3.3 Elasticity and the revenue test

Name: _____ Class: _____ Date: _____ **Total: 20 marks**

KEY WORDS price elasticity of demand • income elasticity • cross elasticity

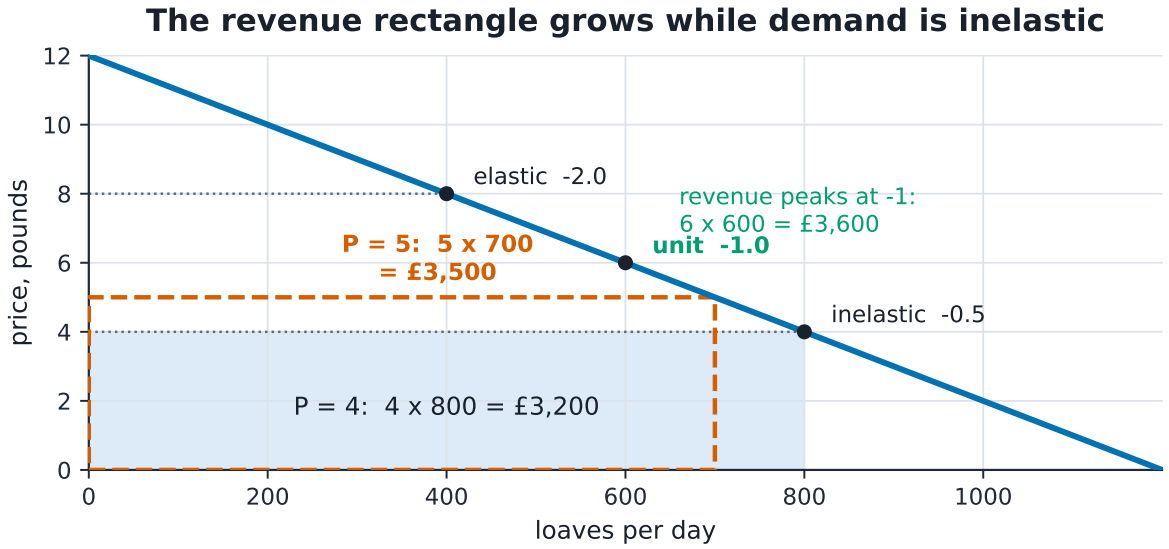
Objective

Compute point elasticities on a linear demand; run the revenue test both directions; classify goods by income and cross elasticity; give priced advice at a boundary.

1 Key knowledge and worked examples

■ The percentage ruler

The **price elasticity of demand** is $\varepsilon = \frac{\%\Delta Q}{\%\Delta P}$; on $Q = a - bP$ it is $-bP/Q$ – a property of points, not curves. Revenue $P \times Q$ grows with price while demand is inelastic ($|\varepsilon| < 1$), peaks at -1, shrinks when elastic.



Inelastic demand: the revenue rectangle grows as the price rises

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■ **Worked example. The loaf, twice**

At £4: $\varepsilon = -100\times4/800 = -0.5$; revenue $4\times800 =$ £3,200 ✓. At £5: $-100\times5/700 = -0.71$; revenue £3,500 ✓ – the rectangle grew. Push to £8: $\varepsilon = -2.0$, revenue back to $8 \times 400 =$ £3,200 ✓ – elastic, and shrinking.

2 Practice

The bread demand is $Q_d = 1200 - 100P$ unless a question says otherwise.

2.1 Compute the point elasticity at £3, at £6 and at £9, and classify each as elastic, unit or inelastic. [4]

2.2 The price moves £4 → £5: compute revenue at both prices. Then £6 → £7: compute revenue at both. Explain the contrast in one line. [4]

2.3 City incomes rise 8% and the quantity of artisan bread bought rises from 800 to 880. Compute the income elasticity and classify the good. [3]

2.4 When the loaf price moves £4 → £5, croissant sales move 200 → 160; when the SAME move happens, sandwich-roll sales move 200 → 240. Using midpoints, compute both cross elasticities and classify each relationship. [4]

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2.5 Nimbus currently charges £5 (quantity 700). Compute the elasticity there, and state – with the number – the revenue-maximising price and quantity on this demand. [3]

2.6 A rival baker says: "Our slope is −100, so we are less elastic than the coffee carts at −50." Correct the confusion in two lines. [2]

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Solutions

2.1

- At £3: $-100 \times 3/900 =$ **−0.33 (inelastic)**.
- At £6: $-100 \times 6/600 =$ **−1.00 (unit)**.
- At £9: $-100 \times 9/300 =$ **−3.00 (elastic)**.
- Elasticity steepens as you climb the curve.

2.2

- £4 → £5: 3,200 → 3,500 – rose (inelastic step).
- £6 → £7: 3,600 → 3,500 – fell (elastic step).
- Crossing the unit point at £6 flips the revenue test's answer.
- The two steps straddle the peak, which is the whole lesson.

2.3

- $\%\Delta Q = 80/800 = 10\%$.
- Elasticity $= 10/8 =$ **1.25**.
- Positive (a normal good) and above 1: a **luxury** by budget share.

2.4

- Croissants: $(-40/180) \div (1/4.5) =$ **−1.0 – complements**.
- Rolls: $(+40/220) \div (1/4.5) = +0.82$ – **substitutes**.
- The sign does the classification.
- Size adds strength: −1.0 is a strong complement, +0.82 a moderate substitute.

2.5

- At £5: $\varepsilon = -100 \times 5/700 =$ **−0.71**.
- Revenue peaks where $\varepsilon = -1$: $P =$ **£6**, $Q = 600$.
- Revenue there is £3,600 – one more pound is affordable, one more is not.

2.6

- Elasticity is a percentage ratio, not a slope: it depends on P/Q as well as b.
- A flat-seeming slope at a high price can be more elastic than a steeper slope at a low one – compare points, not slopes.

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