

Demand, Supply & Elasticity of Demand

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Typed study notes - definitions, diagrams, formulas, solved numericals and 10 practice questions with answers.

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How I would use these notes One careful read with the diagrams, then straight to the formula sheet on page 8. Cover the answers on pages 9-10 and attempt each question first - the method matters more than the final number.

Prepared by AssignEase as a sample study pack. Examples and figures are original illustrations, not live market data.

02 / DEMAND

Demand

What buyers want, what they can actually pay for, and why the curve slopes down.

Definition Demand is the relationship between the different possible prices of a good and the quantities consumers are willing and able to buy at those prices, over a given period, other things remaining unchanged.

Two words carry this whole definition: willing and able. Wanting something is not demand. I can dream about a Royal Enfield all year - unless I have the money to back it at the actual price, the market doesn't count me. Desire plus purchasing power: that's demand.

Law of demand

Ceteris paribus (other things staying the same), when the price of a good rises, its quantity demanded falls; when the price falls, quantity demanded rises. Price and quantity move in opposite directions, so the demand curve slopes down from left to right.

Why? Two effects. The substitution effect: tea gets cheaper relative to coffee, and people swap across. The income effect: a lower price quietly stretches what your fixed Rs 500 can buy. There's a third lens too - the first dosa satisfies more than the third, so extra units only tempt us at lower prices (falling marginal utility).

Price (Rs per unit)	Quantity demanded (units per week)
30	70
40	60
50	50
60	40
70	30

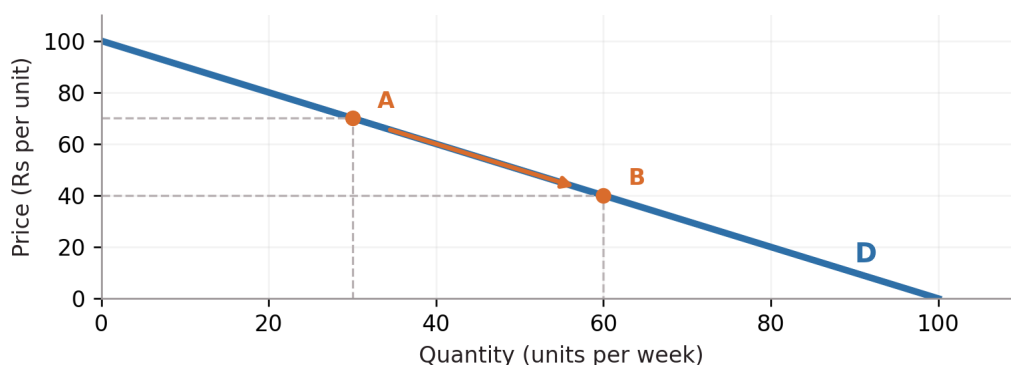


Figure 1. Demand for $Q_d = 100 - P$. Moving from A to B is an expansion of quantity demanded - the price fell, nothing else moved.

Movement along the curve vs a shift of the curve

This distinction earns marks every single year. A change in the good's own price causes a movement along the same curve: price falls, expansion; price rises, contraction. A change in anything else - income, tastes, prices of related goods, number of buyers, expectations - shifts the whole curve. Rightward means more demanded at every price; leftward means less.

Quick examples. Higher income lifts demand for normal goods (eating out) and cuts demand for inferior goods (the cheapest instant noodles). Coffee turning expensive pushes tea's demand curve right. Printers getting dearer drags compatible-ink demand left, because the two go together.

Exam tip Write 'ceteris paribus' in the answer - it's the assumption doing the work. And keep the vocabulary clean: demand is the whole curve, quantity demanded is one point on it. Mixing those up costs easy marks.

03 / SUPPLY

Supply

The seller's side of the market.

Definition Supply is the relationship between the different possible prices of a good and the quantities producers are willing and able to offer for sale at those prices, over a given period, other things unchanged.

Law of supply

Other things equal, a higher price leads to a larger quantity supplied and a lower price to a smaller one. Price and quantity supplied move together, so the supply curve slopes upwards from left to right.

Think from the seller's chair. A better price makes it worth running the machine an extra hour or hiring another pair of hands. Those extra units cost more to make (marginal cost rises as you stretch capacity), so sellers only bring them out if the price covers it. Give it time, and a high price can pull entirely new sellers into the market.

Price (Rs per unit)	Quantity supplied (units per week)
30	30
40	40
50	50
60	60
70	70

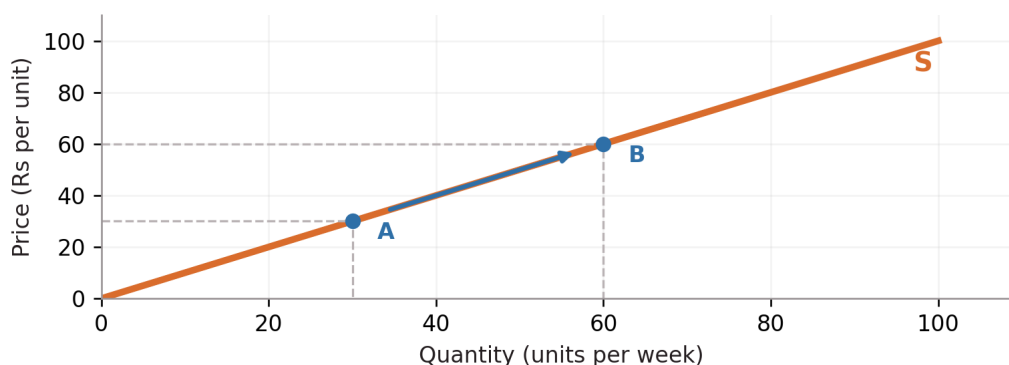


Figure 2. Supply for $Q_s = P$. Moving from A to B is an expansion of quantity supplied after the price rose.

Movement vs shift, again

Same logic as demand. Own price moves you along the curve. Input costs, technology, taxes, subsidies, the number of sellers, weather and expectations move the curve itself. Cheaper raw material or better technology shifts supply right - more offered at every price. A per-unit tax or dearer inputs shift it left. A subsidy nudges it right.

Key points Stock and supply are not the same thing. Stock is everything the seller is holding; supply is what they're willing to sell at a price over a period. And a price rise by itself never shifts supply - it only expands quantity supplied along the same curve.

04 / MARKET EQUILIBRIUM

Market equilibrium

Where the two curves meet, the market clears.

Definition Equilibrium is the point where quantity demanded equals quantity supplied ($Q_d = Q_s$). The price here is the equilibrium price (P^*), the quantity is the equilibrium quantity (Q^*). At any other

price, the market is out of balance.

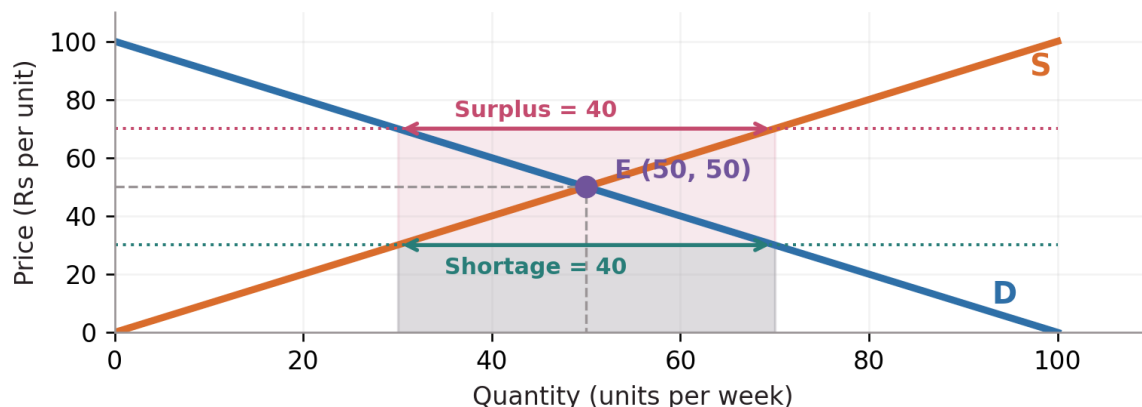


Figure 3. Demand $Q_d = 100 - P$ and supply $Q_s = P$ intersect at E. Above Rs 50 a surplus pushes price down; below it a shortage pushes price up.

Worked example: solve for P^* and Q^*

$Q_d = 100 - P$ and $Q_s = P$. At equilibrium the two are equal: $100 - P = P$, so $2P = 100$ and $P^* = \text{Rs } 50$. Substitute back into either equation: $Q^* = 50$ units per week. Check with the other equation - supply at Rs 50 is also 50, so it holds.

Price	Q_d	Q_s	Market condition
Rs 70	30	70	Surplus = $70 - 30 = 40$
Rs 50	50	50	Equilibrium
Rs 30	70	30	Shortage = $70 - 30 = 40$

Why the price tends to adjust

Above Rs 50, sellers can't move their stock. At Rs 70 there's a surplus of 40 units; unsold goods pile up, someone cuts the price, others follow. Below Rs 50 it's the mirror image: at Rs 30 buyers want 70 but only 30 exist, and disappointed buyers bid the price up. Either way the market pushes itself back to E - as long as prices are free to move.

How shifts move the equilibrium

Change (other curve fixed)	Price	Quantity
Demand increases (shifts right)	Rises	Rises
Demand decreases (shifts left)	Falls	Falls
Supply increases (shifts right)	Falls	Rises
Supply decreases (shifts left)	Rises	Falls

Exam tip When both curves shift together, one answer becomes uncertain unless you know the size of each shift. 'Both increase'? Quantity surely rises; price is uncertain. Writing that uncertainty IS the correct answer - don't force a single direction.

05 / PRICE ELASTICITY OF DEMAND

Price elasticity of demand

The law of demand gives the direction. Elasticity gives the size.

Core formula Price elasticity of demand = % change in quantity demanded / % change in price. The raw value is negative (price and quantity move opposite ways); by convention we quote its absolute value, Ed.

Everyone knows demand falls when price rises. The exam question is always: by how much? A 10% price hike that kills 30% of sales is a completely different story from one that kills 2%. Elasticity is the number that separates those stories.

1. Percentage method (original-value base)

$E_d = |(\Delta Q/Q_1) / (\Delta P/P_1)| = |(\Delta Q/\Delta P) \times (P_1/Q_1)|$. Reach for this when the question gives original values or ready-made percentage changes. One catch: reversing the direction changes the base, so the answer changes with it.

Worked example Price rises from Rs 20 to Rs 22; Qd falls from 100 to 90. $\% \Delta Q = (-10/100) \times 100 = -10\%$. $\% \Delta P = (2/20) \times 100 = 10\%$. Elasticity $= -10/10 = -1$, so $E_d = 1$: unit elastic.

2. Arc (midpoint) method

Take the averages of price and quantity as the bases, so direction stops mattering:

Midpoint formula $E_d = |[(Q_2 - Q_1) / ((Q_1 + Q_2)/2)] / [(P_2 - P_1) / ((P_1 + P_2)/2)]|$

Same numbers: average Q = 95, average P = 21. $\% \Delta Q = (-10/95) \times 100 = -10.526\%$; $\% \Delta P = (2/21) \times 100 = 9.524\%$. $E_d = 10.526 / 9.524 = 1.11$ (approx), so demand is elastic over this stretch. The answer differs from method 1 on identical data - the base changed, and that's the whole story. If the question names a method, use it; if it stays silent, state which one you picked.

3. Point elasticity

$E_d = |(dQ/dP) \times (P/Q)|$. The derivative captures responsiveness right at a point instead of across a gap. For Q = 100 - 2P, $dQ/dP = -2$. At P = Rs 20, Q = 60, so $E_d = |-2 \times 20/60| = 0.67$ - inelastic. Move up the same straight line to P = Rs 30, Q = 40, and $E_d = 1.5$ - elastic. Same line, different elasticity. Remember that; it buries the 'steep means inelastic' myth.

Geometric shortcut for a straight-line demand curve: E_d at a point = lower segment / upper segment. Midpoint of the line gives $E_d = 1$; above it elastic; below it inelastic. Straight lines only.

My numerical routine Name the method - write the formula - compute both percentage changes - substitute - state E_d - classify (elastic, inelastic, unit) - one line of meaning. The steps are where the marks sit.

06 / ELASTICITY TYPES & TOTAL REVENUE

Elasticity types & total revenue

Five labels, a handful of determinants and one revenue rule.

Type	Value of E_d	What it means
Perfectly inelastic	$E_d = 0$	Quantity does not budge when price changes (vertical curve).
Relatively inelastic	$0 < E_d < 1$	Quantity responds by a smaller percentage than price.
Unit elastic	$E_d = 1$	Equal percentage responses both ways.
Relatively elastic	$E_d > 1$	Quantity responds by a larger percentage than price.
Perfectly elastic	E_d tends to infinity	Any price above the going rate kills demand entirely (horizontal curve).

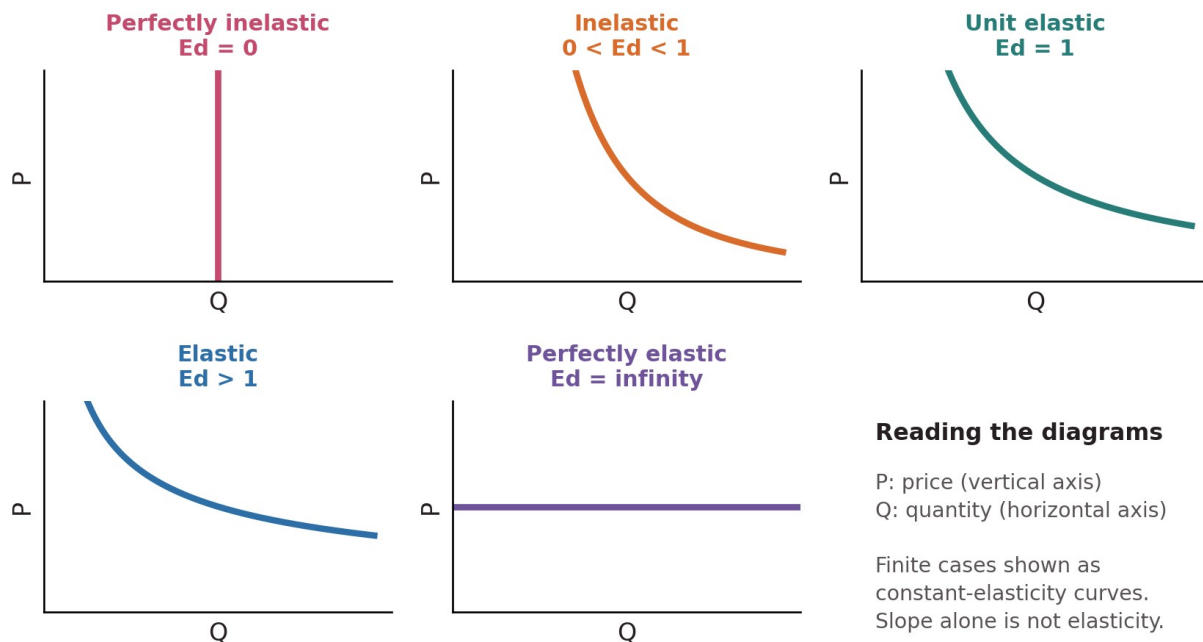


Figure 4. The five cases at a glance. The unit-elastic curve is a rectangular hyperbola; the extremes are straight vertical and horizontal lines.

What makes demand more elastic?

Four things, mostly. Close substitutes (dozens of cola brands - elastic; electricity - not). Share of the budget (a 50% jump in salt prices barely registers; 50% on rent really does). Time to adjust (petrol demand is stubborn across a week, flexible across a year). And how narrowly the good is defined ('food' is inelastic; one particular basmati brand is anything but). Necessities cluster at the inelastic end, luxuries at the elastic end.

Total revenue and the price test

$TR = P \times Q$. The test every pricing question wants: for a small price rise, elastic demand means TR falls; inelastic means TR rises; unit elastic means TR barely moves. A price cut flips the first two.

Watch it work: price drops from Rs 10 to Rs 9 and sales climb from 100 to 120 units. TR goes from Rs 1,000 to Rs 1,080 - up. Midpoint $E_d = (20/110) / (1/9.5) = 1.73$ (approx), elastic, exactly what the revenue rise predicts. The number and the revenue movement always tell the same story, so use one to check the other.

Avoid this error Slope is not elasticity. Slope uses plain changes ($\Delta Q/\Delta P$); elasticity uses percentage changes, and it varies along a single straight line. Never judge elasticity from how steep a drawn curve looks.

07 / INCOME & CROSS-PRICE ELASTICITY

Income & cross-price elasticity

Two elasticities where something other than own price does the moving.

Income elasticity of demand (E_y)

Formula $E_y = \% \text{ change in quantity demanded} / \% \text{ change in income}$. Keep the sign - it carries the meaning.

Positive E_y : a normal good. Negative E_y : an inferior good, where demand falls as incomes rise - the cheapest rice quietly swapped for basmati. Within normal goods, E_y below 1 is income-inelastic (necessities behave this way) and E_y above 1 is income-elastic (the luxury pattern). One caution: 'inferior' describes the income response, not poor quality.

Worked example Income rises from Rs 20,000 to Rs 22,000 (+10%); quantity demanded rises from 50 to 60 units (+20%). $E_y = 20/10 = +2$: normal and income-elastic. A 1% income rise pushes

demand up by about 2%.

Cross-price elasticity of demand (Exy)

Formula $E_{xy} = \% \text{ change in quantity demanded of good X} / \% \text{ change in price of good Y}$. Again, keep the sign.

Sign of E_{xy}	Relationship	Everyday pair
$E_{xy} > 0$	Substitutes	Tea and coffee
$E_{xy} < 0$	Complements	Printers and compatible ink
$E_{xy} = 0$	Unrelated	Rice and bicycle tyres

Substitutes first: coffee rises from Rs 100 to Rs 110 (+10%) and tea demand climbs from 200 to 230 units (+15%). $E_{xy} = +1.5$. Tea and coffee substitute for each other - and the size, 1.5, says the switching is strong.

Now complements: printer prices up 10%, compatible-ink demand down 20%. $E_{xy} = -2$. Watch the numerator carefully - it is the quantity of the OTHER good. Dividing by ink's own price would be own-price elasticity, a different answer entirely.

Why a business cares

Price elasticity before touching the MRP. Cross-price elasticity to track rivals and linked products. Income elasticity to plan for boom years and slowdown years. Three numbers, three different decisions.

Key point Taking the absolute value is a convention for own-price elasticity only. For income and cross-price elasticity the sign IS the answer. Never drop it.

08 / FORMULA SHEET & EXAM STRATEGY

Formula sheet & exam strategy

Everything worth memorising, collected in one place.

Concept	Formula / condition
Equilibrium	$Q_d = Q_s$. Solve for P^* , substitute back for Q^* .
Shortage / surplus	Shortage = $Q_d - Q_s$; surplus = $Q_s - Q_d$.
Percentage change	$\% \Delta X = [(X_2 - X_1) / X_1] \times 100$ (original base).
Price elasticity, original base	$E_d = (\Delta Q / Q_1) / (\Delta P / P_1) = (\Delta Q / \Delta P) \times (P_1 / Q_1) $
Price elasticity, midpoint	$E_d = (\Delta Q / Q_{avg}) / (\Delta P / P_{avg}) $, with averages of the two points
Point price elasticity	$E_d = (dQ/dP) \times (P/Q) $
Income elasticity	$E_y = \% \Delta Q_d / \% \Delta Y$ (retain the sign)
Cross-price elasticity	$E_{xy} = \% \Delta Q_x / \% \Delta P_y$ (retain the sign)
Total revenue	$TR = P \times Q$, using the actual quantity sold

Distinctions that quietly earn marks

- Demand and supply are whole schedules or curves; quantity demanded and quantity supplied are single points at particular prices.
- Own-price changes cause movements along a curve; changes in other determinants shift the curve.
- The law of demand states a direction; elasticity states the size of the response. Elasticity has no units.
- Equilibrium means planned purchases equal planned sales - not that the outcome is fair or ideal.

How I structure an exam answer

Theory: definition first, then the law with its assumption, then the mechanism, a labelled diagram, a two-line example, and a closing line. Numerical: formula, method, substitution, result, meaning. Never skip the last one - interpretation marks are the easiest marks on the paper.

Last-minute checks P on the vertical axis, Q on the horizontal. Same good for own-price formulas, two different goods for cross-price. Never mix original and midpoint bases in one calculation. Keep negative signs on income and cross elasticities. If the method is not specified, name the one you are using.

09 / PRACTICE QUESTIONS 1-5

Practice questions 1-5

Theory and application. Attempt each one before reading the answer.

01. Define demand and state the law of demand. Why does the demand curve usually slope downward?

Answer: Demand is the set of quantities buyers are willing and able to purchase at different prices over a period. The law of demand: other things equal, a price rise cuts quantity demanded and a price fall raises it. The curve slopes down because of the substitution effect (buyers drift to relatively cheaper options), the income effect (a lower price stretches a fixed income further) and falling marginal utility - extra units tempt us only at lower prices.

02. Distinguish an expansion of quantity demanded from an increase in demand, with examples.

Answer: Expansion is a movement down the SAME demand curve, caused by a fall in the good's own price: tea gets cheaper, more tea is bought. An increase in demand is a rightward shift of the whole curve, caused by a non-price factor: coffee turns expensive and tea demand rises at every tea price. Price change = movement; anything else = shift. Name the cause and say which of the two is happening.

03. State the law of supply and explain two factors that can shift the supply curve.

Answer: Other things equal, a higher price raises quantity supplied and a lower price reduces it - the curve slopes upward. Two shifters: input costs (dearer inputs shift supply left, since each unit costs more to produce) and technology (better methods shift supply right, since producers can offer more at every price). Own price never shifts the curve; it only moves us along it.

04. If $Q_d = 120 - 2P$ and $Q_s = 20 + 3P$, find the equilibrium. At $P = \text{Rs } 25$, identify the imbalance.

Answer: Set them equal: $120 - 2P = 20 + 3P$, so $100 = 5P$ and $P^* = \text{Rs } 20$. Then $Q^* = 120 - 2(20) = 80$ units, and Q_s gives $20 + 3(20) = 80$, so it checks. At Rs 25: $Q_d = 70$ and $Q_s = 95$, a surplus of 25 units. Sellers stuck with unsold stock cut prices, pulling the market back towards equilibrium.

05. Demand increases while supply is unchanged. Explain the effect on equilibrium and describe the diagram.

Answer: Demand shifts right from D_0 to D_1 while S stays put. At the old price, buyers now want more than sellers offer - a shortage appears and pushes the price up. Sellers respond by expanding quantity supplied along S . The new equilibrium has a higher price AND a higher quantity. In the diagram: P vertical, Q horizontal, one upward S , two downward demand curves, and label both intersections E_0 and E_1 .

Self-check In answers 1-3, include the phrase 'other things equal'. In 4, show the substitution into both equations. In 5, keep the demand shift and the movement along supply clearly separate.

10 / PRACTICE QUESTIONS 6-10

Practice questions 6-10

Numericals. Round final elasticities to two decimals and say what the number means.

06. Price rises from Rs 40 to Rs 44; Qd falls from 200 to 170. Find Ed using original-value percentages.

Answer: $\% \Delta P = (4/40) \times 100 = 10\%$. $\% \Delta Q = (-30/200) \times 100 = -15\%$. $E_d = |-15/10| = 1.50$. Elastic - quantity reacted more strongly than price did.

07. Price falls from Rs 12 to Rs 10; Qd rises from 80 to 100. Find midpoint Ed.

Answer: $Q_{avg} = 90$, $P_{avg} = 11$. $\% \Delta Q = (20/90) \times 100 = 22.222\%$. $\% \Delta P = (-2/11) \times 100 = -18.182\%$. $E_d = |22.222 / -18.182| = 1.22$ (approx). Elastic across this interval - and because the base is the average, the same answer comes out in reverse.

08. Income rises from Rs 30,000 to Rs 33,000; Qd rises from 40 to 42. Find Ey and classify the good.

Answer: $\% \Delta Y = (3,000/30,000) \times 100 = 10\%$. $\% \Delta Q = (2/40) \times 100 = 5\%$. $E_y = 5/10 = +0.50$. Positive, so a normal good; below 1, so income-inelastic - the typical necessity pattern. Don't call it inferior: inferior needs a negative sign.

09. The price of good Y rises by 8%; demand for good X falls by 12%. Find Exy and state the relationship.

Answer: $E_{xy} = -12/8 = -1.50$. Negative, so X and Y are complements - dearer Y drags demand for X down with it. A positive result would have meant substitutes.

10. For Q = 120 - 2P, calculate point Ed at P = Rs 20. Would a small price rise increase or reduce total revenue?

Answer: At $P = 20$, $Q = 120 - 40 = 80$, and $dQ/dP = -2$. $E_d = |-2 \times 20/80| = 0.50$ - inelastic. So a small price rise increases total revenue. Quick check: TR at Rs 20 is $20 \times 80 = \text{Rs } 1,600$; at Rs 21, $Q = 78$ and $TR = 21 \times 78 = \text{Rs } 1,638$. Up Rs 38, exactly as the elasticity predicted.

Final revision test Can you define each concept, draw and label all four diagrams, pick the right elasticity method, keep the right signs, and explain what your answer means in plain words? If yes, this unit is done.

Sources checked: OpenStax, Principles of Economics 3e, sections 3.1, 3.2, 5.1, 5.2 and 5.4 (openstax.org). Explanations paraphrased; all numeric examples and figures are original.