

Cambridge AS & A Level · Business 9609 · Notes

Marketing analysis A2

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Read first: [The nature of marketing](#), [The marketing mix](#)

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What you need to know

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

1. **Explain the idea of elasticity of demand** in its three forms: price elasticity (PED), income elasticity (YED) and promotional elasticity (PrED). Each measures how strongly the quantity demanded reacts to a change in one thing.
2. **Calculate PED, YED and PrED** from data, and turn them round to work out a change in quantity demanded or in revenue.
3. **Interpret the results:** what the size and the sign of each figure say about customers.
4. **Explain how elasticity affects business decisions:** pricing, promotion budgets, sales and revenue forecasts, which products to stock as incomes change.
5. **Explain the limitations of elasticity** in all its forms.
6. **Describe the product development process**, stage by stage, from an idea to a launch.
7. **Explain where ideas for new products come from.**
8. **Explain why research and development (R&D) matters** to a business, and weigh its benefits against its costs and risks.
9. **Explain why businesses forecast sales.**
10. **Use time series analysis:** calculate a four-period centred moving average (the trend), seasonal variations and their averages, and use them to forecast sales.
11. **Explain qualitative sales forecasting** methods.
12. **Explain how sales forecasts affect business decisions**, and how reliable they are.

This is A Level content; since 2023 it has been asked on Paper 3. Before 2023 price elasticity was also asked on AS Papers 1 and 2, and some of those questions are counted below.

Understand it

Elasticity: how strongly demand reacts

Every business knows that if it raises its price it will usually sell less. What it needs to know is **how much** less.

Elasticity of demand measures the responsiveness of the quantity demanded to a change in one of the things that affect it, always as a ratio of two **percentage** changes:

$$\text{elasticity} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in the cause}}$$

Percentages are used so that products of any size or price can be compared. A percentage change is always measured from the **original** figure:

$$\% \text{ change} = \frac{\text{new} - \text{original}}{\text{original}} \times 100$$

Price elasticity of demand (PED)

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

A village bakery raises the price of its sourdough loaf from 5.00 to 5.40 dollars, an increase of $0.40 \div 5 \times 100 = 8\%$. Weekly sales fall from 800 to 760 loaves, a change of $-40 \div 800 \times 100 = -5\%$. So $\text{PED} = -5 \div 8 = -0.625$.

PED is **negative** for almost every product, because price and quantity move in opposite directions. Write the minus sign. What tells you how responsive customers are is the **size** of the number, ignoring the sign:

- **Price elastic** (size above 1): quantity changes by a **bigger** percentage than price. Customers are sensitive to price, usually because there are close substitutes.
- **Price inelastic** (size below 1): quantity changes by a **smaller** percentage than price. Customers still buy less, but not much less: the product is a habit, a necessity, has few substitutes, or is a small part of their spending.
- **Unit elastic** (exactly 1): both change by the same percentage.

Inelastic does **not** mean demand stays the same; the bakery still lost 40 sales a week.

PED and revenue. Revenue = price $\times$ quantity, so whether a price change raises revenue depends on which percentage is bigger.

	Raise the price	Cut the price
Price elastic	Revenue falls	Revenue rises
Price inelastic	Revenue rises	Revenue falls

The bakery's revenue went from $800 \times 5 = 4000$ to $760 \times 5.40 = 4104$ dollars: the 8% price rise outweighed the 5% loss of sales. A phone-case seller who cuts its price from 20 to 17 dollars (−15%) and sees sales rise from 300 to 390 a month (+30%) has $PED = 30 \div (-15) = -2$, elastic; its revenue rises from 6,000 to 6,630 dollars.

Higher revenue is not the same as higher profit. Selling 90 more phone cases means buying 90 more from the supplier; whether profit rises depends on those extra costs.

Income elasticity of demand (YED)

$$YED = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in income}}$$

Here the **sign** matters as much as the size:

- **Positive YED: a normal good.** People buy more as their incomes rise. Above 1 (income elastic) demand rises faster than income, typical of luxuries such as restaurant meals and foreign holidays. Between 0 and 1 (income inelastic) demand barely moves, typical of necessities.
- **Negative YED: an inferior good.** People buy **less** as incomes rise because they switch to something better, and **more** when incomes fall: budget own-brand groceries, the cheapest bus service.

If average incomes rise 4% and a restaurant chain's meals sell 7% more, $YED = 7 \div 4 = 1.75$. If sales of a supermarket's value range fall 2% at the same time, $YED = -2 \div 4 = -0.5$.

Promotional elasticity of demand (PrED)

$$PrED = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in promotional spending}}$$

PrED is normally positive: more advertising, more sales. A florist that raises its advertising budget by 50% and sells 15% more bouquets has $PrED = 15 \div 50 = 0.3$, promotion inelastic.

A promotion-inelastic figure does not prove that the extra advertising was a waste. Compare the **amounts** in dollars: if the florist's budget is small and its sales are large, a 50% increase in a few hundred dollars of advertising can bring in thousands of dollars of extra revenue.

Turning the formula round

If the elasticity is known, rearrange to predict the effect of a planned change:

$$\% \text{ change in quantity demanded} = \text{elasticity} \times \% \text{ change in the cause}$$

With $PED -0.625$, a further 4% price rise at the bakery would cut sales by $0.625 \times 4 = 2.5\%$. The next step is often the new quantity (original $\times (1 + \text{the \% change})$) and then the new revenue (new price $\times$ new quantity).

How elasticity guides decisions

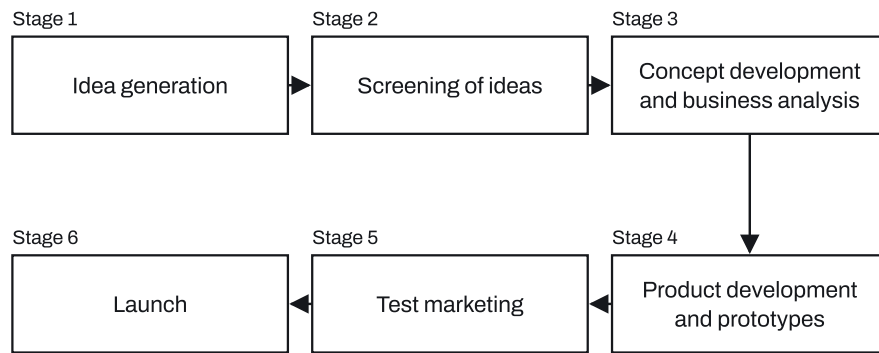
- **Pricing.** Inelastic demand: a price rise brings in more revenue. Elastic demand: a price cut (or a penetration price) wins proportionately more sales and market share. Different PEDs for different groups of customers allow **price discrimination**: higher prices to the less sensitive group.
- **Promotion budgets.** PrED shows how many extra sales each extra dollar of promotion is likely to bring, so a business can compare that revenue with the cost.
- **Sales and revenue forecasts.** Combined with a planned price change, or a forecast change in incomes, elasticity predicts next year's sales, which feeds into production, staffing, purchasing and cash-flow plans.
- **Product portfolio.** When a recession is coming, a business with income-elastic luxuries may add cheaper lines (with low or negative YED) to protect its sales; in a boom it can push its premium range.
- **Making demand less price sensitive.** Branding, quality and differentiation make customers less willing to switch, which pushes PED towards zero and gives the business more control over its price.

Limitations of elasticity

- **Estimates, not facts.** Elasticities come from past sales or market research, which may be a small or unrepresentative sample. A figure measured last year may already be out of date.
- **Everything else must stay the same.** The calculation assumes only one thing changed. In real markets competitors respond (match a price cut, launch a promotion), tastes change and incomes move at the same time, so the predicted change may not happen.
- **It varies.** PED is different at different prices (a small rise may be accepted, a big one may not), for different customer groups, in different countries, and over time as customers find substitutes.
- **Data may belong to another product or market.** An industry-wide figure, or one for an existing product, may not fit a new product or a new region.
- **PrED depends on the promotion.** A clever campaign and a dull one with the same budget have very different effects; the figure ignores quality and timing.
- **YED is an average.** A product can be normal for low-income customers and inferior for high-income ones.
- **Revenue is not profit.** Elasticity says nothing about costs, so on its own it cannot show whether a decision is profitable.

The product development process

New products are developed in stages, so that weak ideas are dropped early, before much money has been spent on them.



1. **Idea generation:** collect as many ideas as possible.
2. **Screening:** reject ideas that do not fit the business's objectives, skills or budget, or have no obvious market.
3. **Concept development and business analysis:** describe the product in detail, test the concept on potential customers, and estimate its price, costs, sales and profit (forecasts and break-even).
4. **Product development and prototypes:** design and build working versions, test them for safety, quality and ease of making them in large numbers, and improve them.
5. **Test marketing:** sell the product in one region or to a small group, and adjust the marketing mix from the results.
6. **Launch (commercialisation):** full-scale production and the launch promotion.

At each stage the business can stop. This costs time, but launching an untested product that fails costs far more: unsold inventory, wasted promotion and damage to the brand.

Do not confuse this **process** with **product development** in Ansoff's matrix (new products for existing markets), which is a growth strategy.

Sources of new ideas

- **The business's own R&D department:** scientists and engineers working on new materials, technology and processes.
- **Market research and customer feedback:** complaints, reviews, surveys and focus groups that show unmet needs.
- **Employees:** suggestion schemes, especially staff who deal with customers every day.
- **Competitors:** studying rivals' products, then improving on them (without breaking their patents).
- **Suppliers and distributors:** new materials or components, and retailers' knowledge of what sells.
- **Outside research:** universities, technology partners, trade fairs and expired patents.

Research and development (R&D)

R&D is the work of scientists, engineers and designers to invent new products and to find better ways of making them.

Why it matters:

- **Competitive advantage and differentiation:** a better or unique product, protected by a **patent**, which rivals cannot copy for years.
- **Higher prices and margins:** a product customers see as clearly better is less price sensitive.
- **New markets and growth:** new products bring new customers and replace products reaching the end of their life cycle.
- **Lower costs:** process innovation can make production cheaper or less wasteful.
- **Image:** a reputation for innovation strengthens the brand and attracts skilled staff and investors.

Drawbacks and risks:

- **High cost,** often years before any revenue, which strains cash flow and may need borrowing.
- **Uncertain results:** much research leads to nothing, and some launched products fail.
- **Time:** in fast-moving markets a rival may get there first, or the technology may date before launch.
- **Opportunity cost:** the same money could be spent on marketing or on improving existing products.

How much R&D matters depends on the industry (vital in technology and pharmaceuticals, less so for a hairdresser), on what competitors are spending, on whether results can be protected, and on whether the business can afford it and market the result well.

Why forecast sales

A **sales forecast** is an estimate of how much a business expects to sell over a future period, in units or in dollars. Almost every other plan is built on it:

- **Operations:** how much to produce, how much capacity is needed, how much raw material and inventory to buy.
- **Workforce planning:** how many staff, and when (temporary staff for the peak season).
- **Finance:** the cash-flow forecast and the budgets start from expected revenue, so the business can arrange finance before a shortage.
- **Marketing:** setting realistic sales targets, and timing promotions and price changes.

A good forecast avoids two costly mistakes: running out of stock and losing sales, or holding too much stock and too many staff.

Time series analysis

Time series analysis forecasts by finding the pattern in past sales and extending it into the future (extrapolation). Quarterly sales usually have:

- a **trend:** the underlying long-term direction (rising, falling or flat);
- **seasonal variation:** a regular pattern within the year (summer peaks, winter dips);
- **random variation:** one-off events that cannot be predicted.

Finding the trend with a four-period centred moving average. A total of four consecutive quarters always contains one of each season, so the seasonal pattern cancels out. But the middle of four quarters falls **between** two quarters. Adding two consecutive four-quarter totals (an eight-quarter total) and dividing by 8 centres the average on a real quarter.

Pinecrest Campsite's revenue (thousand dollars) for ten quarters:

Quarter	Revenue	Four-quarter totals	Eight-quarter total	Trend ($\div 8$)	Seasonal variation
2023 Q1	38				
2023 Q2	64				
2023 Q3	92	224 and 228	452	56.5	+35.5
2023 Q4	30	228 and 234	462	57.75	-27.75
2024 Q1	42	234 and 240	474	59.25	-17.25
2024 Q2	70	240 and 244	484	60.5	+9.5
2024 Q3	98	244 and 248	492	61.5	+36.5
2024 Q4	34	248 and 253	501	62.625	-28.625
2025 Q1	46				
2025 Q2	75				

For 2023 Q3: the first four quarters total $38 + 64 + 92 + 30 = 224$; the next four (2023 Q2 to 2024 Q1) total $64 + 92 + 30 + 42 = 228$. The trend for 2023 Q3 is $(224 + 228) \div 8 = 56.5$. The first two and last two quarters have no trend value, because there are not enough quarters on both sides.

Seasonal variation is how far a quarter's actual figure is from the trend:

$$\text{seasonal variation} = \text{actual} - \text{trend}$$

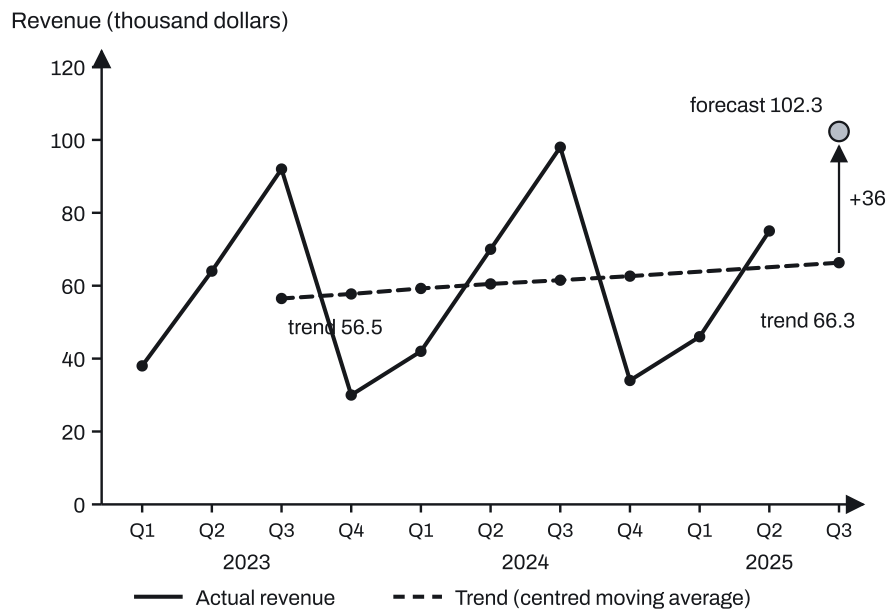
The sign carries the meaning: $92 - 56.5 = +35.5$ means summer is 35.5 thousand dollars **above** trend; $30 - 57.75 = -27.75$ means the autumn quarter is **below** it.

Average seasonal variation for a quarter is the mean of its seasonal variations from different years. For Q3: $(35.5 + 36.5) \div 2 = 36$.

Forecasting. Extend the trend, then add the average seasonal variation for the quarter being forecast:

$$\text{forecast} = \text{projected trend} + \text{average seasonal variation}$$

Pinecrest's trend rose from 56.5 to 62.625 over five quarters, an average of $6.125 \div 5 = 1.225$ a quarter. Three quarters on from 2024 Q4, the trend for 2025 Q3 is $62.625 + 3 \times 1.225 = 66.3$, so the forecast is $66.3 + 36 = 102.3$ thousand dollars. (In the exam the projected trend is usually given to you.)



Strengths of time series analysis: it is based on actual data rather than opinion; it separates the trend from the seasonal pattern, so a business can plan for both; it suits stable markets with a clear seasonal pattern and short-term operational planning.

Weaknesses: it assumes the future will repeat the past. A new competitor, a new product, a recession, a change in tastes or a change in the business's own marketing mix will make it wrong. The further ahead the forecast, the less reliable. It needs several years of data, so a new business or new product cannot use it. Precise-looking numbers can give managers false confidence.

Qualitative sales forecasting

When there is little past data (a new product, a new market) or the market is changing fast, businesses use judgement instead of, or alongside, numbers:

- **Sales force composite:** each salesperson estimates sales in their area, based on what customers are telling them; the estimates are added up.
- **Panel of experts (Delphi technique):** experts give forecasts separately and anonymously, see a summary of the others' views, and revise their own over several rounds until they broadly agree.
- **Consumer surveys and market research:** asking potential buyers how likely they are to buy.
- **Managers' experience** (sometimes called a hunch): quick and cheap, but easily biased.

Qualitative methods pick up changes that past data cannot, but they are subjective and may be biased. The most reliable forecasts combine both kinds.

Key facts and formulas

There is no formula list for this subject in the exam. "Learn it" means you must remember it.

Fact or formula	Status
$\% \text{ change} = (\text{new} - \text{original}) \div \text{original} \times 100$	Learn it
$\text{PED} = \% \text{ change in quantity demanded} \div \% \text{ change in price (negative for almost all products)}$	Learn it
$\text{YED} = \% \text{ change in quantity demanded} \div \% \text{ change in income}$	Learn it
$\text{PrED} = \% \text{ change in quantity demanded} \div \% \text{ change in promotional spending}$	Learn it
Rearranged: $\% \text{ change in quantity demanded} = \text{elasticity} \times \% \text{ change in price, income or promotion}$	Learn it
Size above 1: elastic (responsive); size below 1: inelastic (less responsive); exactly 1: unit elastic	Learn it
YED positive: normal good (above 1: luxury, income elastic); YED negative: inferior good	Learn it
Revenue = price $\times$ quantity; price elastic: a price cut raises revenue; price inelastic: a price rise raises revenue	Learn it
Four-period centred moving average (trend) = (two consecutive four-quarter totals added) $\div 8$	Learn it
Seasonal variation = actual – trend (keep the sign)	Learn it
Average seasonal variation = total of that quarter's seasonal variations $\div$ number of them	Learn it
Forecast = projected trend + average seasonal variation for that quarter	Learn it

How to do it

We have tagged 23 questions on this topic, 2021–2025: on Paper 3 throughout and, until 2022, also on AS Papers 1 and 2. 14 of the questions have parts of more than one type, so the counts add up to 39.

Question type	Questions
Calculate an elasticity (PED, PrED or XED) from data	8
Evaluate the usefulness of elasticity for pricing / marketing decisions	7
Use a given elasticity to predict the change in demand or revenue	6
Evaluate (or analyse) the usefulness of sales forecasting / time series analysis	5

Question type	Questions
Evaluate (or analyse) the importance of new product development / R&D	5
Define PED and explain how it guides pricing decisions	4
Time series calculations: centred moving average, seasonal variation, forecast	4

On Paper 3 a calculation part (a) is usually followed by a 12-mark (b) on the same case. The 12-mark grid is **K** 2 (knowledge), **App** 2 (application: using the case's facts and figures, not just copying them), **An** 2 (one link in a chain of reasoning earns 1, two or more links earn 2) and **Eval** 6 (a supported judgement; the top level, 5–6, needs it in the context of the business). An 8-mark "analyse" question is K 2, App 2, An 4, with no evaluation. Below, (K), (App), (An) and (Eval) show the mark a sentence earns; (1) in a calculation is one mark.

1. Calculate an elasticity (PED, PrED or XED) from data (8 questions)

Paper 3 (a), [2]–[4]. A PED calculation for 4 marks:

- Formula (1):** $\text{PED} = \% \text{ change in quantity demanded} \div \% \text{ change in price}$. Writing it gives a mark even if nothing else is right.
- Percentage change in quantity (1):** $(\text{new} - \text{original}) \div \text{original} \times 100$, with its minus sign if sales fell.
- Percentage change in price (1),** again from the original price.
- Answer (1):** divide, and keep the minus sign. A correct answer on its own gets full marks, but working earns marks when something goes wrong.

Variants:

- No minus sign** on a PED costs one mark; dollar signs on the answer (it has no units) also cost marks.
- Rounding:** give 2 decimal places, or what the question asks; a sensibly rounded answer to 1 decimal place has also been accepted.
- Promotional elasticity [2]:** $\% \text{ change in quantity demanded} \div \% \text{ change in promotional spending}$ (1), answer (1). It is positive.
- Income elasticity:** the same pattern, with the percentage change in income underneath; the sign shows normal or inferior.
- Cross elasticity** was asked once (2022), under the old syllabus: $\% \text{ change in quantity of product A} \div \% \text{ change in price of product B}$. A positive answer means the two are substitutes. It is not in the 2026–2028 list.
- Read the data carefully:** which price is old and which is new, monthly or weekly figures, which product the line refers to.

2. Evaluate the usefulness of elasticity for pricing / marketing decisions (7 questions)

Paper 3 (b), [12], straight after the calculation. The question may say "usefulness", "impact", "whether ... is sufficient", or (on an older paper) "recommend whether to change the price".

1. **K:** what the elasticities measure (PED, YED, PrED) and what elastic and inelastic mean; what the decision involves (the marketing mix, pricing methods, the marketing objective).
2. **App: interpret** the case's figures, never just quote them. Say what your calculated figure means for this business ("demand for its main product is price inelastic, so..."), work out revenue before and after a price change, say what a YED sign shows about the product.
3. **An:** build chains. Elastic → a price cut raises quantity by more than the price falls → revenue rises → (if costs allow) profit rises. Positive YED with incomes rising → demand grows without a price cut. Promotion figures → is the extra revenue worth the extra spend?
4. **Eval** (half the marks): the limitations from "Understand it" **applied to this case:** when and where the estimate was made, which product it is for, how competitors will react, whether the price change is large, costs and profit, other parts of the mix (product quality, place, brand), the business's objectives. End with a judgement that answers the question for this business and says what it depends on.

3. Use a given elasticity to predict the change in demand or revenue (6 questions)

[1]–[5]. Rearrange: % change in quantity = elasticity × % change in price (or income, or promotion).

- **Short form [1]–[2]:** the percentage change in quantity, **with its direction**. A YED of 1.6 and incomes falling 4% gives $1.6 \times (-4) = -6.4\%$: "a 6.4% **fall** in quantity demanded". "6.4%" with no direction loses a mark.
- **Long form [4]–[5]:** each stage earns a mark, so write every one:
 1. the percentage change in price (or the new price);
 2. the percentage change in quantity demanded (elasticity × that change);
 3. the new quantity: original quantity × (1 + the percentage change);
 4. the new revenue: new price × new quantity.
- The answer may be asked as a percentage or in units; either has been accepted when the question is not specific.
- PrED works the same way: a 40% rise in promotion with PrED 0.45 gives an 18% rise in quantity. If the question asks for the change in **revenue** and the price is unchanged, revenue changes by the same percentage as quantity.
- A price **cut** times a negative PED gives a **positive** change in quantity. Check the direction makes sense.

4. Evaluate (or analyse) the usefulness of sales forecasting / time series analysis (5 questions)

Paper 3, [12] after a time series calculation, or [8] "analyse one benefit and one limitation".

For [12]:

1. **K:** what a sales forecast is; what time series analysis is (a forecast from the trend and seasonal variation in past data); its benefits and limitations. If you show no clear knowledge of what time series analysis is, all your marks stay in the lowest level.

2. **App**: how seasonal this business's sales are; what it needs to plan ahead (skilled staff, inputs with long delivery times, output that cannot be changed quickly); what in the case could break the pattern (a new competitor, a new product range, a change in government policy, a planned move into a new market).
3. **An**: forecast → plan staff, materials and capacity in advance → avoid shortages and idle resources → lower costs and higher profit. Or forecast → cash-flow forecast → finance arranged in time. Or: the market is changing → the past pattern breaks → resources are misallocated.
4. **Eval**: it works best for this business when the seasonal pattern is clear and stable and the forecast is short term; it is less reliable over long periods or when the case shows change ahead; combine it with qualitative methods and market research; a forecast is only useful if managers act on it. If the question asks whether time series analysis is "sufficient" for an objective, weigh what else the decision needs (costs, capacity, data for each product or market).

Benefits, not costs of the method: "it takes a long time" and "the calculations are complicated" are not rewarded.

For [8] (one benefit and one limitation): K 2 (one for the benefit, one for the limitation; a definition can earn only one), App 2 (one for each, from the case), An 4 (a developed chain for each). Write **one** of each: if you give more, only the best one counts.

5. Evaluate (or analyse) the importance of new product development / R&D (5 questions)

Paper 3, [12] "evaluate the importance ... to future success", or [8] "analyse two benefits of developing new products".

1. **K**: define new product development (taking a new product from an idea to a launch on the market) or R&D; benefits (differentiation, competitive advantage, pricing power, new customers, repeat purchase, spreading risk, refreshing the brand) and drawbacks (cost, cash flow, risk of failure, time).
2. **App**: the case's R&D spending (as a share of revenue, against competitors or the industry), how competitive and fast-changing its market is, test results or complaints about its current products, its finances.
3. **An**: new product → differentiated from rivals → customers less price sensitive → higher price and margin. Or R&D spending → cash outflows years before revenue → liquidity falls → borrowing → higher gearing and risk.
4. **Eval**: success depends on whether the product meets customers' needs, the marketing that supports it, how quickly rivals respond, patents, the finance available, the length of product life cycles in the industry; compare R&D with other routes to success (market development, marketing, cost cutting). Judge for this business: how far do its future sales depend on staying ahead of its rivals' products?

Variants:

- **The product development process** (an older 16-mark question): explain the stages (research, prototypes, testing, test marketing), and weigh the cost and delay of following them against the risk of launching a product that fails.

- **[8]** "two benefits": K 2 (a definition can earn only one), App 2, An 4. Only benefits are rewarded, and only the best two.
- If you mention market research, link it to the R&D process (testing the concept or prototype with customers).

6. Define PED and explain how it guides pricing decisions (4 questions)

AS Papers 1 and 2, 2021–2022 (old syllabus), **[2]** to **[5]**, or part of a 20-mark essay.

- **Define [2]**: the **responsiveness of quantity demanded (1) to a change in the product's price (1)**. The formula on its own also earns 2. "A change in demand over price" is only partial.
- **Explain [3]–[5]**: link PED to a decision. Elastic → cut price → quantity rises by a bigger percentage → revenue and market share rise. Inelastic → raise price → revenue rises with few customers lost. Also: forecasting sales after a price change, choosing a pricing strategy (price discrimination, penetration), and that the best choice depends on the objective (revenue or market share).
- **If a figure is given** (for example a PED of -3), use it: say what it means for this business and what it should do. A general "if elastic do this, if inelastic do that" with no reference to the figure earns little.

7. Time series calculations: centred moving average, seasonal variation, forecast (4 questions)

Paper 3 (a), **[1]–[4]** each.

Centred moving average [3]–[4]:

1. Work out the two four-quarter totals either side of your quarter: the four quarters from two before it to one after it, and the four from one before it to two after it (1).
2. Add the two totals to get the eight-quarter total (1).
3. Divide by 8 (1).
4. Answer (1).

Dividing a **single** four-quarter total by 4 is not centred and earns at most half the marks. The eight-quarter total written alone, with no working, can earn nothing.

Seasonal variation [1]–[2]: actual — trend, **with the sign**. A positive answer to a negative variation earns at most one mark (or none on a 1-mark part).

Average seasonal variation [2]: add that quarter's variations from each year (1), divide by how many there are (1).

Forecast [2]: projected trend + average seasonal variation (1), answer (1). Adding a negative variation lowers the forecast. Your own earlier answer is followed through.

Worked examples

Example 1

SparkWash runs a car-wash on a busy main road. Last month it raised the price of its premium wash from 12.00 to 13.50 dollars. Weekly premium washes fell from 2,000 to 1,650.

(a) Calculate the price elasticity of demand for SparkWash's premium wash. [4]

(b) The owner now plans to set the price at 11.40 dollars instead of the original 12.00 dollars. Using your answer to (a), calculate the weekly revenue from premium washes at the new price. [4]

(a) $PED = \% \text{ change in quantity demanded} \div \% \text{ change in price (1)}$.

$\% \text{ change in quantity} = (1650 - 2000) \div 2000 \times 100 = -17.5\% (1)$.

$\% \text{ change in price} = (13.50 - 12) \div 12 \times 100 = 12.5\% (1)$.

$PED = -17.5 \div 12.5 = -1.4 (1)$.

(b) $\% \text{ change in price} = (11.40 - 12) \div 12 \times 100 = -5\% (1)$.

$\% \text{ change in quantity} = -1.4 \times (-5) = +7\% (1)$.

New quantity = $2000 \times 1.07 = 2140$ washes (1).

New weekly revenue = $2140 \times 11.40 = 24396$ dollars (1).

Demand is price elastic, so the price rise cut revenue from $2000 \times 12 = 24000$ to $1650 \times 13.50 = 22275$ dollars, and the price cut lifts it to 24,396 dollars. Whether that is worth doing depends on the cost of the 140 extra washes each week (water, staff time), which the data does not give.

Example 2

Islet Ferries carries passengers between a mainland port and two holiday islands. Its revenue (\$m):

	Q1	Q2	Q3	Q4
2024		3.8	6.2	2.9
2025	2.1	4.0		

The seasonal variations for Q4 in 2022 and 2023 were -0.95 and -0.83 (\$m).

(a) Calculate the four-period centred moving average for 2024 Q4. [4]

(b) Calculate the seasonal variation for 2024 Q4. [1]

(c) Using your answer to (b), calculate the average seasonal variation for Q4. [2]

(d) The projected trend for 2025 Q4 is \$3.96m. Calculate the forecast revenue for 2025 Q4. [2]

(a) Four-quarter totals: $3.8 + 6.2 + 2.9 + 2.1 = 15.0$ and $6.2 + 2.9 + 2.1 + 4.0 = 15.2$ (1).

Eight-quarter total = $15.0 + 15.2 = 30.2$ (1).

Centred moving average = $30.2 \div 8$ (1) = 3.775, so **\$3.775m** (1).

(b) Seasonal variation = $2.9 - 3.775 = -0.875$, so **-0.875 (\$m)**: Q4 is below trend (1).

(c) Total = $-0.95 + (-0.83) + (-0.875) = -2.655$ (1). Average = $-2.655 \div 3 = -0.885$ (\$m) (1).

(d) Forecast = projected trend + average seasonal variation = $3.96 + (-0.885)$ (1) = 3.075, so **\$3.075m** (1).

Example 3

Brightfield Seeds (BS) breeds crop seeds and sells them to farmers in Country T. It spends 9% of its revenue on R&D, more than any of its three larger rivals. After six years of research it has developed a maize seed whose plants survive long dry spells, and it has applied for a patent. Droughts in Country T are becoming more frequent, and last year many farmers lost half of their maize harvest.

Analyse two benefits to BS of its spending on research and development. [8]

A product rivals do not have. R&D lets a business create products that are different from its competitors' (K). BS's six years of research have produced a maize seed that survives long dry spells, in a country where droughts are becoming more frequent (App). Farmers who lost half their harvest last year have a strong reason to choose this seed over ordinary ones, so they are less likely to switch to a rival on price (An); BS can charge a higher price per bag than for its standard seeds and earn a higher profit margin on every sale (An).

Protection from larger rivals. A second benefit is that R&D can produce a competitive advantage that the law protects, through a patent (K). BS has applied for a patent on its seed, and its three rivals are all larger than it (App). If the patent is granted, the larger rivals cannot legally copy the seed for many years, even though they could afford to (An); BS keeps the drought-seed market to itself while the patent lasts, gaining market share and the revenue to recover the cost of six years' research (An).

Each benefit earns K, App and a developed chain: $2 K + 2 App + 4 An = 8$. There is no evaluation in "analyse".

Example 4

Lumen Cinemas (LC) owns 14 cinemas in Country R. Each month it sells 60,000 standard tickets at 9 dollars and spends 15,000 dollars on promotion. Some of its screens have premium recliner seats. Its marketing objective is to raise ticket revenue by 8% next year. A year ago a market research agency surveyed cinema-goers across Country R and estimated:

	Estimate
PED for standard tickets	-0.7
YED for premium recliner seats	+2.2

Estimate

PrED for standard tickets

0.35

Average incomes in Country R are forecast to rise by 3% next year. A new film-streaming service launched in Country R two months ago.

Evaluate the usefulness of elasticity of demand to LC when deciding on its marketing mix. **[12]**

Knowledge. Elasticity of demand measures how much the quantity demanded responds to a change in price (PED), in incomes (YED) or in promotional spending (PrED) (K). The marketing mix is the combination of product, price, promotion and place that a business uses to meet its marketing objectives (K).

How it helps. With a PED of -0.7 , demand for standard tickets is price inelastic (App). A 6% price rise, to 9.54 dollars, would cut tickets by $0.7 \times 6 = 4.2\%$, to 57,480 a month, but revenue would rise from 540,000 to about 548,400 dollars, because the price rises by more than sales fall (An). The YED of $+2.2$ shows premium seats are a luxury: with incomes up 3%, demand for them should rise by about 6.6% without any price cut, so LC could convert more screens to recliners (App). The PrED of 0.35 is inelastic, yet a 20% rise in promotion (3,000 dollars a month) would bring about 7% more tickets, 4,200 a month or 37,800 dollars of revenue at 9 dollars each (An). Together these figures show LC which parts of its mix to use to move towards its 8% target: the price rise alone gives only about 1.5%, so promotion and premium seats are needed as well (An).

Why it is limited. The figures are estimates from a survey of cinema-goers across the whole country, not LC's own customers, so LC's 14 cinemas may face different competition and different customers (Eval). The survey was taken a year ago, before the streaming service launched; if some cinema-goers now watch films at home instead, standard tickets have a closer substitute and are probably more price elastic than -0.7 , so the price rise could lose revenue rather than gain it (Eval). The PrED figure is an average for promotion in general and says nothing about which kind of promotion works best for LC's cinemas (Eval). And the figures are about revenue: whether a price rise or more promotion raises profit depends on costs that the case does not give (Eval).

Judgement. Elasticity is useful to LC as a starting point: it shows clearly that a price rise alone will not reach the 8% target, and that the premium-seat product and promotion deserve attention (Eval). But it is not enough on its own, because the most important change in LC's market, the streaming service, happened after the estimates were made (Eval). How useful the figures are depends on how quickly LC updates them with its own sales data; it should test a small price rise at a few cinemas first and compare the result with the estimate before changing the price everywhere (Eval).

The marks: 2 K, 2 App, 2 An (developed chains), and 6 Eval for a supported judgement in LC's context that weighs the figures against their limits and says what the answer depends on.

Common mistakes

- **Turning the formula upside down.** Price change on top gives the reciprocal of PED. Quantity always goes on top, with the cause (price, income, promotion) underneath.

- **Using the change in units instead of the percentage change.** "Sales fell by 40 and price rose by 0.40" is not an elasticity. Convert both to percentages first.
- **Dividing by the new figure.** Every percentage change is measured from the **original** price or quantity.
- **Losing the minus sign on PED**, which costs a mark, or adding a sign where the answer should be positive (promotional elasticity, or cross elasticity of substitutes).
- **Giving a change with no direction.** "12%" could be a rise or a fall; write "a 12% decrease in quantity demanded".
- **Thinking "inelastic" means sales do not change.** They still change, just by a smaller percentage than the price.
- **Writing off promotion because PrED is below 1.** Compare the extra revenue with the extra spending in dollars; a small budget increase can still pay for itself many times over.
- **Assuming more revenue means more profit.** Profit also depends on the costs of the extra output; say so when the case gives no cost data.
- **Theory without the case's figures.** "If demand is elastic, cut the price" earns little on its own. Use the figure in the case, or your own answer to part (a), and say what it means for this business.
- **Writing about the fall in quantity, not revenue.** On a pricing question the key effect of a price rise with elastic demand is the fall in **revenue**.
- **Dividing one four-quarter total by 4.** That average is not centred on a quarter; use two totals and divide by 8.
- **Dropping the sign of a seasonal variation.** -0.875 and 0.875 mean opposite things, and the positive one loses the mark.
- **Confusing the product development process with Ansoff's "product development" strategy.** The process is the stages from idea to launch.
- **Spending most of a 12-mark answer on analysis.** Analysis is worth 2 marks and evaluation 6; give at least half the answer to weighing up and judging.
- **Writing about sales forecasting only, when the question asks about business planning** (or the marketing mix, or a marketing objective). Knowledge of both parts of the question is needed for both K marks.

How to get the marks

- **Command words.** *Calculate*: formula, each percentage change, then the answer, every stage written down. *Define*: the whole idea in a sentence. *Explain*: a point, how it works, the case. *Analyse*: chains of cause and consequence, no judgement needed. *Evaluate*: both sides, then a supported judgement for the business in the case.
- **Show every stage of a calculation.** Each stage has its own mark, and a mistake early on is followed through, so working protects your marks.
- **Signs and words.** PED negative; seasonal variations with $+$ or $-$; a rearranged answer with "increase" or "decrease". No dollar sign on an elasticity.

- **Use part (a) in part (b).** Interpreting your own elasticity or forecast (what it means, what revenue it implies) is the quickest application mark; a wrong figure still earns application and analysis if you interpret it correctly.
- **Interpret, do not quote.** "PED is -0.7 " scores nothing on its own; "demand is price inelastic, so a price rise would raise revenue" does.
- **12-mark answers: half on evaluation.** Two K and two App marks come quickly, one developed chain gives both An marks, and the remaining six marks reward judgement in context: what it depends on, for this business.
- **Analyse [8]:** exactly the number of points asked (one benefit and one limitation, or two benefits), each with the case and a chain of at least two links. Extra points are not rewarded.
- **Name the technique.** On a forecasting question, say what time series analysis is (trend, seasonal variation, moving averages, extrapolation) before judging it.

Quick check

1. Define price elasticity of demand, and state what a PED of -0.3 tells a business about its customers.
2. A jeweller estimates that the YED for its gold rings is $+2.4$. Average incomes are forecast to fall by 5%. Calculate the forecast change in the quantity of rings demanded.
3. A language school raised its monthly advertising spend from 8,000 to 10,000 dollars. Monthly enrolments rose from 400 to 420, and each enrolment brings in 150 dollars. Calculate the promotional elasticity of demand, and state whether the extra advertising paid for itself in revenue.
4. A bakery's seasonal variations for Q2 in three years were $+4.6$, $+5.2$ and $+4.9$ (thousand dollars). The projected trend for next year's Q2 is 61.3 thousand dollars. Calculate the forecast sales for next year's Q2.
5. A city bike-hire scheme has three years of quarterly rental data with a clear summer peak. Next month the city opens its first metro line. Explain one limitation of using time series analysis to forecast next year's rentals. [3]

Answers

1. PED is the responsiveness of the quantity demanded of a product to a change in its price. A PED of -0.3 is price inelastic: a price rise of 10% would cut quantity by only about 3%, so customers are not very sensitive to price and a price rise would raise revenue.
2. % change in quantity = $2.4 \times (-5) = -12\%$: a **12% decrease** in the quantity of rings demanded.
3. % change in spending = $2000 \div 8000 \times 100 = 25\%$; % change in enrolments = $20 \div 400 \times 100 = 5\%$; $PrED = 5 \div 25 = 0.2$, promotion inelastic. But the 20 extra enrolments bring in $20 \times 150 = 3000$ dollars, more than the 2,000 dollars of extra advertising, so it did pay for itself in revenue.
4. Average seasonal variation = $(4.6 + 5.2 + 4.9) \div 3 = 4.9$. Forecast = $61.3 + 4.9 = 66.2$ thousand dollars.
5. Time series analysis assumes that the trend and seasonal pattern of the past will continue (K). The new metro line is a change the past data knows nothing about: some people who hired bikes to get across the city may take the metro instead, while others may hire bikes to get to and from the stations (App). So the forecast could be too high or too low, and if the scheme plans its bikes and repair staff on it, it may have bikes standing idle or customers finding no bike to hire (An).

Past questions to try

- 9609/32/F/M/23 Q3: parts (a) and (b), a revenue change from a promotional elasticity and a PED from prices and quantities, then (c) evaluating elasticity for a new marketing mix.
- 9609/32/M/J/24 Q3: a seasonal variation and a centred moving average, then the usefulness of sales forecasting.
- 9609/33/O/N/24 Q3: parts (a) and (b), a change in sales from an income elasticity, then a promotional elasticity.
- 9609/32/F/M/24 Q4: a change in quantity from a given PED, then evaluating new product development.