S4 Economics Practice Paper I Price elasticity, market equilibrium, per-unit tax, price controls, costs of production, market structure and efficiency

S4 Economics I Time allowed: 75 minutes I Total: 100 marks I 24 questions

Part A Price elasticity of demand and total revenue

Question 1 (16 marks)

1. The price of a good falls from HKD 20 to HKD 16 and quantity demanded rises from 1,000 to 1,300 units. Using the percentage method, calculate the price elasticity of demand and state whether demand is elastic, unit elastic or inelastic. (4 marks)

> **Answer:** Change in quantity = (1,300 - 1,000) / 1,000 x 100 = 30.0%; change in price = (16 - 20) / 20 x 100 = -20.0%; elasticity = 30.0 / 20.0 = 1.5, greater than 1, so demand is elastic.

2. Calculate total revenue before and after the price cut, and find the percentage change in total revenue. (4 marks)

> **Answer:** Original revenue = 20 x 1,000 = HKD 20,000; new revenue = 16 x 1,300 = HKD 20,800; the change is HKD 800, or 4.0%. With elastic demand, a price cut raises revenue because quantity rises faster than price falls.

3. The price of related good Y rises 10% and the quantity demanded of this good falls 8%. Find the cross price elasticity and state the relationship between the two goods. (4 marks)

> **Answer:** Cross elasticity = -8% / 10% = -0.8. The negative sign means demand for this good falls when the price of Y rises, so the goods are complements, such as a printer and its ink cartridge.

4. A consumer income rises 25% and quantity demanded of a good rises 10%. Find the income elasticity and classify the good. (4 marks)

> **Answer:** Income elasticity = 10% / 25% = 0.4. It is positive but below 1, so the good is a normal necessity whose demand rises only slightly with income.

Part B Market equilibrium and a per-unit tax

Question 2 (16 marks)

5. In a market, quantity demanded is Qd = 1,400 - 50P and quantity supplied is Qs = 200 + 50P (Q in units, P in dollars). Find the equilibrium price and quantity. (4 marks)

> **Answer:** Set Qd = Qs: 1,400 - 50P = 200 + 50P, so 100P = 1,200 and P = 12.0. Substituting gives Q = 1,400 - 50 x 12 = 800 units.

6. If demand becomes Qd = 1,600 - 50P while supply is unchanged, find the new equilibrium price and quantity and explain the change in quantity. (4 marks)

> **Answer:** 1,600 - 50P = 200 + 50P gives P = 14.0 and Q = 900 units. Higher demand shifts the demand curve right; the higher price both induces extra output and rations out marginal buyers, so quantity rises

> from 800 to 900 units.

7. The government imposes a per-unit tax of HKD 6 on sellers and demand returns to Qd = 1,400 - 50P. Find the price paid by consumers, the net price received by producers and the quantity traded. (4 marks)

> **Answer:** Supply becomes Qs = 200 + 50(P - 6). Setting 1,400 - 50P = 200 + 50P - 300 gives P = 15.0 and Q = 650 units, with producers receiving 15.0 - 6 = 9.0. The tax shifts supply up and cuts quantity from 800 to 650 units.

8. Find the total tax revenue and the tax burden per unit borne by consumers and by producers. (4 marks)

> **Answer:** Tax revenue = 6 x 650 = HKD 3,900. Consumers pay 15.0 instead of 12.0, bearing 3.0, while producers receive 9.0 instead of 12.0, also bearing 3.0. Because the two curves have equal absolute slopes, the burden is shared equally whatever the statutory taxpayer.

Part C Price ceiling, price floor and quota

Question 3 (17 marks)

9. Using Qd = 1,400 - 50P and Qs = 200 + 50P, the government sets a price ceiling of HKD 10. Find quantity demanded, quantity supplied and the shortage. (4 marks)

> **Answer:** The ceiling of 10 is below the equilibrium price of 12.0, so it binds. Qd = 1,400 - 500 = 900 units and Qs = 200 + 500 = 700 units, leaving a shortage of 200 units.

10. If a price floor of HKD 16 is imposed instead, find the surplus and the government purchase cost. (4 marks)

> **Answer:** Qd = 600 units and Qs = 1,000 units, so 400 units are unsold; buying the surplus at 16 costs HKD 6,400.

11. If an import quota limits quantity to 600 units with local supply unchanged, find the price consumers are willing to pay, the lowest price local producers accept and the quota rent. (4 marks)

> **Answer:** Consumers pay the price that clears 600 units: 1,400 - 50P = 600 gives P = 16.0. Local producers accept 600 = 200 + 50P, so P = 8.0. The quota rent is (16.0 - 8.0) x 600 = HKD 4,800, captured by quota holders.

12. Compare the efficiency effects of a price ceiling, a price floor and a quota, and give one non-price rationing or administrative cost for each. (5 marks)

> **Answer:** All three move quantity away from the equilibrium 800 units and create deadweight loss. A ceiling cuts quantity to 700 units and brings queues, first-come-first-served rationing or black markets plus quality erosion. A floor cuts quantity to 600 units and requires buying up or destroying the surplus at a cost of HKD 6,400. A quota caps quantity at 600 units and needs licensing or auctioning, generating HKD 4,800 of quota rent. The further the intervention is from equilibrium, the larger the deadweight loss.

Part D Short-run costs and economies of scale

Question 4 (17 marks)

13. A firm has total cost TC = 500 + 20Q + 0.5Q^2 in dollars. Find total cost, average cost and marginal cost at Q = 20. (4 marks)

> **Answer:** TC = 500 + 400 + 200 = 1,100; AC = 1,100 / 20 = 55.0; MC = 20 + Q = 40.0. Since MC is below AC, average cost is falling.

14. Find average cost at Q = 40, the percentage fall in average cost from Q = 20 to Q = 40, and state whether economies of scale exist. (4 marks)

> **Answer:** TC = 500 + 800 + 800 = 2,100 and AC = 2,100 / 40 = 52.5. The fall is (55.0 - 52.5) / 55.0 x 100 = 4.55%, so average cost falls as output expands: economies of scale exist. However MC has risen to 60.0, above AC, so average cost has already started to rise again.

15. Find the output at which average cost is minimised and that minimum average cost, to two decimal places. (4 marks)

> **Answer:** AC = 500/Q + 20 + 0.5Q is minimised where MC = AC: 20 + Q = 500/Q + 20 + 0.5Q, so Q^2 = 1,000 and Q = 31.62 units. Then AC = 500 / 31.62 + 20 + 15.81 = 51.62. This output is the minimum efficient scale.

16. A firm hires 0 to 5 workers with total product 0, 10, 26, 45, 58 and 66 units. Find the marginal product of the first to fifth worker, state when diminishing marginal returns begin and explain why. (5 marks)

> **Answer:** Marginal products are 10, 16, 19, 13 and 8 units. Diminishing marginal returns begin with the fourth worker, whose marginal product falls from 19 to 13. The fixed factors of production, such as plant and machinery, do not change, so each extra worker has less capital to work with and may also obstruct the workflow, reducing the addition to output. Average product peaks at the third worker with 15.00 units.

Part E Monopoly pricing and market concentration

Question 5 (17 marks)

17. A monopolist faces demand P = 140 - 2Q with total cost TC = 200 + 20Q + 2Q^2. Find the profit-maximising output, price and profit. (4 marks)

> **Answer:** TR = 140Q - 2Q^2 so MR = 140 - 4Q, and MC = 20 + 4Q. Setting MR = MC gives 140 - 4Q = 20 + 4Q, hence Q = 15, P = 110.0, TR = 1,650, TC = 950 and profit = 700.0.

18. Explain why demand is elastic at the profit-maximising output and why a monopolist never produces where demand is inelastic. (4 marks)

> **Answer:** MR = P(1 - 1/|Ed|). Since MR = MC > 0, we need 1 - 1/|Ed| > 0, so |Ed| > 1 and demand is elastic. In the inelastic range, cutting output would raise total revenue and lower cost, so profit would rise; the profit-maximising point therefore cannot lie there.

19. If the government regulates the price at marginal cost, find the price, output and resulting profit. (4 marks)

> **Answer:** Setting P = MC: 140 - 2Q = 20 + 4Q gives Q = 20 and P = 100.0. TR = 2,000 and TC = 200 + 400 + 800 = 1,400, so profit is 600.0. Output rises and price falls, raising consumer surplus but cutting the firm profit.

20. Five firms in an industry hold market shares of 40%, 25%, 15%, 10% and 10%. Compute the market concentration index as the sum of squared shares and compare pricing and efficiency with a perfectly competitive market. (5 marks)

> **Answer:** The index is 40^2 + 25^2 + 15^2 + 10^2 + 10^2 = 1,600 + 625 + 225 + 100 + 100 = 2,650, which indicates high concentration. A perfectly competitive market has many firms, a homogeneous product and free entry, so price equals minimum average cost in the long run and output is efficient. Here few firms hold market power, price exceeds marginal cost, output is below the efficient level and deadweight loss arises, with the risk of collusion and entry barriers.

Part F Consumer surplus and socially optimal output

Question 6 (17 marks)

21. Using Qd = 1,400 - 50P and Qs = 200 + 50P, find consumer surplus, producer surplus and total surplus at equilibrium. (4 marks)

> **Answer:** Inverse demand is P = 28 - Q/50 and inverse supply is P = Q/50 - 4. Consumer surplus = (28 - 12) x 800 / 2 = 6,400; producer surplus = (12 + 4) x 800 / 2 = 6,400; total surplus = 12,800.

22. After the HKD 6 per-unit tax, find the new consumer surplus, producer surplus and government tax revenue. (4 marks)

> **Answer:** Quantity traded is 650 units, consumers pay 15.0 and producers receive 9.0. Consumer surplus = (28 - 15) x 650 / 2 = 4,225; producer surplus = (9 + 4) x 650 / 2 = 4,225; tax revenue = 6 x 650 = 3,900.

23. Find total surplus after the tax and the deadweight loss, and explain its source. (4 marks)

> **Answer:** Total surplus is 4,225 + 4,225 + 3,900 = 12,350, so the deadweight loss is 12,800 - 12,350 = 450.0. The loss comes from the units between 650 and 800: buyers value them above their cost of production, but the tax prevents mutually beneficial trades.

24. Each unit produced imposes HKD 2 of external cost, so marginal social cost equals marginal private cost plus 2. Find the socially optimal output, compare it with the market equilibrium and name a suitable policy tool. (5 marks)

> **Answer:** Inverse supply is P = Q/50 - 4, so MSC = Q/50 - 2. Setting P = MSC: 28 - Q/50 = Q/50 - 2 gives Q = 750 units, below the market equilibrium of 800, so the market over-produces 50 units. A Pigouvian tax of 2 per unit would equate private and social cost and cut output to 750 units.