S5 Economics Practice Paper: Price Elasticity and Total Revenue, Price Ceiling and Shortage, Costs and Economies of Scale, Monopoly Profit Maximisation, Real GDP Growth, Unit Tax and Subsidy

S5 | Economics | Time: 75 minutes | Total: 100 marks | 24 questions

Section A: Price elasticity and total revenue

Answer all parts and show your working.

1. A good's price falls from $20 to $18 and quantity demanded rises from 100 to 120 units. Using the initial-value method, calculate the price elasticity of demand (PED) and state whether demand is elastic or inelastic.
Answer: %dQ = (120 - 100) / 100 x 100% = 20%; %dP = (18 - 20) / 20 x 100% = -10%; PED = 20 / (-10) = -2. The absolute value 2 is greater than 1, so demand is elastic.

2. Using the same figures, calculate total revenue (TR) before and after the price cut, and explain the change in TR using the elasticity value.
Answer: TR before = $20 x 100 = $2000; TR after = $18 x 120 = $2160; change = +$160 (an increase of 8%). Since |PED| = 2 > 1, the percentage fall in price (10%) is smaller than the percentage rise in quantity (20%), so TR rises.

3. For another good, price rises by 10% and quantity demanded falls by 4%. Find its PED, state the elasticity, and calculate the percentage change in total revenue.
Answer: PED = (-4%) / 10% = -0.4. The absolute value 0.4 is less than 1, so demand is inelastic. Change in TR = (1 + 0.1) x (1 + -0.04) - 1 = 0.056, i.e. TR rises by 5.6%.

4. Explain why demand is usually more elastic in the high-price range of a straight-line demand curve, and state the implication for a firm's pricing.
Answer: In the high-price range the quantity is small, so a given absolute price change is a large percentage change in price while the same absolute quantity change is a small percentage change in quantity; consumers also spend a larger share of income and can more easily switch to substitutes. Implication: cutting price raises revenue where demand is elastic, while large price cuts are less effective where demand is inelastic.

Section B: Price ceiling and shortage

In a market, demand is Qd = 120 - 2P and supply is Qs = 20 + 2P (quantity in thousand units, price in dollars).

5. Find the equilibrium price and quantity.
Answer: Set Qd = Qs: 120 - 2P = 20 + 2P, so 100 = 4P and P = $25; then Q = 120 - 2 x 25 = 70 thousand units.

6. If the government sets a price ceiling of $20, find quantity demanded, quantity supplied and the size of the shortage.
Answer: Qd = 120 - 2 x 20 = 80 thousand units; Qs = 20 + 2 x 20 = 60 thousand units; shortage = 80 - 60 = 20 thousand units.

7. Under the ceiling, what quantity is actually traded and what is consumers' total spending?

Answer: The quantity traded is limited by supply, so it equals Qs = 60 thousand units. Total consumer spending = $20 x 60 = $1200 thousand dollars, i.e. $1.2 million.

8. State two forms of non-price competition that a price ceiling may cause, and explain its efficiency (deadweight loss) effect.
Answer: Examples of non-price competition: queuing, rationing or first-come-first-served, sellers allocating by tie-in conditions or extra requirements, and black-market trading. On efficiency: the quantity traded is below the equilibrium quantity, buyers willing to pay more than the ceiling go unserved, and the loss of consumer and producer surplus is a deadweight loss.

Section C: Costs, average cost and economies of scale

A firm's total cost function is TC = 500 + 20Q + 0.5Q^2 (in dollars).

9. State the fixed cost, and calculate total cost and average cost at Q = 20.
Answer: Fixed cost = $500 (the part that does not vary with output). TC = 500 + 20 x 20 + 0.5 x 400 = $1100; AC = 1100 / 20 = $55.

10. Calculate average cost at Q = 40 and use the two average cost figures to explain economies of scale.
Answer: TC(40) = 500 + 20 x 40 + 0.5 x 1600 = $2100; AC = 2100 / 40 = $52.5. AC falls from $55 to $52.5 as output rises, which is economies of scale: fixed cost is spread over more units and variable cost grows more slowly than output.

11. Derive the marginal cost (MC) function and calculate MC at Q = 20 and Q = 40.
Answer: MC = dTC/dQ = 20 + 1.0Q = 20 + Q. At Q = 20, MC = 20 + 20 = $40; at Q = 40, MC = 20 + 40 = $60.

12. If the market price is $55, should the firm expand output at Q = 20? Explain with marginal analysis.
Answer: Yes. P = $55 exceeds MC at Q = 20 ($40): each extra unit adds $55 of revenue but only $40 of cost, a net gain of $15. The firm should expand until MC rises to equal P, the profit-maximising condition for a price taker.

Section D: Profit maximisation of a monopolist

A monopolist faces demand P = 100 - 2Q and has total cost TC = 20Q + 100 (in dollars).

13. Derive the total revenue (TR) and marginal revenue (MR) functions.
Answer: TR = P x Q = (100 - 2Q)Q = 100Q - 2Q^2; MR = dTR/dQ = 100 - 4Q.

14. Find the profit-maximising output and price, stating the condition used.
Answer: Profit is maximised where MR = MC, and MC = dTC/dQ = 20. Setting 100 - 4Q = 20 gives Q = 20; substituting into demand, P = 100 - 2 x 20 = $60.

15. Calculate total profit at that output.
Answer: TR = $60 x 20 = $1200; TC = 20 x 20 + 100 = $500; profit = $1200 - $500 = $700.

16. If the market were perfectly competitive (pricing at P = MC), find output and the deadweight loss relative to the monopoly outcome.
Answer: P = MC gives 100 - 2Q = 20, so Q = 40. Deadweight loss = 0.5 x (monopoly price - MC) x (competitive output - monopoly output) = 0.5 x (60 - 20) x (40 - 20) = $400.

Section E: Nominal and real GDP

An economy's nominal GDP was 2,800 billion dollars in 2023 and 3,024 billion in 2024; the GDP deflator was 100 in 2023 and 105 in 2024; population in 2024 was 7.2 million.

17. Calculate real GDP for 2024 (base year 2023).
Answer: Real GDP = nominal GDP / (deflator / 100) = 3,024 / 1.05 = 2880 billion dollars.

18. Calculate the real GDP growth rate from 2023 to 2024 (to two decimal places).
Answer: Real growth rate = (2880 / 2,800 - 1) x 100% = 2.86%.

19. Calculate real GDP per capita in 2024.
Answer: Real GDP per capita = 2880 billion / 7.2 million = 2880 x 10^9 / 7.2 x 10^6 = $400000.

20. Calculate the nominal GDP growth rate and explain why it differs from the real growth rate.
Answer: Nominal growth = (3,024 / 2,800 - 1) x 100% = 8%. The gap of 5.14 percentage points comes from the 5% rise in the deflator (100 to 105): nominal GDP reflects both price and output changes, whereas real GDP removes the price effect, so only the real rate measures the increase in actual output.

Section F: Unit tax and subsidy

In a market, demand is Qd = 200 - 5P and supply is Qs = 10 + 5P (quantity in thousand units, price in dollars).

21. Find the equilibrium price and quantity before any tax.
Answer: 200 - 5P = 10 + 5P, so 190 = 10P and P = $19; Q = 200 - 5 x 19 = 105 thousand units.

22. The government imposes a unit tax of $4 per unit on sellers. Find the new market price and quantity traded.
Answer: Sellers receive P - 4, so supply becomes Qs = 10 + 5(P - 4) = -10 + 5P. Equating with demand: 200 - 5P = -10 + 5P, giving P = $21 and Q = 200 - 5 x 21 = 95 thousand units.

23. Calculate the per-unit tax burden borne by consumers and by producers, and the government's tax revenue.
Answer: Consumer burden = $21 - $19 = $2; producer burden = $19 - ($21 - $4) = $2; the two add to $4, equal to the tax. Tax revenue = $4 x 95 thousand units = $380 thousand dollars.

24. Suppose instead the government pays sellers a unit subsidy of $3. Find the new market price, quantity traded and the government's subsidy outlay.
Answer: Sellers receive P + 3, so supply becomes Qs = 10 + 5(P + 3) = 25 + 5P. Equating with demand: 200 - 5P = 25 + 5P, giving P = $17.5, Q = 200 - 5 x 17.5 = 112.5 thousand units, and subsidy outlay = $3 x 112.5 = $337.5 thousand dollars.

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