to increase to 1,500 pounds per week.

(i) Would the price floor result in a shortage, a surplus, or neither? Explain.

(ii) Calculate the price elasticity of supply if the price increases from $1 to $1.20. Show your work.

(iii) Between $1 and $1.20, is the supply elastic, unit elastic, or inelastic? Explain.

(b) Bananas are an input for muffins.

(i) Draw a correctly labeled graph of the market for muffins indicating the equilibrium price and quantity, labeled P_0 and Q_0, respectively.

(ii) On the graph drawn in part (b)(i), show the impact of an increase in the price of bananas on the muffin market, labeling the new equilibrium price and quantity P_1 and Q_1, respectively.

(iii) On the same graph, completely shade the area that represents the **change** in the consumer surplus caused by the increase in the price of bananas.

Question 1

(c) In the market for coffee, the equilibrium price is $3.00 per cup and the equilibrium quantity is 100 cups per week. The cross-price elasticity of coffee with respect to muffins is −2.

(i) Are coffee and muffins normal goods, inferior goods, complementary goods, or substitute goods?

(ii) Assume the supply of coffee is perfectly elastic. Using the equilibrium price and quantity given above, draw a correctly labeled graph for the coffee market, and show the impact of an increase in the price of muffins on the coffee market.

(iii) Given the original quantity of 100 cups of coffee per week, if the increase in the price of muffins is 10%, calculate the new equilibrium quantity in the coffee market. Show your work.

Solution 1

(a)(i)

Mark scheme

- Surplus. At the price floor of $1.20 (above the 1.00$ equilibrium), the price floor is binding/effective, so quantity supplied (1,500 lb/week) exceeds quantity demanded — this excess of Qs over Qd is a surplus, not a shortage.

Solution 1

(a)(ii)

Mark scheme

- Price elasticity of supply 2.2–2.5 (either the midpoint or point method earns the point). Midpoint formula: $\%\Delta Q = (1500-1000)/1250 = 0.4 = 40\%$; $\%\Delta P = (1.20-1.00)/1.10$ $0.182 = 18.2\%$; $E = 40\%/18.2\%$ 2.2. (Equivalently with the point method using the original base: $\%\Delta Q = 500/1000 = 50\%$, $\%\Delta P = 0.20/1.00 = 20\%$, $E = 50\%/20\% = 2.5$.) Any correctly-worked elasticity value from a valid formula (2, 2.2, or 2.5) earns the point.

Solution 1

(a)(iii)

Mark scheme

- Elastic. Since the price elasticity of supply calculated above is greater than 1 (the percentage change in quantity supplied exceeds the percentage change in price), supply over this range is elastic.

Solution 1

(b)(i)

Mark scheme

- A correctly labeled graph of the muffin market: Price on the vertical axis, Quantity on the horizontal axis, an upward-sloping supply curve S and a downward-sloping demand curve D intersecting at the initial equilibrium, with the equilibrium price and quantity labeled P0 and Q0 respectively (dashed lines dropping to the axes).

Solution 1

(b)(ii)

Mark scheme

- Because bananas are an input to muffins, the rise in the price of bananas raises muffin producers' costs, shifting the muffin supply curve LEFT from S to S1. The new intersection with demand D occurs at a higher price and lower quantity, labeled P1 ($>$ P0) and Q1 ($<$ Q0).

Solution 1

(b)(iii)

Mark scheme

- The area representing the decrease in consumer surplus is the trapezoid bounded above by the new price line P1, below by the original price line P0, on the left by the price (vertical) axis, and on the right by the (unchanged) demand curve D between the points (Q1, P1) and (Q0, P0) — i.e., the whole shaded band between P0 and P1 under the demand curve, out to Q0/Q1, must be completely shaded.

Solution 1

(c)(i)

Mark scheme

- Complementary goods. The cross-price elasticity of coffee with respect to muffins is negative ($-2 < 0$): a rise in the price of muffins decreases the quantity demanded of coffee, which is the defining property of complements.

Solution 1

(c)(ii)

Mark scheme

- Correctly labeled coffee-market graph: Price on the vertical axis, Quantity on the horizontal axis,
  a perfectly elastic (horizontal) supply curve S drawn at $P = 3$, $and a downward-sloping demand curve D with initial equilibrium quantity 100 cups/week. Because coffee and mu$
  while the equilibrium quantity falls (to 80 cups/week, from part (c)(iii)).

Solution 1

(c)(iii)

Mark scheme

- $\%\Delta Q = \%\Delta P(\text{muffins}) \times \text{cross-price elasticity} = 10\% \times (-2) = -20\%$. New equilibrium quantity $= 100 - (0.20 \times 100) = 100 \times (1 - 0.20) = 80$ cups per week. (Using the midpoint formula to back out the same $-20\%/80$ result is also acceptable.)