

Price elasticity of demand (PED)

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Read first: [Demand](#), [Price changes](#)

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What you need to know

By the end of this topic you should be able to:

1. **Define price elasticity of demand (PED)**: how strongly the quantity demanded of a product responds to a change in **its own price**.
2. **Calculate PED** with the formula, say what the answer means (elastic, inelastic, unitary, perfectly elastic or perfectly inelastic), and **draw and read demand curves** that show different PEDs.
3. **Explain the determinants of PED**: the main things that decide whether demand for a product is elastic or inelastic.
4. **Link PED to total spending (revenue)**: say what happens to consumers' spending, which is the firm's revenue, when the price changes, both with a diagram and with a calculation.
5. **Explain why PED matters** for decisions by consumers, producers (firms) and the government.

The whole topic is the same for every candidate (0455 has no Core/Extended split). It builds on the Demand note: PED measures how far along the demand curve buyers move when the price changes.

Understand it

What PED measures

When the price of a product rises, people buy less of it (the law of demand). PED tells you **how much** less. For some products a price rise hardly changes the amount bought (salt, electricity); for others it makes buyers switch away in large numbers (one brand of chocolate, one airline's flights).

Because different products are measured in different units (litres, tickets, kilograms), PED compares **percentage** changes, not the raw numbers:

$$\text{PED} = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in price}}$$

A percentage change is always worked out from the **starting** value:

$$\text{percentage change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100$$

For example, the price of a meal rises from \$5 to \$6 and the number sold each week falls from 1000 to 700.

- Price: $\frac{6-5}{5} \times 100 = +20\%$.
- Quantity demanded: $\frac{700-1000}{1000} \times 100 = -30\%$.
- PED = $\frac{-30}{+20} = -1.5$.

Reading the answer

Price and quantity demanded move in **opposite** directions, so PED is negative. Exam questions write it either way ("−2.0" or "2.0"). To decide whether demand is elastic, **ignore the minus sign** and look at the size of the number:

PED (ignoring the sign)	Name	What it means
more than 1	elastic	quantity demanded changes by a bigger percentage than price
less than 1 (but above 0)	inelastic	quantity demanded changes by a smaller percentage than price
exactly 1	unitary (unit elastic)	quantity demanded changes by the same percentage as price
0	perfectly inelastic	quantity demanded does not change at all
infinity	perfectly elastic	any price rise makes quantity demanded fall to zero

So −1.5 is elastic, −0.2 is inelastic, and −2.0 is **elastic** (the minus sign does not make it inelastic).

Using the formula backwards

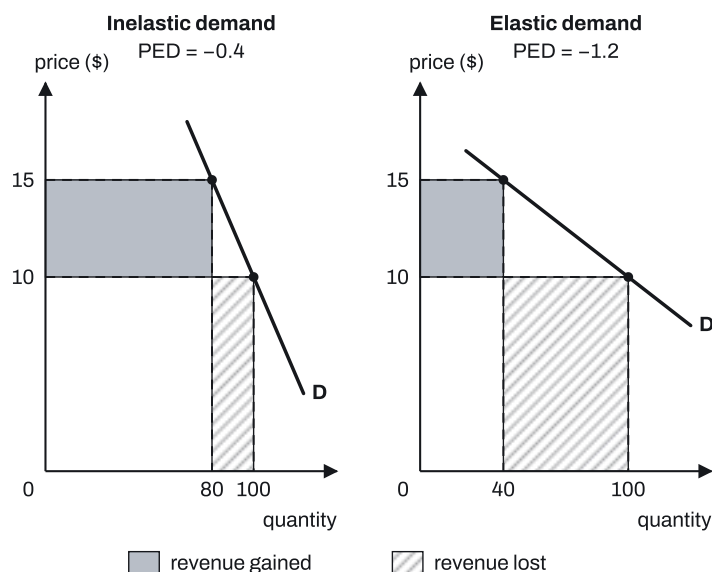
Rearranging the formula answers two other kinds of question:

$$\% \text{ change in quantity demanded} = \text{PED} \times \% \text{ change in price}, \quad \% \text{ change in price} = \frac{\% \text{ change in quantity demanded}}{\text{PED}}$$

- PED is −0.8 and the price rises by 5%: quantity demanded changes by $-0.8 \times 5 = -4\%$, a fall of 4%.
- PED is −0.5 and the government wants a 10% fall in consumption: the price must rise by $\frac{-10}{-0.5} = 20\%$.

PED on a diagram

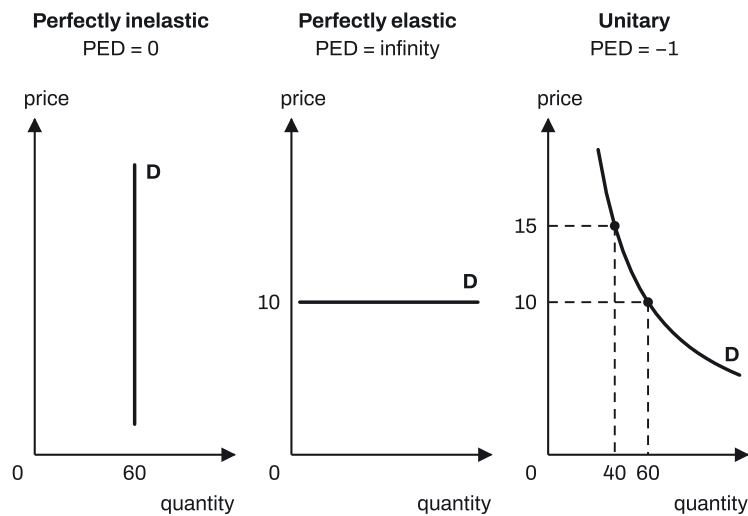
On diagrams drawn to the same scale, a **steep** demand curve shows **inelastic** demand (a big price change, a small change in quantity), and a **flat** demand curve shows **elastic** demand (a big change in quantity).



In both diagrams the price rises by 50%, from \$10 to \$15.

- **Left (inelastic):** quantity demanded falls from 100 to 80, which is -20% , so $\text{PED} = \frac{-20}{50} = -0.4$.
- **Right (elastic):** quantity demanded falls from 100 to 40, which is -60% , so $\text{PED} = \frac{-60}{50} = -1.2$.

Three special cases have their own shapes:



- **Perfectly inelastic** (PED = 0): a **vertical** line. Buyers take the same quantity at any price.
- **Perfectly elastic** (PED infinite): a **horizontal** line. Buyers pay this price and not a cent more; above it they buy nothing.
- **Unitary** (PED = -1): a curve that bends towards the axes, on which price $\times$ quantity is the same at every point, so spending never changes.

PED and total spending (revenue)

What consumers spend on a product is what the firms selling it receive:

$$\text{total spending (total revenue)} = \text{price} \times \text{quantity sold}$$

A price change pulls revenue two ways: each unit sold earns more (or less), but fewer (or more) units are sold. PED says which pull is stronger. In the first diagram, the grey area is the revenue **gained** from charging \$5 more on the units still sold, and the hatched area is the revenue **lost** on the units no longer sold.

- **Inelastic** (left): revenue rises from $10 \times 100 = 1000$ dollars to $15 \times 80 = 1200$ dollars. The gain is bigger than the loss.
- **Elastic** (right): revenue falls from 1000 dollars to $15 \times 40 = 600$ dollars. The loss is bigger than the gain.

This gives the rule to learn:

Demand is	Price rises	Price falls
elastic (PED more than 1)	revenue falls	revenue rises
inelastic (PED less than 1)	revenue rises	revenue falls
unitary (PED = 1)	revenue unchanged	revenue unchanged
perfectly inelastic (PED = 0)	revenue rises by the same % as the price	revenue falls by the same % as the price

Short version: with **inelastic** demand, price and revenue move in the **same** direction; with **elastic** demand they move in **opposite** directions. The rule also works backwards: if a price cut **lowers** revenue, demand must be inelastic; if revenue stays the same, PED is 1.

What makes demand elastic or inelastic

Determinant	More elastic when...	More inelastic when...
Substitutes (the most important)	there are many close substitutes, so buyers can switch	there are few or no close substitutes (salt, petrol, tap water)

Determinant	More elastic when...	More inelastic when...
Necessity or luxury	it is a luxury or a want that people can do without	it is a necessity that people must buy
Share of income	it takes a large share of income (cars, holidays)	it takes a small share of income (matches, salt), so a price rise is hardly noticed
Time	buyers have longer to find alternatives or change habits	the period is short, so buyers cannot adjust yet
Habit or addiction	it is bought by choice	it is habit-forming or addictive (cigarettes, sugary food), or buyers are loyal to a brand built up by advertising
How widely it is defined	it is one brand (one make of trainers), with other brands to switch to	it is the whole product (all footwear), with nothing similar to switch to
Can the purchase wait?	it can be put off (a new sofa when the old one still works)	it cannot be put off (medicine when ill, school shoes that have worn out)

The "brand versus product" idea explains a common exam twist: the demand for vehicle fuel as a whole is inelastic, but the demand for **one** brand is elastic, because drivers can fill up at a rival brand. If one brand raises its price, its revenue falls and rival brands gain customers and revenue.

Why PED matters

For producers (firms):

- **Pricing.** A firm whose demand is inelastic can raise its price and earn more revenue; a firm whose demand is elastic can cut its price and earn more revenue (selling many more units). Raising the price of a product with elastic demand loses revenue.
- **Passing on costs.** If costs rise, a firm with inelastic demand can pass them on to buyers as higher prices without losing many sales; a firm with elastic demand cannot.
- **Different prices in different markets.** A firm can charge more where demand is inelastic (peak-time rail fares, business travellers) and less where it is elastic (off-peak fares, students).
- **Planning.** Products with inelastic demand have more stable sales and revenue, which makes planning easier. Firms try to make demand less elastic, for example by advertising to build brand loyalty.

For consumers: when a necessity with inelastic demand gets dearer (food staples, fuel, medicine), people keep buying it, so they spend more on it and have less for everything else. Poorer households, who spend a larger share of income on necessities, are hit hardest. When demand is elastic, consumers can protect themselves by switching to substitutes.

For the government:

- **Tax revenue.** Taxing products with inelastic demand (tobacco, alcohol, petrol) raises a lot of revenue, because sales fall only a little.
- **Changing behaviour.** A tax on a demerit good with inelastic demand cuts consumption only a little, so the price rise must be large to have much effect. If demand is elastic, a tax cuts consumption a lot but raises less revenue, and consumers spend less on the good in total.
- **Subsidies.** A subsidy that lowers the price of a merit good raises consumption a lot only if demand is elastic.
- **Fairness.** Taxes on necessities with inelastic demand take a bigger share of poor people's income.

Key facts and formulas

This topic has no formula list in the exam. "Learn it" means you must remember it.

Formula	Status
$PED = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$	Learn it
$\% \text{ change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100$	Learn it
$\% \text{ change in quantity demanded} = PED \times \% \text{ change in price}$	Learn it
$\% \text{ change in price} = \frac{\% \text{ change in quantity demanded}}{PED}$	Learn it
PED is negative; ignore the sign when judging: more than 1 elastic, less than 1 inelastic, 1 unitary, 0 perfectly inelastic, infinite perfectly elastic	Learn it
Total revenue (total spending) = price $\times$ quantity sold	Learn it
Inelastic: price and revenue move the same way. Elastic: opposite ways. Unitary: revenue unchanged	Learn it
Vertical demand curve: PED = 0. Horizontal: PED infinite. Steeper (same scale): more inelastic	Learn it
Determinants: substitutes, necessity or luxury, share of income, time, habit or addiction, how widely defined, whether the purchase can wait	Learn it

How to do it

In the questions we have tagged for this topic (34 questions, 2021–2025), the parts about this topic are these. Each question has one part on this topic (the 20-mark Paper 2 questions have their other parts on other topics), so the counts add to 34.

Question type	Question parts
Multiple choice (concept)	16
Multiple choice (calculation)	11
Analyse (6 marks)	4
Explain (4 marks)	2
Discuss (8 marks)	1

No Define (2) part on this topic has been tagged; section 2 ends with a model definition in case one is set.

1. Multiple choice (concept) (16 question parts)

1. **Find what the question is really asking about:** the revenue rule, the meaning of a PED value, a determinant, or a diagram.
2. **Apply the matching rule** from this note before reading the options.
3. **Check the wording of each option:** "demand" versus "quantity demanded", "price elasticity of demand" versus "of supply".

Variations you will meet:

- **PED and revenue** (9 parts). Use the revenue table. Price rises and revenue rises $\rightarrow$ demand was inelastic (PED between 0 and 1). Revenue unchanged after a price cut $\rightarrow$ PED is 1. PED = -1 and the price rises $\rightarrow$ quantity demanded falls and revenue stays the same. To get the **biggest** rise in revenue from a price increase, pick PED = 0 (revenue rises by the full percentage of the price rise). An indirect tax on a product with elastic demand $\rightarrow$ quantity **and** total spending both fall. The

significance of PED to a firm is that it predicts what a price change will do to its **revenue**. One brand of a product with inelastic total demand: that brand's demand is elastic, so raising its price loses it revenue and **other brands'** revenue rises. If a price rise increases revenue while seats or stock were left unsold, the seller was working **below full capacity**.

- **The meaning of a PED value, and the definition** (3 parts). PED is the percentage change in quantity demanded divided by the percentage change in price (not the other way round, and not about income or other goods' prices). A value of -2.0 means elastic.
- **Determinants** (2 parts). The degree of necessity and the closeness of substitutes are determinants; a close substitute is the most likely cause of PED above 1. Income changes, stocks and monopoly are distractors.
- **Diagrams** (2 parts). Perfectly elastic demand is the **horizontal** line; perfectly inelastic is the vertical line. A curve that is merely flat-ish is "elastic", not "perfectly elastic".

2. Multiple choice (calculation) (11 question parts)

1. **Write down what you know:** the PED, the % change in price, the % change in quantity, or the old and new values.
2. **Turn raw numbers into percentage changes** from the **old** value.
3. **Use the formula the right way round:** quantity on top, price underneath.
4. **Sense-check the direction:** a price rise must lead to a fall in quantity demanded.

Variations you will meet:

- **Find the change in quantity demanded** (5 parts). Multiply: $\text{PED} \times \% \text{ change in price}$. With PED -1.7 and a 5% price cut, quantity demanded rises by 8.5%. If you are asked for the **new quantity**, apply the % change to the old quantity: a price that doubles (+100%) with PED -0.2 cuts quantity by 20%, so 100 million becomes 80 million. When comparing options, work out each option's quantity change and pick the largest.
- **Calculate PED from data** (3 parts), from figures in the stem or read off a demand-curve diagram. Work out both % changes, divide, and compare with 1. For example, a price rise from \$4 to \$5 (+25%) with quantity falling from 50 to 30 (-40%) gives $\text{PED} = -1.6$, elastic.
- **Which price fall is inelastic, from a table** (2 parts). Work out total revenue (price $\times$ quantity) at each price. Demand is inelastic where a price **fall** makes revenue **fall**. This is quicker than calculating every PED.
- **Find the price change needed** (1 part). Divide: $\% \text{ change in price} = \% \text{ change in quantity} \div \text{PED}$. Inverting this (multiplying instead) is the usual wrong answer.

3. Analyse (6 marks) (4 question parts)

1 mark for each relevant point or developed step in a chain, up to 6. A list of points with no links usually caps the answer at 3 or 4. The four set so far are:

a) Analyse the influences on (or reasons for) the PED of a product (2 parts, for example shoes; one brand of luxury chocolate compared with salt).

1. Take a determinant and **apply it to the product**: "Shoes have substitutes such as sandals and boots (1)".
2. Say which way it pushes PED: "which may make demand price-elastic (1)".
3. Explain why: "because a rise in the price of shoes would make buyers switch to the other types of footwear (1)".
4. Repeat with two more determinants, including one that pushes the **other** way (a necessity, a small share of income, cannot delay the purchase).
5. For a comparison question, state each determinant for **both** products ("one brand of chocolate has other brands to switch to (1) whereas salt has no close substitute (1)"), then conclude which is elastic and why.

b) Analyse how PED affects a firm's pricing, or the advantages of selling a product with inelastic demand (2 parts).

1. Define PED or inelastic demand (1).

2. For **elastic** demand: a price rise causes a bigger % fall in quantity demanded (1), a sign of close substitutes or a luxury (1), so the firm may **cut** its price (1) to raise revenue (1).
3. For **inelastic** demand: a price rise causes a smaller % fall (1), a sign of few substitutes or a necessity (1), so the firm may **raise** its price (1), and revenue rises (1) and possibly profit, if revenue rises by more than costs (1).
4. Advantages of inelastic demand also include **stable sales and revenue** (1), which make planning easier (1), and being able to pass on cost rises. A diagram of a price rise increasing revenue on a steep curve is also rewarded.

4. Explain (4 marks) (2 question parts)

"Explain two reasons why demand for a product may be price-inelastic" or "why demand for soap is more price-inelastic than demand for a luxury brand of perfume".

1. **Identify** a reason (1): "It is a necessity."
2. **Develop** it (1): "so people keep buying it even when its price rises."
3. Do the same for a second reason. Only the first two reasons are credited, so don't list five.
4. In a comparison, say it about **both** products for the full 2 marks: "Soap has fewer substitutes than a luxury brand of perfume (2)", or "soap has no close substitutes (1) whereas perfume brands can be swapped for each other (1)".

Make sure the reasons match the direction asked: reasons for **inelastic** demand are few substitutes, necessity, small share of income, addiction, brand loyalty, a short time period.

5. Discuss (8 marks) (1 question part)

"Discuss whether or not the demand for chocolate is likely to be price-elastic." Marked by levels: Level 3 (6–8 marks) needs **both sides developed** with correct use of PED.

1. **Start with what PED means**: "demand is price-elastic if a change in price causes a bigger percentage change in quantity demanded, so PED is more than 1."
2. **Why it might be elastic** (two developed points): many substitutes (other brands, other snacks), so buyers switch when the price rises; a luxury, so easy to go without; one **brand** is more elastic than chocolate as a whole; over a longer period buyers change habits.
3. **Why it might not be** (two developed points): it takes a small share of income, so a price rise is hardly noticed; it can be habit-forming; some see it as a necessity or are loyal to a brand.
4. **Judgement**: say what it depends on (the brand or the whole product, rich or poor consumers, the time period) and give a reasoned conclusion.

A Discuss part on the significance of PED (for example whether a firm should raise its price, or whether a tax will cut consumption) uses the same plan: the case for, the case against, both linked to PED and revenue, then a judgement.

If a Define (2) part is set ("define price elasticity of demand"): a measure of how responsive the quantity demanded of a product is (1) to a change in the price of that product (1). The formula, with quantity over price, also earns the marks.

Worked examples

Example 1

A bus company cuts its fare from \$2.50 to \$2.00. The number of journeys made each day rises from 8000 to 9000. What is the price elasticity of demand, and what happens to the company's total revenue?

- **A** –0.625, and total revenue falls
- **B** –1.6, and total revenue rises

- **C** -0.625 , and total revenue rises
- **D** -1.6 , and total revenue falls

[1]

Price change: $\frac{2.00-2.50}{2.50} \times 100 = -20\%$. Quantity change: $\frac{9000-8000}{8000} \times 100 = +12.5\%$. $PED = \frac{12.5}{-20} = -0.625$, which is inelastic, so a price cut lowers revenue. Check: $2.50 \times 8000 = 20\,000$ dollars before and $2.00 \times 9000 = 18\,000$ dollars after. The answer is **A**. (1) (B and D come from dividing the wrong way round.)

Example 2

Explain two reasons why the demand for petrol is likely to be price-inelastic. [4]

Petrol has few close substitutes for most car drivers (1). When its price rises they cannot easily switch to another fuel, so the quantity bought falls by a smaller percentage than the price rises (1).

Petrol is a necessity for people who drive to work or run delivery vans (1), so they have to keep buying it even at the higher price (1).

Two reasons, each identified and developed: 4 marks.

Example 3

Analyse how price elasticity of demand influences which products a government chooses to tax. [6]

Price elasticity of demand measures how responsive quantity demanded is to a change in price (1). A tax raises the price consumers pay (1). If demand for the product is inelastic, for example tobacco or petrol, the quantity bought falls by a smaller percentage than the price rises (1), because these products have few substitutes or are addictive (1). So sales stay high and the government collects a large amount of tax revenue (1). If demand is elastic, consumers switch to substitutes and sales fall by a larger percentage (1), so the tax raises little revenue and may cost jobs in the industry (1). A government that mainly wants revenue will therefore tax products with inelastic demand (1), but if it wants to cut consumption of a demerit good it will need a large tax, since consumption falls only a little (1).

Nine creditable points offered for 6 marks, each linked to the next; a safety margin if one is not accepted.

Example 4

Discuss whether or not a bus company would gain from cutting its fares. [8]

Why it might gain. If demand for bus travel is price-elastic, a fare cut causes a larger percentage rise in the number of journeys, so total revenue rises. Demand may be elastic where there are close substitutes, such as trains, taxis or cycling, because passengers switch to the bus when it becomes cheaper. Over a longer period more people may change their habits and stop driving to work, so the rise in passengers grows. The buses run anyway, so extra passengers add little to costs and the extra revenue can raise profit.

Why it might not. If demand is price-inelastic, for example for workers who have no car and no other way to travel, the fare cut causes only a small percentage rise in journeys, so revenue falls. With PED of -0.625 , as in Example 1, a 20% cut lowers daily revenue from \$20 000 to \$18 000. Extra passengers may also mean the company has to run more buses, raising costs, and rival bus firms may cut their fares too, so the company gains few passengers.

Judgement. The company gains only if demand for its service is elastic, which is more likely where passengers have good alternatives and the fare is a large share of their spending. It should test demand, for example by cutting off-peak fares, where travellers are more price-sensitive, while keeping peak fares, where demand is inelastic.

Both sides are developed with PED and revenue, and the judgement says what the answer depends on: Level 3 (6–8 marks).

Common mistakes

- **Dividing the wrong way round.** PED is quantity change **over** price change. The March 2023 report noted that many candidates inverted the formula when finding the price rise needed to cut consumption, and got a quarter of the right answer.
- **Being misled by the minus sign.** In June 2025 most candidates called a PED of -2.0 inelastic. Ignore the sign: 2 is more than 1, so demand is elastic.
- **Saying "demand" rises when you mean "quantity demanded".** A price change moves buyers **along** the demand curve; it does not shift demand. The March 2025 report found many candidates choosing a fall in demand after a price cut.
- **Mixing up PED and PES.** Examiners report candidates giving determinants of price elasticity of **supply** when asked about demand, and the other way round. Demand is about buyers: substitutes, necessity, share of income.
- **Putting a determinant the wrong way round.** Many substitutes make demand **elastic**, not inelastic (June 2025 report). Some candidates asked for reasons for inelastic demand wrote reasons for elastic demand (March 2021).
- **Using raw changes instead of percentages.** A fall of 20 units means nothing until you divide by the old quantity.
- **Being generic.** Answers that list determinants without applying them to the product in the question (shoes, chocolate, holidays in the source) score less. Use the product's name and the source's facts.
- **Forgetting the revenue rule's direction.** With elastic demand, a price rise lowers revenue; the June 2022 cinema question showed many candidates choosing "elastic" when revenue went **up**.
- **Confusing "elastic" with "perfectly elastic".** Only a horizontal demand curve is perfectly elastic (March 2022 report).
- **Leaving out the meaning of PED in a Discuss answer.** The June 2025 chocolate question was often answered as "will demand rise or fall", which scores little. Start by saying what elastic demand means.

How to get the marks

- **Multiple choice is 1 mark with no penalty for a wrong answer.** For calculations, write the formula and the two percentage changes in the margin; for revenue questions, use $\text{price} \times \text{quantity}$ to check.
- **Define** (2 marks): responsiveness of quantity demanded (1) to a change in the product's own price (1).
- **Explain** (4 marks): two reasons, each **identified** (1) and **developed** (1). Only the first two are counted. In a comparison, mention both products.
- **Analyse** (6 marks): chains, not lists. Each point says **why** (a determinant or the revenue rule) and **so what** (elastic or inelastic; revenue rises or falls; the firm raises or cuts its price). Aim for six linked steps plus one spare. A labelled diagram showing a price rise and the revenue gained and lost can earn up to 2 marks where the mark scheme allows it.
- **Discuss** (8 marks): define PED, develop at least two points on each side in the context given, then write a judgement saying what the answer depends on. One-sided answers stay in Level 2 (3–5 marks).
- **Use the source material.** "Shoes have substitutes such as sandals and boots" earns the mark; "products have substitutes" often doesn't.
- **Use the terms precisely:** price-elastic and price-inelastic demand, quantity demanded, total revenue (total spending), substitutes, necessity.

Quick check

1. The price elasticity of demand for a product is -0.4 . Its price is cut by 10% from \$20, when 500 units a week were sold. Find the new quantity sold and the change in total revenue.
2. The price of a concert ticket falls from \$8 to \$6 and the number sold rises from 300 to 450. Calculate the PED, say whether demand is elastic or inelastic, and state what happens to total revenue.
3. The price elasticity of demand for sugary drinks is -0.6 . By what percentage must a tax raise their price to cut consumption by 12%?
4. Which product is most likely to have price-elastic demand?

- **A** table salt
- **B** one brand of fizzy drink
- **C** electricity
- **D** a life-saving medicine

5. Define price elasticity of demand. [2]

Answers

1. Quantity changes by $-0.4 \times (-10) = +4\%$, so sales rise to $500 \times 1.04 = 520$. Revenue was $20 \times 500 = 10\,000$ dollars; the new price is \$18, so revenue is $18 \times 520 = 9\,360$ dollars, a fall of \$640. Demand is inelastic, so a price cut lowers revenue.
2. Price: $\frac{6-8}{8} \times 100 = -25\%$. Quantity: $\frac{450-300}{300} \times 100 = +50\%$. PED = $\frac{50}{-25} = -2$: elastic. Revenue rises from $8 \times 300 = 2\,400$ dollars to $6 \times 450 = 2\,700$ dollars.
3. % change in price = $\frac{-12}{-0.6} = 20\%$.
4. **B.** One brand has many close substitutes (other brands), so buyers switch when its price rises. The others are necessities with few substitutes, so their demand is inelastic. (1)
5. How much the quantity demanded of a product responds (1) to a change in the price of that product (1), measured as the percentage change in quantity demanded divided by the percentage change in price.

Past questions to try

- 0455/13/M/J/24 Q6: a new world demand for oil after its price doubles.
- 0455/11/M/J/25 Q7: spotting inelastic demand from a price and quantity table.
- 0455/22/F/M/24 Q4: part (c), why one brand of luxury chocolate and salt have different PEDs.
- 0455/23/M/J/21 Q5: part (c), the advantages of selling a product with inelastic demand.