Past-paper walk-through

Market Equilibrium and Consumer and Producer Surplus ▪ 2.6

eXercise

Questions in this set

- 2026 Q3
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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

2026 ▪ Q3

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3. In Gurkeland, the domestic market for cucumbers is characterized by a downward-sloping demand curve and an upward-sloping supply curve, and the market for cucumbers is currently in equilibrium at a price of $20 per bushel.

Part A

Draw a correctly labeled graph of the market for cucumbers and show the equilibrium price, labeled $20, and the equilibrium quantity, labeled Q_1.

Part B

Suppose that Gurkeland engages in free trade with other countries and that the world price of cucumbers is $10 per bushel.

i. On your graph in part A, show the world price of cucumbers, labeled $10, and the quantity of cucumbers sold by domestic producers, labeled Q_2.

Question 3

ii. Will total economic surplus in Gurkeland increase, decrease, or remain the same after engaging in free trade?

Part C

Now suppose that the government of Gurkeland imposes a $5 tariff per bushel on the import of cucumbers.

i. On your graph in part A, show the new quantity of cucumbers, labeled Q_3, that will be sold by domestic producers as a result of the $5 tariff imposed on the import of cucumbers.

ii. As compared with the free trade described in part B, will domestic producer surplus in the market for cucumbers increase, decrease, or remain the same as a result of the $5 tariff imposed on the import of cucumbers? Explain.

Question 3

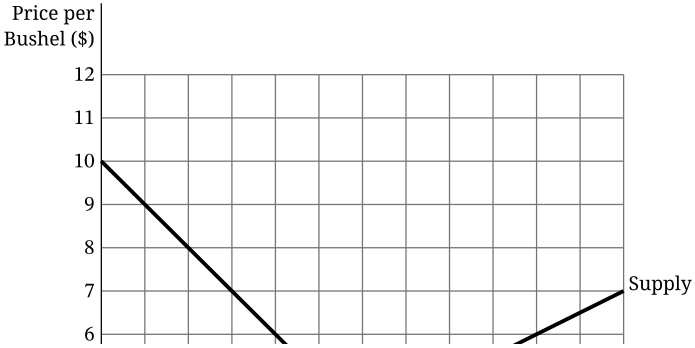
STOP

END OF EXAM

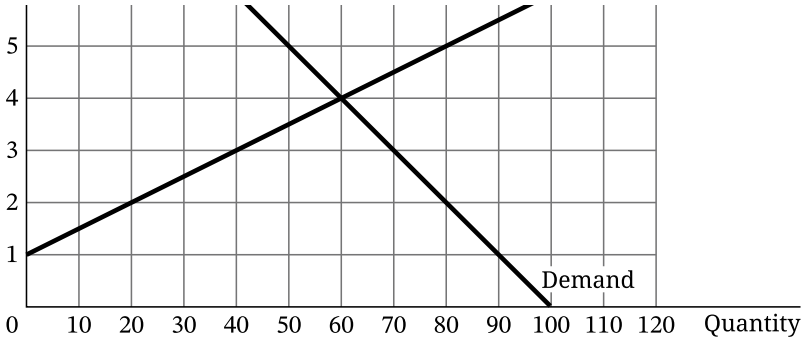
Question 2

2025 Set 1 ▪ Q2

2. The graph provided shows the market for rice in the country of Rushland.



Question 2



Question 2

A. Calculate the total economic surplus at market equilibrium. Show your work.

B. If the government sets a price floor at $3 per bushel, will there be a surplus, a shortage, or neither? Explain.

C. Suppose that instead of the price floor, Rushland engages in international trade and the world price of rice is $5 per bushel.

i. Will Rushland export or import rice? Explain using numbers from the graph.

ii. Calculate the domestic consumer surplus when Rushland engages in international trade. Show your work.

iii. Calculate the total revenue that Rushland's farmers will earn at the world price. Show your work.

Solution 2

(a)

Mark scheme

- Total Economic Surplus $= \frac{1}{2} \times (\$10 - \$1) \times (60 - 0) = \frac{1}{2} \times \$9 \times 60 = \$270.$ (Equivalently, Consumer Surplus + Producer Surplus $= \frac{1}{2} \times (\$10 - \$4) \times 60 + \frac{1}{2} \times (\$4 - \$1) \times 60 = \$180 + \$90 = \$270.$) Must show work; final answer 270.

Solution 2

(b)

Mark scheme

- There will be NEITHER a surplus NOR a shortage. Explanation: a price floor set at $3 per bushel is below the equilibrium price ($4), so it is not binding and therefore has no effect on the market price and quantity.

Solution 2

(c)(i)

Mark scheme

- Rushland will EXPORT rice. Explain with ONE of: (1) at the world price of 5, $the domestic quantity supplied is 80 bushels of rice$, $which is greater than the domestic quantity$ Rushland has a domestic surplus of 30 bushels of rice that can be exported.

Solution 2

(c)(ii)

Mark scheme

- Domestic Consumer Surplus $= \frac{1}{2}\times(\$10-\$5)\times(50-0) = \frac{1}{2}\times\$5\times50 = \$125$. Must show work; final answer \$125.

(c)(iii)

Mark scheme

- Total Revenue = World Price $\times$ Quantity Sold $= \$5\times80 = \$400$ (quantity sold is the domestic quantity supplied at the world price, 80 bushels). Must show work; final answer \$400.

Question 1

2025 Set 2 ▪ Q1

Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

(a)(i) Draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward and show each of the following. The market equilibrium price and quantity, labeled P_M and Q_M, respectively.

(a)(ii) Draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward and show each of the following. Deskward's profit-maximizing price and quantity, labeled P_F and Q_F, respectively.

(a)(iii) Draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward and show each of the following. Deskward's average total cost curve consistent with long-run equilibrium, labeled ATC.

Question 1

2025 Set 2 ▪ Q1

Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

(b) If the monthly rent, a fixed cost, on Deskward's factory building increases, what will happen to the firm's profit-maximizing quantity in the short run? Explain.

Question 1

2025 Set 2 ▪ Q1

Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

(c)(i) Suppose the government is considering granting a per-unit subsidy to producers of wooden desks. On your market graph in part A, show the short-run effect of a per-unit subsidy on each of the following. The new market equilibrium price and quantity of wooden desks, labeled P^* and Q^*, respectively.

(c)(ii) Suppose the government is considering granting a per-unit subsidy to producers of wooden desks. On your market graph in part A, show the short-run effect of a per-unit subsidy on each of the following. The area representing the total cost of the subsidy to the government, shaded completely.

Question 1

2025 Set 2 ▪ Q1

Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

(d) Instead of the per-unit subsidy, suppose the government imposes a binding price floor in the market for wooden desks. Will the price floor result in a shortage of wooden desks, a surplus of wooden desks, or neither? Explain.

Question 1

2025 Set 2 ▪ Q1

Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

(e)(i) Deskward also produces chairs. Deskward increases its production from 500 chairs to 600 chairs, and its long-run total cost increases from \$80,000 to \$108,000. Calculate Deskward's long-run average total cost of producing 500 chairs. Show your work.

(e)(ii) As Deskward increases production from 500 chairs to 600 chairs, is Deskward experiencing economies of scale, diseconomies of scale, or the efficient scale? Explain using numbers.

Solution 1

(a)(i)

Mark scheme

- Draw a correctly labeled graph of the market for wooden desks with a downward-sloping demand (D) curve and an upward-sloping supply (S_1) curve. Label the market equilibrium price (where D and S_1 intersect) as P_M and the market equilibrium quantity as Q_M.

Solution 1

(a)(ii)

Mark scheme

- Draw Deskward's graph with the firm's horizontal demand and marginal revenue curve (d = MR) extended from the market equilibrium price P_M, and label the firm's price as P_F (= P_M, since the firm is a price taker) (1 point). Also draw a rising marginal cost (MC) curve and show the firm's profit-maximizing quantity, labeled Q_F, at the point where MR = MC (1 point).

Solution 1

(a)(iii)

Mark scheme

- Show the average total cost (ATC) curve tangent to the firm's d = MR curve at Q_F, and show the MC curve passing through the minimum point of the ATC curve. Tangency of ATC to price (zero economic profit) with MC crossing ATC at its minimum indicates Deskward's ATC curve is consistent with long-run competitive equilibrium.

Solution 1

(b)

Mark scheme

- Deskward's profit-maximizing quantity will NOT change in the short run. An increase in a fixed cost (like rent) does not affect the firm's marginal cost or marginal revenue; since profit maximization occurs where MR = MC and neither curve shifts, the profit-maximizing quantity is unchanged (only the firm's economic profit falls).

Solution 1

(c)(i)

Mark scheme

- On the market graph from part A, show the supply curve shifting right, from S_1 to S_2 (a per-unit subsidy lowers producers' effective cost of production, increasing supply). Label the new, lower market equilibrium price as P^* and the new, higher market equilibrium quantity as Q^*, at the intersection of D and S_2.

Solution 1

(c)(ii)

Mark scheme

- Shade completely the rectangle bounded by the vertical gap between S_1 and S_2 (the per-unit subsidy) at the new equilibrium quantity Q^* — i.e., the area between S_1 and S_2 from quantity 0 to Q^*, spanning from P^* up to the price on S_1 at Q^*. This area equals the per-unit subsidy times Q^*, the total cost of the subsidy to the government.

Solution 1

(d)

Mark scheme

- The price floor will result in a surplus of wooden desks. Because the price floor is binding, it is set above the market equilibrium price; at this higher price, the quantity of wooden desks supplied is greater than the quantity demanded, creating a surplus.

Solution 1

(e)(i)

Mark scheme

- Long-run average total cost (LRATC) at 500 chairs = Total Cost / Quantity = \$80{,}000 / 500 = \$160 per chair. Show the division as work.

Solution 1

(e)(ii)

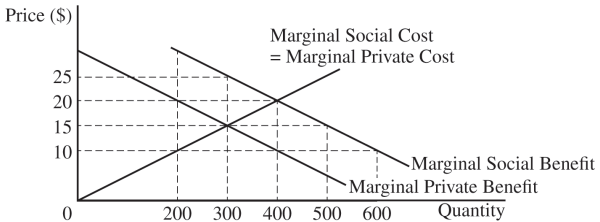
Mark scheme

- Deskward is experiencing diseconomies of scale. As output increases from 500 to 600 chairs, LRATC increases from \$160 (= \$80{,}000/500) to \$180 (= \$108{,}000/600) per chair. Because LRATC rises as output increases, this is diseconomies of scale (economies of scale would require falling LRATC; efficient scale requires LRATC to be at its minimum).

Question 2

2024 Set 1 ▪ Q2

2. Good X is produced and sold in a perfectly competitive market. The provided graph shows the market for Good X.



(a) Identify the market equilibrium price and quantity.

(b) Calculate the deadweight loss at the market equilibrium. Show your work.

Question 2

(c) Suppose the government wants to eliminate the deadweight loss in the market for Good X.

(i) Which of the following will achieve the government's objective: a per-unit tax on consumers or a per-unit subsidy to consumers? Explain.

(ii) What is the dollar value of the per-unit tax or per-unit subsidy identified in part (c)(i) ?

(d) Suppose instead the government imposes a price ceiling of $10. Will the price ceiling achieve the socially optimal quantity of Good X? Explain.

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 2

(a)

Mark scheme

- The market equilibrium price is \$15, and the market equilibrium quantity is 300 units (read directly off the given supply-and-demand graph/data as the point where quantity supplied equals quantity demanded).

Solution 2

(b)

Mark scheme

- Deadweight loss = \$500. Work: \$DWL = \tfrac{1}{2} \times (\$25 - \$15) \times (400 - 300) = \tfrac{1}{2} \times \$10 \times 100 = \$500\$. This is the triangle between the demand and supply curves from the market quantity (300) to the socially optimal quantity (400), using the demand price (\$25) and supply price (\$15) at the margin.

Solution 2

(c)(i) Mark scheme

- The government should grant a per-unit subsidy to consumers (not a per-unit tax) to eliminate the deadweight loss and achieve the socially optimal quantity of Good X. Explanation (any one is sufficient): a per-unit subsidy to consumers internalizes the external benefit and increases consumers' incentive/ability to buy, raising quantity to the socially optimal level (400); a subsidy equal to the marginal external benefit lowers the effective price paid by consumers, increasing consumption to 400; a subsidy equal to the gap between marginal social benefit and marginal private benefit increases the quantity exchanged to the socially optimal quantity (400). (This implies Good X generates a positive externality, so a tax would move the market further from the optimum, not closer.)

Solution 2

(c)(ii)

Mark scheme

- The dollar value of the per-unit subsidy is \$10 — equal to the vertical gap between the marginal social benefit (demand) curve and the marginal private benefit at the socially optimal quantity of 400 units.

Solution 2

(d)

Mark scheme

- No, the price ceiling of \$10 will not achieve the socially optimal quantity of Good X. Explanation: a binding price ceiling causes the quantity actually exchanged in the market to be limited by the (lower) quantity supplied at that price, which is 200 units — less than the socially optimal quantity of 400 units. So the price ceiling creates a shortage and under-provides the good relative to the social optimum.

Question 1

2024 Set 2 ▪ Q1

Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

(a) Draw a correctly labeled graph for Arzeye Pharma and show each of the following. (i) The profit-maximizing quantity of eye treatments, labeled Q* (ii) The profit-maximizing price, labeled P* (iii) The average total cost curve consistent with positive economic profit, labeled ATC (iv) The area representing consumer surplus, shaded completely

Question 1

2024 Set 2 ▪ Q1

Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

(b)(i) Suppose Arzeye Pharma wants to charge a price that maximizes its total revenue rather than its profit. On your graph in part (a), show the revenue-maximizing quantity, labeled Q_R.

(b)(ii) At quantity Q_R identified in part (b)(i), is the demand for eye treatments elastic, inelastic, or unit elastic?

Question 1

2024 Set 2 ▪ Q1

Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

(c)(i) Suppose now that Arzeye Pharma engages in perfect price discrimination. On your graph in part (a), show the lowest price that Arzeye Pharma would charge, labeled P_2.

(c)(ii) What would happen to consumer surplus? Explain.

Question 1

2024 Set 2 ▪ Q1

Arzeye Pharma has a patent, a legal barrier to entry, on its newly developed eye treatment that cures common eye problems. Arzeye Pharma is currently earning positive economic profit and is producing the profit-maximizing quantity of eye treatments.

(d) Suppose instead that Arzeye Pharma's patent expires. Will the demand for Arzeye Pharma's treatment become more elastic, become less elastic, or not change? Explain.

Solution 1

(a) Mark scheme

- Graph of Arzeye Pharma (a profit-maximizing firm with market power) showing, in order: (1) a downward-sloping demand (D) curve and a downward-sloping marginal revenue (MR) curve lying below D; (2) a rising, U-shaped marginal cost (MC) curve intersecting MR at the profit-maximizing quantity, labeled Q*, where MR = MC; (3) the profit-maximizing price P*, found by going up from Q* to the demand curve; (4) the average total cost (ATC) curve drawn below P* at Q* (so P* > ATC, i.e. positive economic profit), with the MC curve passing through the minimum point of the ATC curve; (5) the consumer surplus area — the triangle between the demand curve and the price P*, from the price axis out to Q* — shaded completely. 5 points total: 1 point each for (i) D & MR correctly drawn

Solution 1

with MR below D, (ii) MC rising and Q* located at MR=MC, (iii) P* read off D at Q*, (iv) ATC below P* at Q* with MC through ATC's minimum, (v) consumer surplus fully shaded.

Solution 1

(b)(i)

Mark scheme

- On the same graph, the revenue-maximizing quantity Q_R is marked where the MR curve crosses the horizontal (quantity) axis, i.e. where MR $= 0$. Because total revenue is maximized when marginal revenue is zero, Q_R lies to the right of Q* (a larger quantity than the profit-maximizing quantity, since profit maximization requires MR $=$ MC > 0).

Solution 1

(b)(ii)

Mark scheme

- At quantity Q_R, demand for eye treatments is unit elastic. Total revenue is maximized exactly where marginal revenue equals zero, and that point on the demand curve corresponds to $|E_d| = 1$ (unit elastic demand).

Solution 1

(c)(i)

Mark scheme

- Under perfect price discrimination, Arzeye continues selling additional units as long as a consumer's willingness to pay (given by the demand curve) is at least as high as the marginal cost of producing that unit, so it sells down to the quantity where D = MC. The lowest price it charges, labeled P_2, is therefore found at the intersection of the demand (D) curve and the marginal cost (MC) curve — this price is below both P* and the price at Q_R.

Solution 1

(c)(ii)

Mark scheme

- Consumer surplus would decrease to $0. Explanation: under perfect price discrimination Arzeye charges each consumer the maximum price that consumer is willing to pay for each unit, so it captures the entire area that was previously consumer surplus as additional producer surplus/profit, leaving consumers with none.

Solution 1

(d)

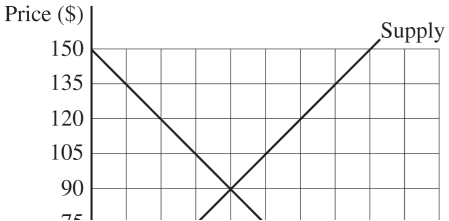
Mark scheme

- Arzeye Pharma's demand will become more elastic. Explanation: once the patent expires, other firms are free to enter the market and offer substitute (e.g. generic) eye treatments. With more substitutes available, consumers can more easily switch away from Arzeye's treatment in response to a price increase, making demand more responsive to price changes (more elastic).

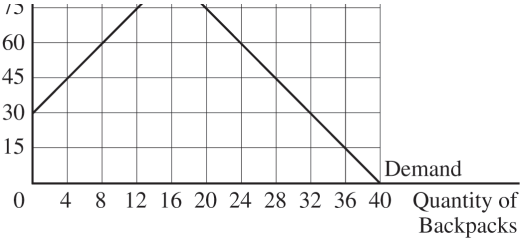
Question 3

2024 Set 2 ▪ Q3

3. Backpacks are produced in a perfectly competitive market that has no externalities. The provided graph shows the market supply and demand curves for backpacks in the country of Jambo.



Question 3



(a) Calculate total economic surplus at the market equilibrium. Show your work.

(b) To decrease the price of backpacks for students, the government of Jambo has decided to set a price ceiling of $60 per backpack. Compared to the market equilibrium, will the quantity of backpacks purchased increase, decrease, or not change as a result of the price ceiling? Explain.

(c) Suppose instead the government of Jambo provides a per-unit subsidy of $30 to the sellers of backpacks.

Question 3

(i) Identify the price paid by consumers per backpack after the per-unit subsidy is implemented.
(ii) Calculate the total cost of the subsidy to the government. Show your work.
(iii) Does the per-unit subsidy cause deadweight loss to increase, decrease, or remain the same compared to the market equilibrium in part (a)? Explain.

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.

Question 3

Question 3

STOP

END OF EXAM

Solution 3

(a)

Mark scheme

- Total Economic Surplus $= \frac{1}{2} \times$ (choke price $-$ minimum supply price) $\times$ equilibrium quantity $= \frac{1}{2} \times (150-30) \times (16 - 0) = \frac{1}{2} \times 120 \times 16 = 960$.

Solution 3

(b)

Mark scheme

- The quantity of backpacks purchased will decrease. Explanation: the price ceiling of $60, set below the equilibrium price, causes a decrease in the quantity of backpacks supplied to 8. Because a shortage results, the quantity actually purchased in the market is limited by this (lower) quantity supplied (8), which is less than the equilibrium quantity (16).

Solution 3

(c)(i)

Mark scheme

- The price consumers pay per backpack after the per-unit subsidy is implemented is $75.

(c)(ii)

Mark scheme

- Total Cost of Subsidy to the Government = Per-unit Subsidy $\times$ Quantity of Backpacks = 30×20 =600.

Solution 3

(c)(iii)

Mark scheme

- The deadweight loss will increase compared to the market equilibrium in part (a). Explanation (either is sufficient): the per-unit subsidy causes the new equilibrium quantity (20 backpacks) to exceed the allocatively efficient quantity (16 backpacks) — i.e. the market overproduces; equivalently, at the new equilibrium quantity of 20 backpacks the marginal cost (105)*isgreaterthanthemarginalbenefit*(75), and this gap between marginal cost and marginal benefit on the extra units produced is the source of the increased deadweight loss.

Question 1

2022 Set 1 ▪ Q1

A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.

(a) Draw a correctly labeled graph for the firm and show each of the following. (i) The quantity of carbon-capture devices produced by the firm, labeled Q_M (ii) The price charged by the firm, labeled P_M (iii) The area representing consumer surplus, shaded completely

Question 1

2022 Set 1 ▪ Q1

A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.

(b)(i) The government is considering different options to regulate the firm. Suppose the government is considering taxing the firm. Could using a per-unit tax change the firm's output to the socially optimal quantity? Explain.

(b)(ii) Instead, suppose the government imposes a price ceiling so that the firm produces the socially optimal quantity. On your graph in part (a), label the quantity and price after the price ceiling is imposed as Q_C and P_C.

(b)(iii) At the price and the quantity identified in part (b)(ii), is the firm earning positive economic profit? Explain.

Question 1

2022 Set 1 ▪ Q1

A firm has a patent on a new carbon-capture technology, making it the only producer of that device. The firm is currently earning a positive economic profit and is producing the profit-maximizing level of output.

(c)(i) Assume the government decides not to regulate the firm and instead the firm produces the quantity of output that maximizes total revenue.
If the firm now increases its output by one unit, would marginal revenue be positive, negative, or zero? Explain.

(c)(ii) Starting at the total-revenue-maximizing quantity, if the firm reduces the price by 10%, would quantity demanded increase by less than 10%, by more than 10%, or by exactly 10%?

Solution 1

(a) Mark scheme

- Monopoly graph for the firm, 5 points total (1 point each): (1) Correctly labeled downward-sloping demand curve D and marginal-revenue curve MR, with MR below D. (2) Marginal-cost curve MC added, intersecting MR at the profit-maximizing quantity labeled Q_M (where $MR = MC$). (3) Profit-maximizing price P_M read up from Q_M to the demand curve. (4) Average-total-cost curve ATC drawn below the demand curve at Q_M, with the MC curve passing through the minimum point of ATC. (5) Consumer surplus – the area bounded above by D, below by the price P_M, from the price axis out to Q_M – shaded completely.

Solution 1

(b)(i)

Mark scheme

- No. A per-unit tax raises the firm's marginal cost, shifting MC upward. The new MC intersects MR at a LOWER quantity than Q_M, so the tax decreases the firm's profit-maximizing output – it moves output further away from (not toward) the socially optimal quantity, which is higher than Q_M (found where $MC = D$).

Solution 1

(b)(ii)

Mark scheme

- The socially optimal quantity Q_C is where the (original, untaxed) MC curve crosses the demand curve D (i.e. $MC = D$); this lies to the right of Q_M. The corresponding price ceiling P_C is the price on the demand curve at Q_C (equivalently, the height of D and MC where they cross). Both Q_C (on the quantity axis, right of Q_M) and P_C (on the price axis, below P_M) should be labeled on the part (a) graph.

Solution 1

(b)(iii)

Mark scheme

- Yes, the firm earns positive economic profit at Q_C, because $ATC < P_C$ at that quantity – profit per unit is $P_C - ATC > 0$. Scoring note: grade for internal consistency with the student's own graph – accept 'no economic profit' only if their ATC curve is drawn at or above P_C at Q_C; the standard graph has ATC below P_C at Q_C, giving positive profit.

Solution 1

(c)(i)

Mark scheme

- Marginal revenue would be negative. At the total-revenue-maximizing quantity, $MR = 0$ (TR is at its peak). Increasing output by one more unit pushes the firm onto the inelastic portion of the demand curve, where selling more requires a price cut large enough that total revenue falls, i.e. $MR < 0$ for that extra unit.

Solution 1

(c)(ii)

Mark scheme

- Less than 10%. At the revenue-maximizing quantity, demand is unit elastic ($|E_d| = 1$). Cutting price further moves the firm onto the inelastic portion of the demand curve, where $|E_d| < 1$, so the percentage increase in quantity demanded is smaller than the 10% percentage decrease in price.

Question 3

2022 Set 1 ▪ Q3

(a) The local market for Good X has a perfectly elastic supply. Draw a correctly labeled graph for the local market for Good X with a market equilibrium price of $5. Label the equilibrium price as $5, and label the equilibrium quantity for the market with a specific value based on the data provided in the table.

(b) Assume the cost of production increases, which causes the price of Good X to increase from $5 to $7.

(i) Calculate the price elasticity of demand for Good X as the price increases from $5 to $7. Show your work.
(ii) Identify whether the demand for Good X is elastic, inelastic, or unit elastic in that range of prices.

(c) Could Emily's marginal benefit for the second unit of Good X equal $4.50 ? Explain.

Question 3

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.

STOP

END OF EXAM

Solution 3

(a)

Mark scheme

- Graph, 2 points (1 point each): (1) A downward-sloping demand curve D and a perfectly elastic (horizontal) supply curve S at price $= \$5$, both correctly labeled. (2) The equilibrium quantity, read from the given demand data at $P = \$5$, labeled as $Q = 8$ units on the quantity axis at the S-D intersection.

Solution 3

(b)(i) Mark scheme

- $E_d = \left| \frac{\%\Delta Q_d}{\%\Delta P} \right| = \frac{\left| \frac{4-8}{8} \times 100 \right|}{\left| \frac{7-5}{5} \times 100 \right|} = \frac{50\%}{40\%} = 1.25$ (magnitude of the price elasticity of demand as price rises from $5 to 7$ and quantity falls from 8 to 4 units).

Solution 3

(b)(ii)

Mark scheme

- Elastic, since $|E_d| = 1.25 > 1$.

Solution 3

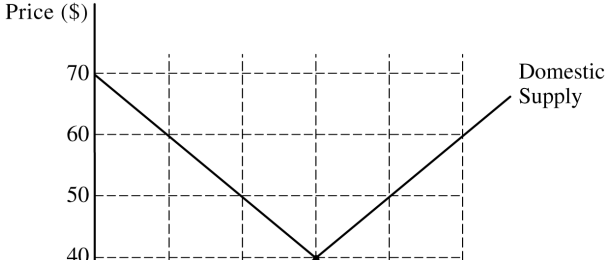
(c)

Mark scheme

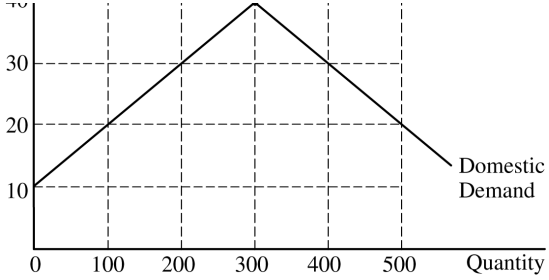
- No. Emily's marginal benefit for the second unit must be greater than or equal to the price she was willing to pay for it $(7) - -since she purchased it at 7$, her marginal benefit must be at least $7, so 4.50$ is inconsistent with that purchase.

Question 2

2022 Set 2 ▪ Q2



Question 2



2. The graph provided depicts New Zealand's domestic supply and demand for wool.

   (a) Calculate the consumer surplus if New Zealand does not trade with the rest of the world. Show your work.

   (b) Instead, assume New Zealand decides to trade wool in the world market. The current world price of wool is $60 per unit, and New Zealand is a price taker in the world market.

Question 2

(i) How many units of wool will New Zealand export?
(ii) What will happen to the consumer surplus of wool consumers in New Zealand when New Zealand begins to trade with the rest of the world? Explain.
(iii) Will total economic surplus in New Zealand increase, decrease, or remain unchanged when New Zealand begins to trade wool in the world market? Explain using numbers.

(c) Now assume domestic demand in New Zealand increases. Will New Zealand's exports increase, decrease, or stay the same?

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 2

(a)

Mark scheme

- Consumer Surplus $= \frac{1}{2} \times 300 \times (\$70 - \$40) = \frac{1}{2} \times 300 \times \$30 = \$9{,}000/2 = \$4{,}500$ (using the no-trade equilibrium quantity of 300 units and the choke price of \$70 minus the no-trade equilibrium price of \$40).

Solution 2

(b) Mark scheme

- (i) New Zealand will export 400 units of wool (the gap between quantity supplied and quantity demanded at the world price of \$60). (ii) Consumer surplus in New Zealand will decrease: the domestic price rises from \$40 to the world price of \$60, which decreases the domestic quantity demanded of wool — consumer surplus falls from \$4,500 before trade to \$500 after trade. (iii) Total economic surplus in New Zealand will increase by \$4,000: producer surplus increases by \$8,000 while consumer surplus decreases by \$4,000, and since the producer-surplus gain exceeds the consumer-surplus loss, total surplus rises by \$8,000 − \$4,000 = \$4,000.

Solution 2

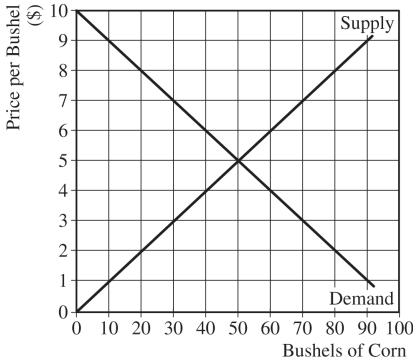
(c)

Mark scheme

- New Zealand's exports will decrease. When domestic demand increases, domestic quantity demanded at the world price rises while domestic quantity supplied is unchanged, shrinking the gap between quantity supplied and quantity demanded — i.e. the export quantity falls.

Question 3

2021 Set 1 ▪ Q3



Question 3

3. The diagram above shows the market for corn in the country of Microland. Corn is produced and sold in a constant-cost, perfectly competitive market.

   (a) Calculate the total revenue earned by corn farmers at the market equilibrium price. Show your work.

   (b) In an attempt to assist corn farmers in Microland, the government sets a $7 price floor on corn.

   (i) How many bushels of corn will be exchanged at the price floor?

   (ii) Calculate the deadweight loss associated with the price floor. Show your work.

   (iii) Assume the government agrees to buy the unsold quantity at $7. Calculate the producer surplus. Show your work.

   (iv) Assume the price floor and the government buying program remain in effect. In addition, assume the demand for corn does not change. In the long run, will the quantity of corn purchased by the government increase, decrease, or remain the same? Explain.

Question 3

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.

STOP

END OF EXAM

Solution 3

(a)

Mark scheme

- Total revenue at the market equilibrium price = \$250. Work: $TR = P \times Q = \$5 \times 50 = \$250$, using the market equilibrium price of \$5 and equilibrium quantity of 50 bushels.

Solution 3

(b)(i)

Mark scheme

- 30 bushels of corn will be exchanged at the $7 price floor. At a binding price floor, the quantity actually exchanged is the smaller of quantity supplied and quantity demanded; here quantity demanded at $7 is 30 bushels (less than the 70 bushels supplied at that price), so only 30 bushels are exchanged.

Solution 3

(b)(ii)

Mark scheme

- Deadweight loss = \$40. Work: $\text{DWL} = \dfrac{(\$7-\$3)\times(50-30)}{2} = \dfrac{\$80}{2} = \$40$, where \$7 is the price floor, \$3 is the price on the supply curve corresponding to the reduced quantity of 30 bushels, and 50 is the original equilibrium quantity — forming the deadweight-loss triangle between quantities 30 and 50.

Solution 3

(b)(iii)

Mark scheme

- Producer surplus = \$245. Work: $PS = \dfrac{(\$7-\$0)\times(70-0)}{2} = \dfrac{\$490}{2} = \$245$. Because the government buys all unsold corn at \$7, producers sell their entire quantity supplied (70 bushels) at \$7, and with the supply curve starting at price \$0 when Q = 0, producer surplus is the full triangle under \$7 across quantities 0 to 70.

Solution 3

(b)(iv)

Mark scheme

- The quantity of corn purchased by the government will increase. Explanation: the \$7 price floor gives typical corn farms short-run economic profits, which incentivizes new firms to enter the market; entry increases market supply (and/or makes market supply more elastic) in the long run, so at the fixed \$7 floor the quantity supplied keeps rising while quantity demanded is unchanged — meaning the unsold surplus the government must buy grows over time.

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 $6 \neq 1$). 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: $(1/4.5)$ / $(-3/4.5) \approx -0.33$.) 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 $\approx$ 2.2–2.5 (either the midpoint or point method earns the point). Midpoint formula: $\%\Delta Q = (1500-1000)/1250 = 0.4 = 40\%$; $\%\Delta P = (1.20-1.00)/1.10 \approx 0.182 = 18.2\%$; $E = 40\%/18.2\% \approx 2.2$. (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 ($\approx$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.)