IIT JAM Economics

Sample Paper – 5

Duration: 180 Minutes **Maximum Marks: 100**

Instructions

- This paper contains **60 questions** in three sections, modelled on the IIT Joint Admission Test for M.Sc. (JAM) — **Economics (EN)** paper.
- **Section A (Q1–Q30) — MCQ (Single Correct):** Q1–Q10 carry **1 mark** each; Q11–Q30 carry **2 marks** each. Wrong answers carry $-\frac{1}{3}$ mark (1-mark Qs) or $-\frac{2}{3}$ mark (2-mark Qs).
- **Section B (Q31–Q40) — MSQ (One or More Correct):** Each question carries **2 marks**. Full marks awarded only if **all** correct options are selected and **no** incorrect option is chosen. **No negative marking.**
- **Section C (Q41–Q60) — NAT (Numerical Answer Type):** Q41–Q50 carry **1 mark** each; Q51–Q60 carry **2 marks** each. Type the exact numerical answer. **No negative marking.**
- **Calculator policy:** Personal calculators, log tables, mobile phones, and other electronic gadgets are strictly prohibited. A **virtual scientific calculator** is provided on-screen. Rough sheets are supplied at the examination centre.

Section A — Multiple Choice Questions (MCQ)

- **Q1–Q10:** 1 mark each; $-\frac{1}{3}$ mark per incorrect answer.
- **Q11–Q30:** 2 marks each; $-\frac{2}{3}$ mark per incorrect answer.

Q1. Which of the following statements **correctly** describes a **Giffen good**?

(A) A Giffen good is a luxury good whose demand rises with income because of a strong positive income effect.

(B) A Giffen good is an inferior good for which the positive income effect (working against the price rise) outweighs the negative substitution

effect when its price rises, causing quantity demanded to *increase*.

(C) A Giffen good has a perfectly inelastic demand curve, so its quantity demanded does not respond to any price change.

(D) A Giffen good is characterised by zero cross-price elasticity with all other goods in the economy.

Q2. Which statement **correctly** distinguishes the **GDP deflator** from the **Consumer Price Index (CPI)**?

(A) The GDP deflator measures the cost of a fixed basket of consumer goods and services, whereas the CPI covers all goods produced in the economy including capital goods.

(B) The CPI excludes imported goods from its basket, while the GDP deflator includes the prices of all goods consumed domestically.

(C) The CPI measures the cost of a *fixed* base-year basket of consumer goods, while the GDP deflator covers all domestically produced goods (including investment and government purchases) and *excludes imports*.

(D) Both the CPI and the GDP deflator use current-year quantities to weight prices, making them equivalent measures of economy-wide inflation.

Q3. Let X and Y be **independent** random variables with $\mathrm{Var}(X) = 9$ and $\mathrm{Var}(Y) = 16$. The variance $\mathrm{Var}(2X - 3Y)$ equals:

(A) 180.

(B) 144.

(C) 36.

(D) -108.

Q4. Using **L'Hôpital's rule**, evaluate $\displaystyle\lim_{x \to 0} \frac{e^x - 1}{\sin x}$.

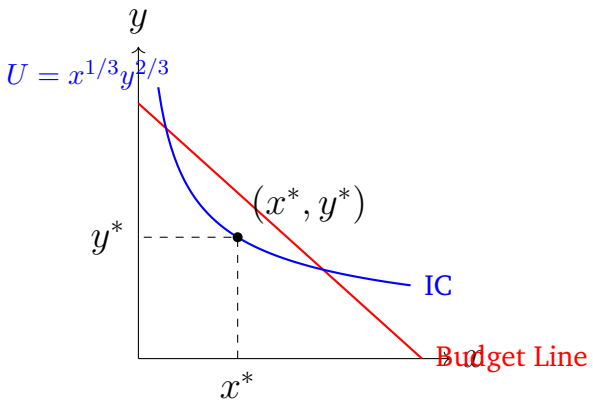
(A) 0.

(B) e.

(C) ∞.

(D) 1.

Q5. A consumer maximises $U(x, y) = x^{1/3} y^{2/3}$ subject to the budget constraint $p_x x + p_y y = M$. The diagram below shows the tangency of an indifference curve with the budget line at the optimal bundle (x^*, y^*).



(A) Two-thirds $(2/3)$ of income is optimally spent on good x.

(B) One-third $(1/3)$ of income is optimally spent on good x, equal to the exponent of x in the utility function.

(C) One-quarter $(1/4)$ of income is spent on good x regardless of prices.

(D) One-half $(1/2)$ of income is spent on each good since the utility function has constant returns to scale.

Q6. In the strict (classical) **Quantity Theory of Money** $(MV = PY)$, if velocity V and real output Y are held constant, which of the following must hold?

(A) Any increase in the money supply M raises real output Y proportionally, validating the activist monetary policy stance.

(B) The velocity of money V is always procyclical, rising during economic expansions.

(C) A doubling of the money supply M leads to a doubling of the price level P, with no effect on real output.

(D) The equation $MV = PY$ implies that inflation is always driven by real-sector supply shocks rather than monetary expansion.

Q7. The **National Bank for Agriculture and Rural Development (NABARD)**, established in 1982, primarily functions as:

(A) A apex development bank that provides refinance support and development assistance to rural cooperative banks, regional rural banks (RRBs), and microfinance institutions engaged in agricultural and rural lending.

(B) A commercial bank that directly accepts deposits from and extends home mortgage loans to rural households.

(C) A tax-collection authority that levies and administers agricultural income tax on behalf of state governments.

(D) A regulator of equity and bond markets in rural India, functioning as the rural counterpart of SEBI.

Q8. Which of the following statements about the **chi-square distribution** $\chi^2(k)$ is **correct**?

(A) The $\chi^2(k)$ distribution is symmetric about its mean for all values of k.

(B) The $\chi^2(k)$ distribution can take negative values when the degrees of freedom k is small.

(C) The mean of a $\chi^2(k)$ random variable is $k/2$.

(D) A $\chi^2(k)$ random variable is defined as the sum of k independent squared standard normal variables $Z_1^2 + Z_2^2 + \cdots + Z_k^2$, and its mean equals k.

Q9. A square matrix A is said to be **positive semi-definite (PSD)** if and only if:

(A) All eigenvalues of A are strictly positive (i.e., $\lambda_i > 0$ for all i).

(B) All eigenvalues of A are non-negative ($\lambda_i \geq 0$ for all i), equivalently $\mathbf{x}^\top A\,\mathbf{x} \geq 0$ for every vector $\mathbf{x}$.

(C) The determinant of A is strictly positive ($\det(A) > 0$).

(D) A is invertible (non-singular) and symmetric.

Q10. The **Sen poverty index** (P_{Sen}) is preferred over the simple Head Count Ratio (HCR) because:

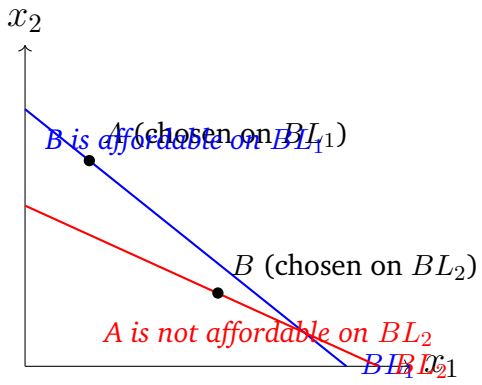
(A) The Sen index equals the square of the head count ratio, making it more sensitive to extreme poverty.

(B) The Sen index, like the HCR, counts only those individuals below the poverty line, but uses a different poverty line threshold.

(C) The Sen index incorporates the *distribution of income among the poor* through the Gini coefficient of the poor (G_p), so it is sensitive to income transfers among the poor and to the depth of poverty, unlike the HCR.

(D) The Sen index is simpler to compute than the HCR and requires no data on individual incomes.

Q11. Which of the following statements **correctly** describes the **Weak Axiom of Revealed Preference (WARP)**?



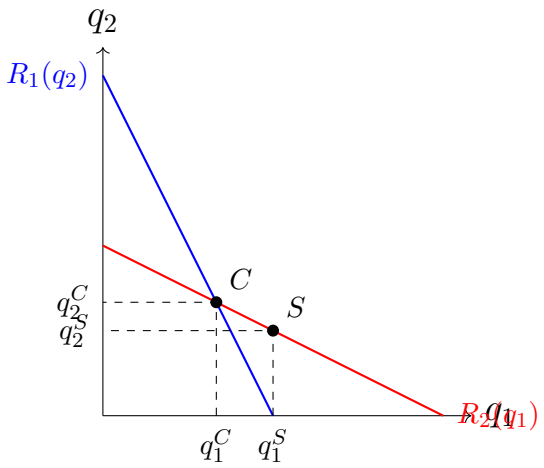
(A) If bundle A is revealed preferred to bundle B (i.e., A is chosen when B is affordable), then B must never be chosen when A is also affordable.

(B) A consumer who satisfies WARP must necessarily have convex and transitive preferences over all bundles.

(C) WARP implies that the Slutsky substitution matrix is positive definite, not merely negative semi-definite.

(D) WARP is a stronger condition than the Strong Axiom of Revealed Preference (SARP) and implies full rational preference recovery.

Q12. In the diagram below, $R_1(q_2)$ and $R_2(q_1)$ are the best-response (reaction) functions of Firm 1 and Firm 2. Point C is the symmetric **Cournot–Nash** equilibrium; point S is the **Stackelberg** equilibrium with Firm 1 as leader. Compared to the Cournot equilibrium, which statement about the Stackelberg outcome is **correct**?



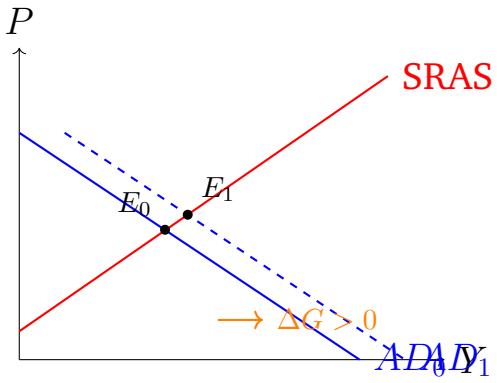
(A) Total industry output is *lower* under Stackelberg than Cournot, leading to a higher market price and higher joint profits.

(B) Both the Stackelberg leader and follower earn strictly higher profits than their respective Cournot profits.

(C) The Stackelberg leader produces *more* output than in Cournot equilibrium and earns a higher profit; total industry output is higher and market price is lower under Stackelberg.

(D) The Stackelberg follower earns the same profit as the leader because the Nash equilibrium condition restores symmetry.

Q13. In the short-run **Aggregate Demand – Aggregate Supply (AD-AS)** model, the effect of an **expansionary fiscal policy** (increase in government expenditure $\Delta G > 0$) in a closed economy is illustrated below. Which of the following **correctly** describes the impact?



(A) The SRAS curve shifts rightward as firms increase production capacity in response to higher government demand.

(B) The AD curve shifts rightward, raising both the equilibrium price level and equilibrium output in the short run.

(C) The AD curve shifts leftward as higher government borrowing crowds out private spending.

(D) Fiscal policy has no effect on output if prices are fully flexible, since the SRAS curve is horizontal at the natural rate.

Q14. Which of the following best describes the **key insight** of **Romer's (1990) model of endogenous technological change**?

(A) Capital accumulation alone, without technological progress, is the primary engine of sustained long-run per-capita growth.

(B) Government investment in public infrastructure permanently raises the balanced growth rate of the economy.

(C) The Solow residual (TFP) fully and satisfactorily explains observed differences in long-run growth rates across countries.

(D) New ideas (blueprints/designs) are *non-rival* goods that generate increasing returns in the aggregate; this enables sustained per-capita

growth driven by intentional private R&D investment rewarded through monopoly rents from innovation.

Q15. In the classical linear regression model $Y = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$, suppose the error terms are **heteroscedastic** (i.e., $\mathrm{Var}(\varepsilon_i) = \sigma_i^2$ varies across observations). Which statement is **correct**?

(A) The OLS estimators remain *unbiased* and *consistent*, but are no longer efficient (BLUE). The conventional OLS standard errors are biased, leading to unreliable t-tests and confidence intervals.

(B) The OLS estimators become biased and inconsistent when heteroscedasticity is present, so the OLS coefficients themselves are unreliable.

(C) OLS with heteroscedastic errors still achieves lower variance than GLS (Generalised Least Squares), making OLS preferable.

(D) Heteroscedasticity can safely be ignored in large samples because the central limit theorem corrects all inference problems asymptotically.

Q16. Evaluate $\displaystyle\int x\, e^x \, dx$ using integration by parts.

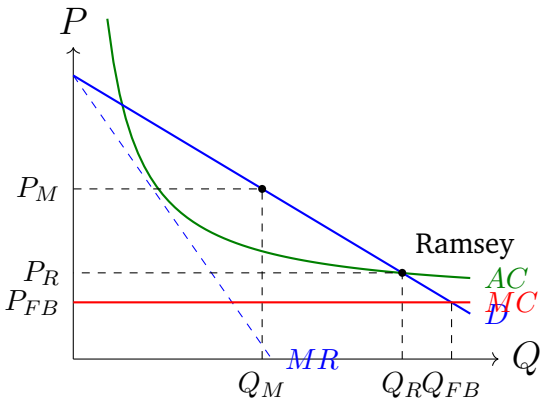
(A) $x\, e^x + C$.

(B) $e^x(x+1) + C$.

(C) $\dfrac{x^2\, e^x}{2} + C$.

(D) $e^x(x-1) + C$.

Q17. **Ramsey pricing** for a regulated natural monopoly is illustrated below, where AC is always declining (natural monopoly), D is the demand curve, MR is marginal revenue, and MC is constant marginal cost. Which statement **correctly** describes Ramsey pricing?



(A) Set price equal to marginal cost at all output levels, accepting government subsidies to cover the loss arising from declining AC.

(B) Apply a uniform percentage markup over marginal cost for every output level, without regard for demand elasticity differences.

(C) Set price above MC so the firm exactly breaks even ($P = AC$), with the markup above MC chosen to be *inversely proportional* to the price elasticity of demand — higher markups on more inelastic segments.

(D) Provide a lump-sum government subsidy equal to the firm's fixed costs so the firm can price at MC without incurring losses.

Q18. Which statement best describes **Friedman's Permanent Income Hypothesis (PIH)**?

(A) Consumption is based on a consumer's lifetime wealth (financial plus human capital), spread evenly over the remaining life horizon (Modigliani's Life-Cycle Hypothesis).

(B) Consumption is proportional to *permanent income* Y^P (the expected long-run average income): $C = \alpha Y^P$, where transitory income changes have little to no effect on current consumption.

(C) Consumption equals a fixed fraction b of *current* disposable income plus autonomous consumption: $C = a + bY_d$ (Keynes' Absolute Income Hypothesis).

(D) Consumers maintain a relatively constant ratio of consumption to income by keeping up with the spending patterns of their social reference group (Duesenberry's Relative Income Hypothesis).

Q19. The **statistical power** of a hypothesis test is defined as:

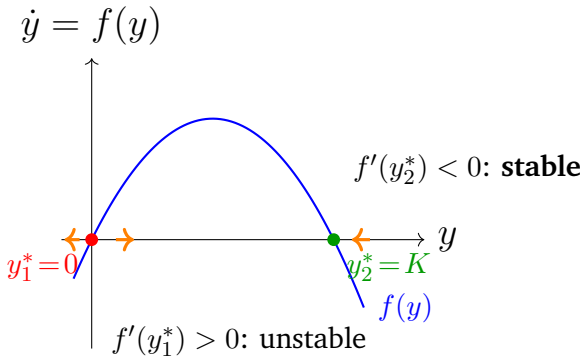
(A) The probability of *correctly rejecting* a false null hypothesis: Power $= P(\text{reject } H_0 \mid H_0 \text{ is false}) = 1 - \beta$, where β is the Type II error probability.

(B) The probability of correctly *accepting* the null hypothesis when it is true, equal to $1 - \alpha$.

(C) The significance level α (the probability of a Type I error, i.e., rejecting H_0 when it is actually true).

(D) A quantity that always increases with sample size but is entirely unaffected by the magnitude of the true effect size.

Q20. The phase portrait below shows $\dot{y} = f(y)$ for the logistic equation $\dot{y} = y(1 - y/K)$, with equilibria at $y_1^* = 0$ and $y_2^* = K$. For a general autonomous ODE $\dot{y} = f(y)$, an equilibrium y^* is **asymptotically stable** if and only if:



(A) $f(y^*) > 0$ (the function value is positive at the equilibrium).

(B) $f'(y^*) > 0$ (the slope of f is positive at the equilibrium).

(C) $f'(y^*) < 0$ (perturbations are dampened: if $y > y^*$, then $\dot{y} < 0$ pulling y back, and vice versa).

(D) $f(y^*) = 1$ (the function value equals unity at the equilibrium).

Q21. Which of the following **correctly** describes **backward induction** in extensive-form games of *perfect information*?

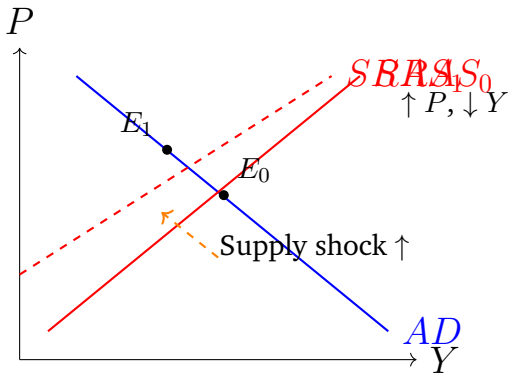
(A) Backward induction applies only to games with simultaneous moves, where players choose strategies without observing opponents' actions.

(B) Backward induction always yields a unique Nash equilibrium even in games with imperfect information and multiple equilibria.

(C) Backward induction determines equilibrium strategies by starting from the first decision node and working forward through the game tree.

(D) Backward induction determines the optimal action at each terminal (last-stage) decision node and rolls back to determine strategies at earlier nodes, yielding a **Subgame Perfect Nash Equilibrium (SPNE)**.

Q22. **Cost-push inflation** is best explained in the AD-AS framework as illustrated below. Which statement **correctly** describes cost-push inflation?



(A) Cost-push inflation results from an adverse supply shock (e.g., a sharp rise in oil prices or wages) that shifts the SRAS curve *leftward*, raising the price level while simultaneously reducing output — leading to stagflation in severe cases.

(B) Cost-push inflation is caused by excessive growth in aggregate demand (e.g., from expansionary monetary policy), which pulls prices upward.

(C) Cost-push inflation is always accompanied by a fall in unemployment, consistent with a movement along the short-run Phillips curve.

(D) Cost-push inflation can be permanently cured by sustained expansionary monetary policy, which restores the economy to its original price level.

Q23. An estimator $\hat{\theta}_n$ is said to be an **unbiased** estimator of the parameter θ if:

(A) It converges in probability to θ as the sample size $n \to \infty$ (this is the definition of *consistency*, not unbiasedness).

(B) Its expected value equals the true parameter for *every* finite sample size n and for all values of θ: $E[\hat{\theta}_n] = \theta$.

(C) It has the smallest variance among all estimators of θ, making it efficient by definition.

(D) It is the maximum likelihood estimator (MLE) of θ, since MLEs are always unbiased.

Q24. An $n \times n$ matrix A is **diagonalisable** (over $\mathbb{R}$ or $\mathbb{C}$) if and only if:

(A) It has n *distinct* eigenvalues (this is a sufficient condition but is *not* necessary for diagonalisability).

(B) Its determinant is non-zero (invertibility does not imply diagonalisability and vice versa).

(C) It has n linearly independent eigenvectors, equivalently, the algebraic multiplicity of every eigenvalue equals its geometric multiplicity.

(D) It is a symmetric matrix (symmetry is sufficient for real diagonalisability but is not a necessary condition for general diagonalisability).

Q25. Which of the following statements about **Special Economic Zones (SEZs) in India** is **correct**?

(A) India's first SEZ was established under the Special Economic Zones Act, 2000, which unified all earlier Export Processing Zones (EPZs) under a single legal framework.

(B) SEZ units are subject to the full domestic labour laws and tax regime without any special exemptions or simplified procedures.

(C) SEZ units are prohibited from exporting goods or services and must supply only to the domestic tariff area.

(D) The Special Economic Zones Act, 2005 grants SEZ units tax incentives (including income-tax exemptions for initial years), customs duty exemptions on imports of goods for production, and a single-window clearance mechanism to promote export-oriented activities.

Q26. Which statement about the **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)** is **correct**?

(A) MGNREGA guarantees at least **100 days** of wage employment per financial year to every rural household whose adult members are willing to do unskilled manual work, with the state obligated to provide work or pay an unemployment allowance.

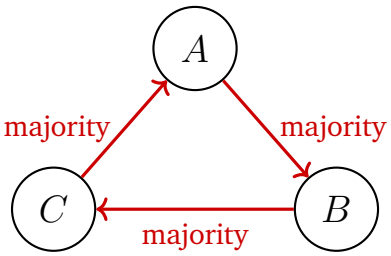
(B) MGNREGA covers both urban and rural areas, providing guaranteed employment to all workers regardless of location.

(C) MGNREGA is a direct income transfer scheme (similar to Universal Basic Income) that provides cash to households without requiring any work in return.

(D) Under MGNREGA, wage rates are set by the Central Government at a uniform national minimum wage applicable equally across all states and union territories.

Q27. **Arrow's Impossibility Theorem** is illustrated below by the Condorcet paradox: with three alternatives A, B, C and three individuals, majority voting produces a cycle. The theorem states that:

Cyclic majority preference: $A \succ B \succ C \succ A$



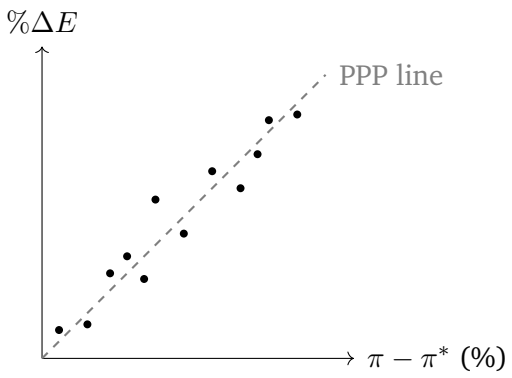
(A) Majority voting always produces a consistent (transitive) social preference ordering, avoiding cycles such as the one above for any number of alternatives.

(B) No social welfare function can simultaneously satisfy all four of: *Unrestricted Domain* (U), *Pareto Efficiency* (P), *Independence of Irrelevant Alternatives* (IIA), and *Non-dictatorship*.

(C) A benevolent social planner acting as a dictator can always find a Pareto-optimal social allocation that reflects the true preferences of all individuals.

(D) The Condorcet paradox of cyclic majority preferences can always be resolved by assigning different voting weights to individuals with more intense preferences.

Q28. The scatter plot below illustrates the empirical relationship between the inflation differential $(\pi - \pi^*)$ and the percentage change in the exchange rate $\%\Delta E$ for a cross-section of countries, with the 45° PPP prediction line. Which statement **correctly** describes **relative Purchasing Power Parity (PPP)**?



(A) Exchange rates between any two countries are determined solely by bilateral trade flows, with no role for capital flows or financial assets.

(B) The *level* of the nominal exchange rate equals the ratio of domestic to foreign real per-capita income.

(C) The *percentage change* in the nominal exchange rate approximately equals the difference between domestic and foreign inflation rates: $(\Delta E/E) \approx \pi - \pi^*$ (relative PPP).

(D) Relative PPP holds exactly in the short run (within months) but systematically breaks down over longer horizons due to structural changes.

Q29. Let $F(x, y) = x^3 + y^3 - 3xy = 0$ define y implicitly as a differentiable function of x in a neighbourhood of a point where $F_y \neq 0$. By the **Implicit Function Theorem**, $\dfrac{dy}{dx}$ equals:

(A) $\dfrac{F_y}{F_x}$.

(B) $F_x \cdot F_y$.

(C) $-F_x \cdot F_y$.

(D) $-\dfrac{F_x}{F_y}$.

Q30. Which statement **correctly** describes the **Pradhan Mantri Jan Dhan Yojana (PMJDY)**?

(A) PMJDY, launched in August 2014, is India's flagship national financial inclusion mission aimed at providing every household with a basic savings bank account (zero-balance), access to credit, micro-insurance, and pension facilities.

(B) PMJDY focuses exclusively on providing micro-enterprise credit to small businesses in urban semi-formal sectors, with no mandate to cover rural households.

(C) PMJDY is a tax-exempt fixed-deposit savings scheme designed primarily to encourage long-term savings among senior citizens above 60 years of age.

(D) PMJDY was launched in 2010 during the UPA government as a component of the Swabhimaan financial literacy campaign.

Section B — Multiple Select Questions (MSQ)

- **Q31–Q40:** 2 marks each. No negative marking. Full marks only if **all** correct options are selected.

Q31. [MSQ — one or more options may be correct.] Which of the following statements about **Bertrand price competition** with **homogeneous goods** and **equal constant marginal costs** are **correct**?

(A) In a Bertrand equilibrium, market price equals marginal cost ($P = MC$) and each firm earns zero economic profit — the *Bertrand paradox*.

(B) Bertrand competition achieves the perfectly competitive outcome (zero profit, $P = MC$) even with only *two* firms (duopoly) in the market.

(C) The Bertrand equilibrium price is strictly higher than the Cournot equilibrium price when firms have identical marginal costs.

(D) Under Bertrand competition with homogeneous goods and equal costs, equilibrium price is always above average cost, ensuring positive profits for each firm.

Q32. [MSQ — one or more options may be correct.] Consider a **Stackelberg duopoly** (Firm 1 as leader, Firm 2 as follower) and a **symmetric Cournot duopoly** with identical cost functions. Which of the following comparisons are **correct**?

(A) Total industry output is *lower* under Stackelberg than under Cournot, so the market price is higher under Stackelberg.

(B) Both the leader and the follower earn *higher* profits under Stackelberg than under the Cournot equilibrium.

(C) The Stackelberg equilibrium is a Nash equilibrium in output space: given the leader's output, the follower's output is a best response, and the leader has no incentive to deviate.

(D) In the Stackelberg equilibrium, the leader produces *more* than in Cournot, total output is higher, and the market price is lower than in the Cournot outcome.

Q33. [MSQ — one or more options may be correct.] In a **closed-economy IS-LM model** with a fixed nominal money supply, an increase in government expenditure ($\Delta G > 0$) causes which of the following?

(A) The IS curve shifts *rightward* by the Keynesian multiplier $\times \Delta G$.

(B) The equilibrium interest rate r^* rises (the LM curve being unchanged, a higher IS requires a higher r to clear the money market).

(C) Private investment is partially *crowded out*: the rise in r reduces investment spending, so the net stimulus to output is less than the full multiplier effect.

(D) The LM curve shifts rightward because higher income raises the demand for money, requiring an increase in money supply.

Q34. [MSQ — one or more options may be correct.] Which of the following statements about the **Heckscher-Ohlin (H-O) model** and the **Stolper-Samuelson theorem** are **correct**?

(A) The H-O theorem attributes international comparative advantage to *technology differences* between countries, analogous to the Ricardian model.

(B) The H-O theorem predicts that each country exports the good that uses its *relatively abundant factor* intensively (factor endowment-based trade).

(C) The Stolper-Samuelson theorem states that free trade benefits *all* factors of production in both trading countries.

(D) According to the Stolper-Samuelson theorem, a rise in the relative price of a good increases the real return to the factor used *intensively* in its production and reduces the real return to the other factor.

Q35. [MSQ — one or more options may be correct.] Which of the following conditions are **necessary** for a firm to practise **price discrimination** profitably?

(A) The firm must possess *market power* (be a price-setter rather than a price-taker in competitive equilibrium).

(B) All buyers must have *identical* demand functions, so that a single price schedule applies uniformly.

(C) The firm must be able to *segment* the market — identify or sort buyers (or groups of buyers) with different willingness to pay.

(D) *Arbitrage* (resale from low-price segments to high-price segments) must be effectively prevented, otherwise buyers in the cheap segment will undercut the firm's high price.

Q36. [MSQ — one or more options may be correct.] Which of the following statements **correctly characterise oligopoly markets**?

(A) Due to free and unrestricted entry, oligopoly firms always earn zero economic profit in the long run, just like perfectly competitive firms.

(B) In an oligopoly, each firm's profit-maximising output or price decision depends on the anticipated reactions of rival firms (*strategic interdependence*).

(C) The **kinked demand curve** model of oligopoly predicts price *rigidity*: the demand curve is more elastic above the prevailing price (rivals do not follow price increases) but less elastic below (rivals match price cuts), creating a kink.

(D) All oligopoly markets inevitably produce at the competitive equilibrium quantity and price, as though the industry were perfectly competitive.

Q37. [MSQ — one or more options may be correct.] Which of the following statements about **properties of estimators** are **correct**?

(A) A **sufficient statistic** $T(X_1, \ldots, X_n)$ for parameter θ contains all the

information about θ that is available in the sample: the conditional distribution of the data given T does not depend on θ.

(B) The **Cramér–Rao lower bound** gives the minimum variance that any unbiased estimator of θ can achieve in a parametric family.

(C) If an estimator is *consistent* (converges to θ as $n \to \infty$), then it must also be unbiased in every finite sample.

(D) An unbiased estimator whose variance achieves the Cramér–Rao lower bound is called an **efficient estimator** (equivalently, the MVUE — Minimum Variance Unbiased Estimator — in regular parametric families).

Q38. [MSQ — one or more options may be correct.] Which of the following are **direct monetary policy instruments** used by the **Reserve Bank of India (RBI)**?

(A) The personal income tax rate, set by the Finance Ministry in the Union Budget.

(B) Government expenditure on public infrastructure projects, as determined by the Ministry of Finance.

(C) The **Cash Reserve Ratio (CRR)**: the fraction of a bank's net demand and time liabilities that must be held as cash with the RBI, directly controlling bank liquidity.

(D) The **Repo rate**: the rate at which commercial banks borrow short-term funds from the RBI against eligible collateral; it is the RBI's key policy interest rate.

Q39. [MSQ — one or more options may be correct.] Which of the following statements about the **Leontief input-output model** are **correct**?

(A) The input-output model captures *inter-industry linkages*: each sector uses outputs of other sectors as intermediate inputs in its production process.

(B) The **Leontief inverse** $(I - A)^{-1}$ (where A is the matrix of direct technical coefficients) gives the total output required from *each* sector to

deliver one unit of final demand from any given sector.

(C) In the Leontief framework, final demand is *endogenously* determined by the technical coefficients of the production structure.

(D) The direct technical coefficient a_{ij} represents the *total* (direct plus all indirect) input of industry i required per unit of output of industry j.

Q40. [MSQ — one or more options may be correct.] Which of the following statements about **growth accounting** and the **Solow residual** are **correct**?

(A) The Solow residual (TFP growth) is computed as: $\hat{A}/A = \hat{Y}/Y - \alpha(\hat{K}/K) - (1-\alpha)(\hat{L}/L)$, where α is capital's share in national income.

(B) Total Factor Productivity (TFP) growth is always non-negative over time, since technology never regresses.

(C) Growth accounting decomposes observed GDP growth into the contributions of capital accumulation, labour input growth, and total factor productivity (TFP) growth.

(D) If TFP growth equals zero and all observed GDP growth is entirely attributable to factor accumulation (capital and labour), then the economy exhibits no technological progress during that period.

Section C — Numerical Answer Type (NAT)

- **Q41–Q50:** 1 mark each; **Q51–Q60:** 2 marks each. No negative marking.

Q41. A consumer has the Leontief utility function $U(x, y) = \min(3x,\ 2y)$ and faces prices $p_x = 1$, $p_y = 1$ with income $M = 10$. The utility-maximising quantity of good y is _____.

Q42. A competitive firm has total cost $TC = q^3 - 6q^2 + 15q$. In the **long-run competitive equilibrium**, the market price P^* equals _____.

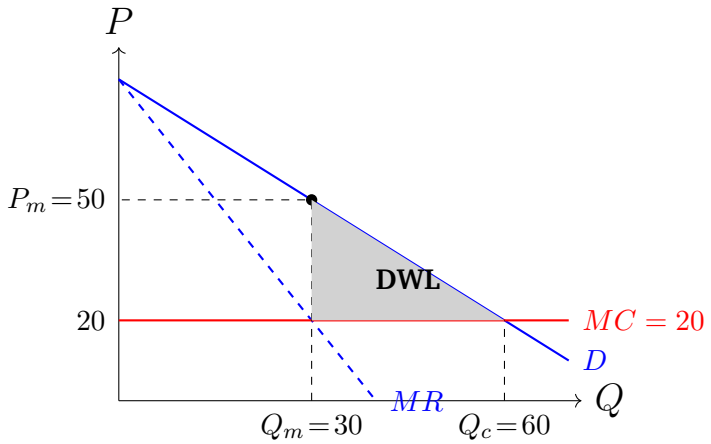
Q43. In a closed economy, the consumption function is $C = 40 + 0.8Y$, autonomous investment is $I = 60$, and government expenditure is $G = 50$.

Using the simple Keynesian model ($Y = C + I + G$), the **equilibrium income** Y^* equals _____.

Q44. A random variable X follows a normal distribution with mean $\mu = 10$ and variance $\sigma^2 = 16$. The value of $E\left[(X - 10)^2\right]$ equals _____.

Q45. Consider the matrix $A = \begin{pmatrix} 5 & 2 \\ 2 & 2 \end{pmatrix}$. The **larger** eigenvalue of A equals _____.

Q46. A monopolist faces inverse demand $P = 80 - Q$ and has constant marginal cost $MC = 20$ (no fixed costs). The **deadweight loss** due to monopoly, relative to the competitive outcome, equals _____.

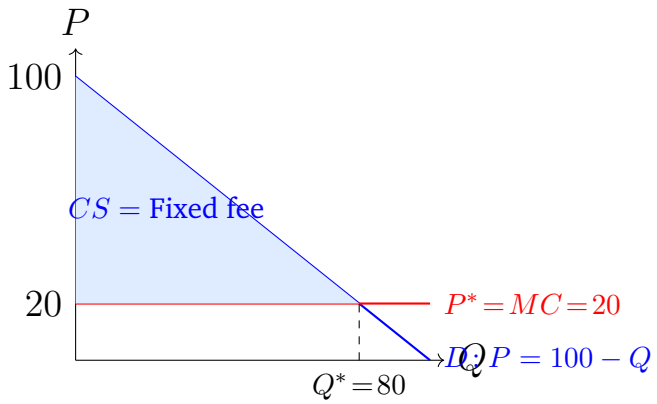


Q47. In a Solow growth model with per-worker production function $y = k^{0.5}$, savings rate $s = 0.2$, and capital depreciation rate $\delta = 0.05$. The **per-worker consumption** c^* at the steady state equals _____.

Q48. A random sample of $n = 100$ observations from a population with *known* standard deviation $\sigma = 10$ yields a sample mean $\bar{x} = 52$. To test $H_0 : \mu = 50$ against $H_1 : \mu \neq 50$, the value of the test statistic $z = \dfrac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$ equals _____.

Q49. A monopolist faces inverse demand $P = 100 - Q$ and has constant marginal cost $MC = 20$. Under a **two-part tariff**, the firm sets $P = MC$

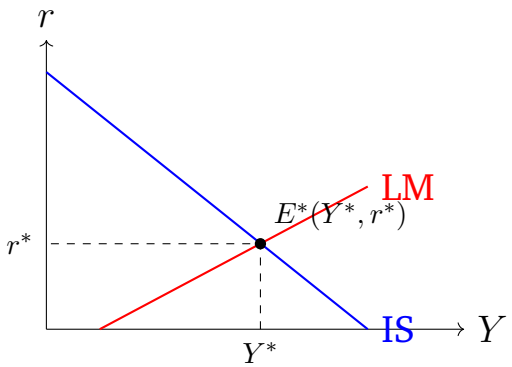
and charges an optimal fixed access fee equal to the total consumer surplus. The diagram below shows the consumer surplus area. The **optimal fixed fee** equals _____.



Q50. In a national income accounting framework, the **Gross National Product (GNP)** at market prices is Rs. 5000 crore and total capital consumption (depreciation) is Rs. 500 crore. The **Net National Product (NNP)** at market prices equals Rs. _____ crore.

Q51. A monopolist faces inverse demand $P = 100 - Q$ and total cost $TC = 20Q + 100$. The **maximum profit** earned by the monopolist equals _____.

Q52. In an IS-LM model, the IS curve is given by $Y = 600 - 50r$ and the LM curve by $Y = 100 + 75r$. The **equilibrium level of income** Y^* equals _____.



Q53. Two events A and B have $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \cap B) = 0.2$. The probability $P(A \cup B)$ equals _____.

Q54. Let $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. The $(1, 2)$ element (row 1, column 2) of the matrix product AB equals _____.

Q55. A consumer faces the inverse demand curve $P = 80 - 2Q$. When the market price rises from $P_0 = 20$ to $P_1 = 30$, the **decrease in consumer surplus** equals _____.

Q56. In the **base year**, a consumer purchases 4 units of good X at Rs. 5 per unit and 2 units of good Y at Rs. 10 per unit. In the **current year**, the price of X rises to Rs. 8 per unit while the price of Y remains at Rs. 10. Using the base-year quantities as weights (Laspeyres index, base $= 100$), the **Consumer Price Index (CPI)** for the current year equals _____.

Q57. In a simple linear regression of Y on X, the sample **correlation coefficient** between X and Y is $r = 0.6$. The **coefficient of determination** R^2 equals _____.

Q58. Consider the discrete-time dynamic equation $y(t) = 2\,y(t-1)$ with initial value $y(0) = 1$. The value of $y(4)$ equals _____.

Q59. A monopolistically competitive firm has total cost $TC = 10Q + 100$ and faces the inverse demand curve $P = 30 - Q$. In the **long-run equilibrium** (where $P = AC$ and $MR = MC$), the firm's equilibrium **output level** equals _____.

Q60. An economy has four individuals with incomes $y_1 = 20$, $y_2 = 40$, $y_3 = 60$, $y_4 = 80$ (in Rs. thousand). Using the formula

$$G = \frac{1}{2n^2\,\bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|,$$

the **Gini coefficient** of income inequality equals _____.

Detailed Solutions

Answer: (B) ↪ Go Back to Q#1

Solution

Concept — GDP Deflator vs. CPI $\|Chapter : Macroeconomics - - - National Income Accounting :$

Consumer Price Index (CPI): $Measures the cost of a$ ***fixed base-year basket*** $of goods and services typical$ $year quantities.$

GDP Deflator: Defined as GDP Deflator $=$ **(Nominal GDP/Real GDP)** $\times 100$**. It effectively weights prices by *current-year output composition*. It covers all domestically produced goods (consumption, investment, government spending, exports) but excludes imports (imports are subtracted from GDP in the national accounts).**

Key differences:

- **CPI: fixed basket (consumer goods), *includes* imports, Laspeyres index.**
- **GDP Deflator: variable basket (all domestic production), *excludes* imports, Paasche-type.**

Why other options fail:

- **(A): Reverses the descriptions — the GDP deflator does *not* use a fixed consumer basket.**
- **(B): States that the CPI excludes imports (false) and that the deflator includes all domestically consumed goods (also false — it covers domestically *produced* goods).**
- **(D): The CPI uses *base-year* (Laspeyres) quantities, not current-year quantities.**

Final Answer: CPI $\rightarrow$ fixed consumer basket; GDP deflator $\rightarrow$ all domestic production, excludes imports $\Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#2

Answer: (A) ↪ Go Back to Q#3

Solution

Concept — L'Hôpital's Rule $\|Chapter : Mathematics - - - Calculus :$

$If \lim_{x\to a} f(x) = 0$ **and** $\lim_{x\to a} g(x) = 0$ **(the** $0/0$ **indeterminate form), then**

$$\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{f'(x)}{g'(x)},$$

provided the right-hand limit exists.

Application: As $x \to 0$: $e^x - 1 \to 0$ and $\sin x \to 0$, so we have $0/0$.

$$\lim_{x\to 0} \frac{e^x - 1}{\sin x} \overset{\text{L'H}}{=} \lim_{x\to 0} \frac{(e^x - 1)'}{(\sin x)'} = \lim_{x\to 0} \frac{e^x}{\cos x} = \frac{e^0}{\cos 0} = \frac{1}{1} = \boxed{1}.$$

Alternative (Taylor series): **$e^x - 1 \approx x + O(x^2)$ and $\sin x \approx x + O(x^3)$, so $(e^x - 1)/\sin x \to x/x = 1$.**

Why other options fail:

- **(A) 0: Incorrectly evaluating numerator or denominator without applying L'Hôpital.**
- **(B) e: Confuses e^x evaluated at $x = 1$ with the limit as $x \to 0$.**
- **(C) ∞: Would require the denominator to vanish faster, which it does not here.**

Final Answer: $\lim_{x\to 0}(e^x - 1)/\sin x = 1 \Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#4

Solution

Concept — Cobb-Douglas Marshallian Demand $\|Chapter : Microeconomics - - - ConsumerTheory :$

$Foraconsumermaximising$**U(x,y) = $x^\alpha y^{1-\alpha}$ subject to $p_x x + p_y y = M$, the first-order (Lagrangian) conditions give:**

$$\frac{MU_x}{MU_y} = \frac{p_x}{p_y} \Rightarrow \frac{\alpha/x}{(1-\alpha)/y} = \frac{p_x}{p_y} \Rightarrow \frac{\alpha y}{(1-\alpha)x} = \frac{p_x}{p_y}.$$

Solving jointly with the budget constraint, the Marshallian demands are:

$$x^* = \frac{\alpha M}{p_x}, \qquad y^* = \frac{(1-\alpha)M}{p_y}.$$

Income share of x:

$$\frac{p_x x^*}{M} = \frac{p_x \cdot (\alpha M/p_x)}{M} = \alpha.$$

With $\alpha = 1/3$, the optimal income share spent on x is $1/3$.

General rule: For Cobb-Douglas $U = x^\alpha y^{1-\alpha}$, the consumer always spends fraction α of income on x and fraction $(1 - \alpha)$ on y, regardless of prices.

Why other options fail:

- **(A) $2/3$: This is $(1 - \alpha) = 2/3$, the income share of y, not x.**
- **(C) $1/4$: Arbitrary; does not correspond to any property of this utility function.**
- **(D) $1/2$: Would hold for Cobb-Douglas with equal exponents ($\alpha = 1/2$), not $1/3$.**

Final Answer: Income share on x equals exponent $\alpha = 1/3 \Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#5

Solution

Concept — Quantity Theory of Money (Fisher Equation) $\|Chapter : Macroeconomics - - - MonetaryTheory :$

$TheFisherequationofexchange$:**MV = PY**, $where$**M**= $moneysupply$,**V**= $velocity$,**P**= $pricelevel$,**Y**= $realoutput.$

In the strict classical version: V **is *constant* (determined by payment technology) and** Y **is at full employment (determined by supply-side factors alone — the classical dichotomy). Therefore:**

$$M \uparrow \Rightarrow \; P = \frac{MV}{Y} \propto M.$$

A doubling of M **with** V **and** Y **fixed exactly doubles** P**.**

In growth-rate form: $\hat{M} + \hat{V} = \hat{P} + \hat{Y}$**. If** $\hat{V} = 0$ **and** $\hat{Y} = 0$**:** $\hat{M} = \hat{P}$ **(money growth equals inflation).**

Why other options fail:

- **(A): In the classical framework, money is *neutral* — changes in** M **affect only** P**, not real** Y **(the classical dichotomy). Active monetary policy does not raise real output.**
- **(B): The strict QTM *assumes* V is constant or at least stable; it does not predict that** V **is procyclical (that is an empirical concern for the modern quantity theory debate).**
- **(D): The QTM says inflation is a *monetary* phenomenon (**$\hat{M} > 0$**), not a real-sector one.**

Final Answer: With V **and** Y **fixed, doubling** M **doubles** $P \Rightarrow$ **(C)**

Answer: (C) ↪ Go Back to Q#6

Solution

Concept — NABARD (National Bank for Agriculture and Rural Development) $\|Chapter : IndianEconomy :$

$NABARDwasestablishedon$**12 July 1982**$byanActofParliamentfollowingtherecommendationsofthe -81).Itisthe$**apex development finance institution**$foragricultureandruraldevelopmentinIndia.$

Primary functions:

- **Refinance: Provides refinance to State Cooperative Banks (StCBs), District Central Cooperative Banks (DCCBs), Regional Rural Banks (RRBs), and microfinance institutions (MFIs) for agricultural and rural credit.**
- **Developmental role: Promotes rural infrastructure, irrigation, watershed devel-**

opment, and rural non-farm enterprises.
- Supervisory role: Supervises RRBs and cooperative banks (excluding urban co-operative banks).
- Financial inclusion: Implements schemes such as RIDF (Rural Infrastructure Development Fund) and supports Self-Help Groups (SHGs).

Why other options fail:

- (B): NABARD is not a commercial bank; it does not directly accept retail deposits or provide home mortgages to individuals.
- (C): NABARD has no tax-collection authority; agricultural income tax is a state subject administered by state governments.
- (D): SEBI (Securities and Exchange Board of India) regulates capital markets; NABARD has no role in equity or bond market regulation.

Final Answer: NABARD = apex development bank providing refinance for agricultural and rural credit $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#7

Solution

Concept — Chi-Square Distribution $\chi^2(k)$ $\|Chapter : Statistics\&Probability :$
Definition:If**Z**$_1, Z_2, \ldots, Z_k \overset{\text{iid}}{\sim} N(0,1)$, then

$$W = Z_1^2 + Z_2^2 + \cdots + Z_k^2 \sim \chi^2(k).$$

Key properties:

- Support: $W \geq 0$ always (sum of squares cannot be negative).
- Mean: $E[W] = k$ (each Z_i^2 has mean 1; summing k such terms gives mean k).
- Variance: $\mathrm{Var}(W) = 2k$.
- Shape: Right-skewed for all finite k; approaches normality as $k \to \infty$.
- Additivity: If $W_1 \sim \chi^2(k_1)$ and $W_2 \sim \chi^2(k_2)$ independently, then $W_1 + W_2 \sim \chi^2(k_1 + k_2)$.

Why other options fail:

- (A): $\chi^2(k)$ is *right-skewed* (positively skewed) for all finite k; it is *not* symmetric. It only approaches symmetry asymptotically as $k \to \infty$.
- (B): $\chi^2(k)$ is defined as a sum of squares and therefore takes only *non-negative* values; it cannot take negative values.
- (C): The mean equals k, not $k/2$. (The $k/2$ figure appears in the gamma distribution parameterisation of χ^2, but the mean is still k.)

Final Answer: $\chi^2(k)$ **= sum of** k **squared standard normals; mean** $= k \Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#8

Solution

Concept — Positive Semi-Definite (PSD) Matrix $\|Chapter : Mathematics - - - Linear Algebra :$

$A real symmetric$**n**$\times n$ **matrix** A **is positive semi-definite (PSD) if and only if:**

$$\mathbf{x}^\top A\,\mathbf{x} \;\geq\; 0 \quad \textbf{for all } \mathbf{x} \in \mathbb{R}^n.$$

Equivalent characterisations:

- **All eigenvalues** $\lambda_i \geq 0$**.**
- **All leading principal minors are** ≥ 0**.**
- $A = B^\top B$ **for some matrix** B **(PSD matrices are Gram matrices).**

Distinction from Positive Definite (PD):

Condition	Eigenvalues	$\mathbf{x}^\top A\mathbf{x}$
PSD	$\lambda_i \geq 0$	≥ 0 **for all** $\mathbf{x}$
PD	$\lambda_i > 0$	> 0 **for all** $\mathbf{x} \neq \mathbf{0}$

Why other options fail:

- **(A): All eigenvalues strictly positive defines *positive definite* (PD), which is a strictly stronger condition than PSD. PSD allows zero eigenvalues.**
- **(C):** $\det(A) > 0$ **is necessary for PD (by Sylvester's criterion) but insufficient for PSD. A singular PSD matrix has** $\det(A) = 0$ **(zero eigenvalue).**
- **(D): Invertibility (**$\det(A) \neq 0$**) is unrelated to PSD. A PSD matrix can be singular (non-invertible), and an invertible matrix need not be PSD.**

Final Answer: PSD $\Leftrightarrow$ **all eigenvalues** $\geq 0 \Leftrightarrow \mathbf{x}^\top A\mathbf{x} \geq 0\ \forall\, \mathbf{x} \Rightarrow$ **(B)**

Answer: (B) ↪ Go Back to Q#9

Solution

Concept — Sen Poverty Index $\|Chapter : Indian Economy - - - Poverty \& Inequality :$

$Amartya Sen (1976) showed that the$**Head Count Ratio (HCR)**$H is inadequate because it is insensitive to the$

Sen index: $P_{\text{Sen}} = H\big[I + (1 - I)\, G_p\big]$**, where:**

- H **= Head Count Ratio (proportion of population below poverty line),**

- I = Poverty Gap Ratio (average income shortfall of the poor as a fraction of the poverty line),
- G_p = Gini coefficient of income distribution *among the poor*.

Advantages over HCR:

(i) Sensitive to the depth of poverty (captures I): a transfer from poor to non-poor increases P_{Sen} even if H is unchanged.
(ii) Sensitive to inequality among the poor (captures G_p): a regressive transfer from a poorer person to a slightly less poor person increases P_{Sen}.

Why other options fail:

- (A): $P_{\text{Sen}} \neq H^2$ in general; the formula is $H[I + (1 - I)G_p]$.
- (B): Describes the HCR, which only counts the number below the poverty line. The Sen index does this *and more*.
- (D): The Sen index is more *complex* (not simpler) than HCR; it requires data on individual incomes, not just a count of those below the poverty line.

Final Answer: Sen index incorporates inequality among the poor via $G_p \Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#10

Solution

Concept — Weak Axiom of Revealed Preference (WARP) $\|Chapter : Microeconomics - - - ConsumerTheory :$

Revealed preference: $Bundle$Aisdirectly revealed preferred$tobundle$B$(written$A $\succsim^* B$) if A is chosen when B is affordable (i.e., B is in the budget set from which A is chosen).

WARP (Samuelson 1938): If A is directly revealed preferred to B, then B must *never* be chosen from any budget set in which A is also affordable. Formally:

$$A \succsim^* B \;\Rightarrow\; B \not\succsim^* A \quad (\text{unless } A = B).$$

Illustration from the diagram:

- On BL_1, bundle A is chosen; bundle B is inside BL_1 (affordable). So $A \succsim^* B$.
- On BL_2, bundle B is chosen; bundle A is *outside* BL_2 (not affordable). So $B \not\succsim^* A$.
- WARP is satisfied: whenever A was affordable on BL_2, B would not be chosen over A.

Why other options fail:

- **(B): WARP does not imply convexity or transitivity. A consumer can satisfy WARP without having well-behaved convex preferences.**
- **(C): WARP alone (for $n \geq 3$ goods) does *not* imply symmetry of the Slutsky matrix. WARP implies the Slutsky matrix is negative semi-definite in the direction of price changes, but not necessarily symmetric.**
- **(D): WARP is *weaker* than SARP (Strong Axiom of Revealed Preference), not stronger. SARP implies full rationality (representable by a complete, transitive preference ordering); WARP alone does not.**

Final Answer: WARP: if A chosen when B affordable, then B never chosen when A affordable $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#11

Solution

Concept — Stackelberg vs. Cournot Duopoly $\|Chapter : Microeconomics - - - MarketStructure :$

$Considerinversedemand$**P = a - b($q_1 + q_2$) and equal constant marginal cost c.**

Cournot equilibrium:

$$q_1^C = q_2^C = \frac{a-c}{3b}, \quad Q^C = \frac{2(a-c)}{3b}, \quad P^C = \frac{a+2c}{3}.$$

Stackelberg equilibrium (Firm 1 leader):

$$q_1^S = \frac{a-c}{2b}, \quad q_2^S = \frac{a-c}{4b}, \quad Q^S = \frac{3(a-c)}{4b}, \quad P^S = \frac{a+3c}{4}.$$

Comparison:

$$q_1^S = \frac{a-c}{2b} > q_1^C = \frac{a-c}{3b}, \quad q_2^S = \frac{a-c}{4b} < q_2^C = \frac{a-c}{3b},$$

$$Q^S = \frac{3(a-c)}{4b} > Q^C = \frac{2(a-c)}{3b}, \quad P^S < P^C.$$

Leader's profit: $\pi_1^S = (a-c)^2/(8b) > (a-c)^2/(9b) = \pi_1^C$ **(leader benefits).**
Follower's profit: $\pi_2^S = (a-c)^2/(16b) < (a-c)^2/(9b) = \pi_2^C$ **(follower is worse off).**

In the diagram: $q_1^S > q_1^C$ **(Stackelberg point S is further right) and** $q_2^S < q_2^C$ **(S is lower). S lies on $R_2(q_1)$, confirming it is a best response for the follower.**

Why other options fail:

- **(A): $Q^S > Q^C$ and $P^S < P^C$ (opposite of what option A claims).**
- **(B): The *follower's* profit falls under Stackelberg; only the leader benefits.**
- **(D): Leader earns more than follower; Stackelberg is asymmetric, not symmetric**

like Cournot.

Final Answer: Leader produces more, earns higher profit; total Q higher, P lower under Stackelberg $\Rightarrow$ **(C)**

Answer: (C) ↪ Go Back to Q#12

Answer: (B) ↪ Go Back to Q#13

Solution

Concept — Romer's (1990) Model of Endogenous Growth $\|Chapter : Macroeconomics - - - EconomicGrowth :$

$PaulRomer's1990modelendogenisedtechnologicalprogressbytreatingknowledge(ideas/designs/bluepr$

Key features:

(i) **Non-rivalry of ideas: A blueprint (e.g., the design for a microchip) can be used simultaneously by multiple firms without any diminution of its value — ideas are *non-rival* inputs to production.**

(ii) **Partial excludability: Patent protection grants temporary monopoly power, enabling R&D firms to recover fixed R&D costs through supernormal profits.**

(iii) **Increasing returns to scale in the aggregate: rival inputs (capital, labour) exhibit CRS; adding the non-rival stock of knowledge yields IRS at the aggregate level.**

(iv) **Sustained growth: Because A (the stock of ideas) grows endogenously through profit-motivated R&D, the model generates perpetual per-capita growth without exogenous technological manna.**

Why other options fail:

- **(A): Capital accumulation alone (without TFP growth) runs into diminishing returns and cannot sustain per-capita growth in the Solow framework. Romer's model specifically addresses this limitation.**
- **(B): Public infrastructure may raise the level of output, but Romer's mechanism is private R&D driven by market incentives, not government investment.**
- **(C): The Solow residual (TFP growth) is treated as exogenous and unexplained by Solow; Romer's contribution was precisely to *endogenise* this residual via the R&D sector.**

Final Answer: Non-rival ideas generate increasing returns; sustained growth from private R&D $\Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#14

Solution

Concept — Heteroscedasticity in OLS $\|Chapter: Statistics\&Econometrics:$

Assumption violated: $Gauss-Markovassumptionof$ **homoscedasticity** $\mathrm{Var}(\varepsilon_i) = \sigma^2$ **(constant). Heteroscedasticity means** $\mathrm{Var}(\varepsilon_i) = \sigma_i^2$ **varies across observations.**

Consequences for OLS:

(i) **Unbiasedness preserved: OLS estimators** $\hat{\beta}$ **remain unbiased (**$E[\hat{\beta}] = \beta$**) since unbiasedness requires only** $E[\varepsilon|\mathbf{X}] = 0$**, which heteroscedasticity does not violate.**

(ii) **Consistency preserved:** $\hat{\beta} \xrightarrow{p} \beta$ **as** $n \to \infty$ **(standard conditions still hold).**

(iii) **Efficiency lost: OLS is no longer BLUE (Best Linear Unbiased Estimator). GLS (which weights by** $1/\sigma_i^2$**) achieves lower variance — Gauss-Markov theorem fails.**

(iv) **Standard errors biased: The conventional OLS variance estimator** $s^2(\mathbf{X}^\top\mathbf{X})^{-1}$ **is *biased*. Typically, OLS standard errors are underestimated when large residuals are concentrated at large** x **values, inflating** t**-statistics and leading to spurious rejection of** H_0**.**

Remedy: Use *heteroscedasticity-robust* (White) standard errors, or apply FGLS/WLS.

Why other options fail:

- **(B): Heteroscedasticity does not cause bias in** $\hat{\beta}$**; the coefficient estimates themselves remain unbiased.**
- **(C): OLS has *higher* variance than GLS under heteroscedasticity; GLS is more efficient.**
- **(D): Even asymptotically, OLS remains inefficient relative to GLS, and the *uncorrected* OLS standard errors remain invalid (though White-robust SEs are asymptotically valid).**

Final Answer: OLS remains unbiased/consistent but not BLUE; conventional SEs unreliable $\Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#15

Solution

Concept — Integration by Parts $\|Chapter: Mathematics---Calculus:$

$Theintegrationbypartsformula: \int u\,dv = uv - \int v\,du.$

Choose: $u = x \Rightarrow du = dx$; $\quad dv = e^x\,dx \Rightarrow v = e^x$.

Apply:

$$\begin{aligned}\int x\,e^x\,dx &= x\cdot e^x - \int e^x\,dx \\ &= x\,e^x - e^x + C \\ &= e^x(x-1) + C.\end{aligned}$$

Verification by differentiation:

$$\frac{d}{dx}\left[e^x(x-1)\right] = e^x(x-1) + e^x\cdot 1 = e^x(x-1+1) = x\,e^x. \checkmark$$

Why other options fail:

- **(A)** $xe^x + C$**: Derivative is** $e^x(x+1) \neq xe^x$**. Omits the second integration step.**
- **(B)** $e^x(x+1) + C$**: Derivative is** $e^x(x+1) + e^x = e^x(x+2) \neq xe^x$**. Sign error in the formula.**
- **(C)** $x^2e^x/2 + C$**: Derivative involves product rule:** $(x^2e^x/2)' = xe^x + x^2e^x/2 \neq xe^x$**.**

Final Answer: $\int xe^x\,dx = e^x(x-1) + C \Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#16

Answer: (C) ↪ Go Back to Q#17

Solution

Concept — Friedman's Permanent Income Hypothesis (1957) $\|Chapter : Macroeconomics - - - ConsumptionTheory :$

$MiltonFriedmanarguedthatconsumersbasecurrentconsumptionnotoncurrentincomebutonpermanent$ **— the expected long-run average sustainable income stream.**

$$C = \alpha Y^P, \quad 0 < \alpha < 1,$$

where α **is the marginal propensity to consume out of permanent income (approximately constant).**

Decomposition: $Y = Y^P + Y^T$**, where** Y^T **= transitory income (temporary, random deviations from** Y^P**). Friedman argued** C **responds very little to** Y^T **(transitory windfalls are largely saved).**

Implications:

- **Short-run MPC** ≈ 0 **(out of transitory income); long-run MPC** $= \alpha$ **(out of permanent income).**
- **Explains the empirical puzzle: cross-section APC declines with income (rich**

households have more transitory income), but time-series APC is roughly stable.

Why other options fail:

- (A): Describes Modigliani's Life-Cycle Hypothesis (LCH) — lifetime wealth smoothing. LCH focuses on the life cycle (working years vs. retirement), which is different from PIH's focus on permanent vs. transitory income.
- (C): Describes Keynes' Absolute Income Hypothesis: $C = a + bY_d$, where consumption is a linear function of *current* income.
- (D): Describes Duesenberry's Relative Income Hypothesis, where consumption depends on income relative to a social reference group or a peak historical income.

Final Answer: PIH: $C = \alpha Y^P$; transitory income has little effect on current consumption $\Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#18

Answer: (A) ↪ Go Back to Q#19

Solution

Concept — Stability of Equilibria in Autonomous ODEs $\|Chapter : Mathematics - - - DifferentialEquations :$

$FortheautonomousODE$ **= f(y)**, $anequilibrium$**y*** **satisfies** $f(y^*) = 0$.

Linear stability analysis: Perturb $y = y^* + \xi$ **(small** ξ**):**

$$\dot{\xi} = f(y^* + \xi) \approx f(y^*) + f'(y^*)\,\xi = f'(y^*)\,\xi.$$

This linearised ODE has solution $\xi(t) = \xi_0 e^{f'(y^*)t}$.

- **If** $f'(y^*) < 0$**:** $\xi(t) \to 0$ **as** $t \to \infty$ **— asymptotically stable.**
- **If** $f'(y^*) > 0$**:** $|\xi(t)| \to \infty$ **— unstable.**

Logistic example $\dot{y} = y(1 - y/K)$**:**

- $y_1^* = 0$**:** $f'(0) = 1 > 0 \Rightarrow$ ***unstable*** **(perturbations grow).**
- $y_2^* = K$**:** $f'(K) = 1 - 2K/K = -1 < 0 \Rightarrow$ ***asymptotically stable*** **(perturbations decay).**

Phase diagram intuition: At a stable y^***:**

- **For** $y > y^*$**:** $f(y) < 0$ **(because** f **is decreasing through zero), so** y **decreases back to** y^***.**

- **For $y < y^*$: $f(y) > 0$, so y increases back to y^*.**

This confirms $f'(y^*) < 0$ is the stability condition (arrows converge to y^*).

Why other options fail:

- **(A): $f(y^*) = 0$ by definition of equilibrium, not $f(y^*) > 0$. The function value must be zero at any equilibrium.**
- **(B): $f'(y^*) > 0$ implies instability: deviations amplify (trajectories diverge from y^*).**
- **(D): $f(y^*) = 1$ would not be an equilibrium at all (since $\dot{y} = f(y^*) = 1 \neq 0$, so y^* is not a rest point).**

Final Answer: Asymptotically stable $\Leftrightarrow f'(y^*) < 0 \Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#20

Solution

Concept — Backward Induction in Extensive-Form Games $\|Chapter : Microeconomics - - - GameTheory :$

Backward induction$(Zermelo1913)isanalgorithmforsolvingfinitegamesof$***perfect information***$(alli$

Algorithm:

(1) Identify all terminal decision nodes (last decision nodes before terminal payoff nodes).
(2) At each terminal decision node, choose the action that maximises the decision-maker's payoff.
(3) Assign the resulting payoff to the node and replace it with a terminal node (rolling back).
(4) Repeat from step 1 for the now-terminal nodes of the truncated game.
(5) Continue until the root is reached.

Outcome: Backward induction yields a Subgame Perfect Nash Equilibrium (SPNE): a strategy profile that prescribes a Nash equilibrium in every subgame (no empty threats or promises).

Zermelo's theorem: Every finite two-player zero-sum game of perfect information has a backward induction solution (one player has a winning strategy or the game is a draw).

Why other options fail:

- **(A): Backward induction applies specifically to *sequential* games (extensive form with perfect information), not to simultaneous-move games, which are analysed**

using normal-form Nash equilibrium.

- (B): Backward induction works cleanly in perfect information games; with *imperfect* information (information sets with multiple nodes), backward induction is not well-defined without further refinements. Also, multiple SPNE can exist.
- (C): Backward induction *starts* from the *last* decision nodes (terminal) and works *backward* (hence the name), not forward from the root.

Final Answer: BI: start at terminal nodes, roll back $\Rightarrow$ SPNE $\Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#21

Answer: (A) ↪ Go Back to Q#22

Solution

Concept — Unbiasedness of an Estimator $\|Chapter : Statistics\&Econometrics : Anestimator_n = T(X_1, \ldots, X_n)$ **is unbiased for** θ **if:**

$$E_\theta[\hat{\theta}_n] = \theta \quad \text{for } \textit{all } n \text{ and } \textit{all } \theta \in \Theta.$$

The bias of an estimator is $\text{Bias}(\hat{\theta}) = E[\hat{\theta}] - \theta$; unbiasedness means zero bias at every sample size.

Examples:

- $\bar{X} = \frac{1}{n}\sum X_i$ is an unbiased estimator of μ (for any distribution with mean μ).
- $S^2 = \frac{1}{n-1}\sum(X_i - \bar{X})^2$ is unbiased for σ^2 (using $n-1$ in the denominator).
- The MLE of σ^2, $\hat{\sigma}^2_{\text{MLE}} = \frac{1}{n}\sum(X_i - \bar{X})^2$, is *biased* (downward).

Why other options fail:

- (A): Describes *consistency*: $\hat{\theta}_n \xrightarrow{p} \theta$ as $n \to \infty$. Consistency is a large-sample property; unbiasedness holds for every fixed n.
- (C): Minimum variance among all estimators defines *efficiency*. An unbiased estimator need not have the smallest variance (e.g., X_1 is unbiased for μ but highly inefficient).
- (D): MLEs are not always unbiased in finite samples (e.g., the MLE for σ^2 is biased). They are asymptotically efficient, however.

Final Answer: Unbiasedness: $E[\hat{\theta}_n] = \theta$ for all n and all $\theta \Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#23

Solution

Concept — Diagonalisability of Matrices $\|Chapter : Mathematics - - - Linear Algebra :$

An**n**$\times n$ **matrix** A **is diagonalisable if there exists an invertible matrix** P **such that** $P^{-1}AP = D$ **(diagonal). This is equivalent to** A **having** n **linearly independent eigenvectors (which form the columns of** P**).**

Necessary and sufficient condition: A **is diagonalisable** $\Leftrightarrow$ **for every eigenvalue** λ_i**, its algebraic multiplicity (AM) equals its geometric multiplicity (GM):**

$$\text{AM}(\lambda_i) = \text{GM}(\lambda_i) = \dim(\ker(A - \lambda_i I)) \quad \forall\, i.$$

Examples:

- $A = I_n$**: one eigenvalue** $\lambda = 1$ **with AM** $= n$ **and GM** $= n \Rightarrow$ **diagonalisable.**
- $A = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$**:** $\lambda = 1$ **has AM** $= 2$ **but GM** $= 1$ **(Jordan block)** $\Rightarrow$ ***not*** **diagonalisable.**

Why other options fail:

- **(A):** n **distinct eigenvalues is a *sufficient* condition (distinct eigenvalues** $\Rightarrow$ **eigenvectors linearly independent), but *not necessary*. The identity matrix** I_n **is diagonalisable with only one distinct eigenvalue.**
- **(B): Invertibility (non-zero determinant) is a separate property. A singular matrix can be diagonalisable (e.g., diagonal matrix with a zero on the diagonal), and a non-singular matrix can fail to be diagonalisable.**
- **(D): Real symmetric matrices are always diagonalisable (by the Spectral Theorem), so symmetry is a *sufficient* condition. However, it is not necessary: non-symmetric matrices can also be diagonalisable (e.g.,** $\text{diag}(1, 2)$**).**

Final Answer: Diagonalisable $\Leftrightarrow$ n **linearly independent eigenvectors (AM = GM for all** λ**)** $\Rightarrow$ **(C)**

Answer: (C) ↪ Go Back to Q#24

Answer: (D) ↪ Go Back to Q#25

Solution

Concept — MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act, 2005) $\|Chapter : Indian Economy :$

$MGNREGA(enacted September 2005, fully operational from 2008) is India's largest public works program$

Key provisions:

1. Guarantee: Every rural household whose adult members are willing to do un-

skilled manual work is entitled to at least 100 days of wage employment per financial year.
2. Demand-driven: Work must be provided within 15 days of applying; if not provided, an unemployment allowance is paid (typically 1/4 of the wage for the first 30 days).
3. Coverage: Restricted to rural areas only.
4. Wages: State-specific MGNREGA wage rates (linked to the Consumer Price Index for agricultural labourers, CPI-AL), not a uniform national rate.
5. Works: Focused on natural resource management, rural connectivity, flood protection, and drought-proofing works.

Why other options fail:

- (B): MGNREGA applies *only to rural areas*; urban employment is addressed by separate schemes (e.g., NULM — National Urban Livelihoods Mission).
- (C): MGNREGA is a *work-for-wages* programme, not a direct income transfer or UBI. Workers must participate in approved public works projects.
- (D): Wages vary by state (14 state-specific notified rates), not a uniform national minimum.

Final Answer: MGNREGA: 100 days of guaranteed rural wage employment for unskilled manual work $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#26

Solution

Concept — Arrow's Impossibility Theorem (1951) $\|Chapter : Microeconomics --- WelfareEconomics :$

$Arrow's theorem shows that no$ **social welfare function (SWF)** $---arule that aggregates individual preference orderings into a social preference ordering ---can simultaneously satisfy all four of the following conditions when there are three or more alternative$

(A) Unrestricted Domain (U): The SWF must work for *any* logically possible profile of individual preference orderings.
(B) Pareto Efficiency (P): If every individual strictly prefers x to y, the social ranking must strictly prefer x to y.
(C) Independence of Irrelevant Alternatives (IIA): The social ranking of x vs. y depends only on individuals' rankings of x vs. y (not on their ranking of a third alternative z).
(D) Non-dictatorship (ND): No single individual's preferences always determine the social preference.

Arrow proved: *any* SWF satisfying (A), (B), and (C) must be a dictatorship (violat-

ing (D)).

Condorcet paradox illustration (from the diagram):

- Person 1: $A \succ B \succ C$; Person 2: $B \succ C \succ A$; Person 3: $C \succ A \succ B$.
- Majority: $A \succ B$ (2 vs. 1), $B \succ C$ (2 vs. 1), $C \succ A$ (2 vs. 1) $\Rightarrow$ cycle: $A \succ B \succ C \succ A$.
- Majority voting fails *transitivity*, violating the requirement for a consistent social ordering.

Why other options fail:

- (A): The Condorcet paradox demonstrates *exactly* that majority voting can fail to produce a consistent social ordering — it can cycle.
- (C): A benevolent dictator would violate Arrow's non-dictatorship condition; Arrow's theorem is precisely a proof that resolving collective choice requires a dictator.
- (D): Assigning different voting weights (intensity voting) can help in practice but still cannot simultaneously satisfy all four conditions in Arrow's framework (weighted majority voting can violate IIA or other conditions).

Final Answer: Arrow: no SWF can satisfy U, P, IIA, and Non-dictatorship simultaneously $\Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#27

Solution

Concept — Relative Purchasing Power Parity (PPP) $\|Chapter : Macroeconomics --- International Finance :$

Absolute PPP:$The exchange rate equals the ratio of domestic to foreign price levels$:E = P/P*.

Relative PPP (the more empirically testable version): takes rates of change of the absolute PPP condition:

$$\frac{\dot{E}}{E} \approx \pi - \pi^*,$$

where $\pi = \dot{P}/P$ is the domestic inflation rate and $\pi^* = \dot{P}^*/P^*$ is the foreign inflation rate. In discrete time:

$$\frac{\Delta E}{E} \approx \pi - \pi^*.$$

Interpretation: A country with higher inflation than its trading partner experiences a proportionate *depreciation* of its currency.

Empirical validity: Relative PPP holds much better over *long horizons* (5–20 years)

than in the short run, where exchange rates are dominated by capital flows, risk premia, and expectations (as illustrated by scatter points deviating from the PPP line in the short run but clustering around it in the long run).

Why other options fail:

- (A): Exchange rates are determined by both trade flows and capital flows; capital account flows typically dominate in the short run.
- (B): Describes no standard PPP theory. The exchange rate equals the *price level ratio* (not income ratio) under absolute PPP.
- (D): Relative PPP actually holds *better* in the long run than the short run. In the short run, real exchange rates fluctuate substantially (Rogoff's "PPP puzzle").

Final Answer: Relative PPP: $(\Delta E/E) \approx \pi - \pi^* \Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#28

Solution

Concept — Implicit Function Theorem (IFT) $||Chapter: Mathematics---Calculus:$ If **F(x,y) = 0** $defines$ **y** $implicitly as a$ **C**^{1} function of x near a point (x_0, y_0) where $F_y(x_0, y_0) \neq 0$, then:

$$\frac{dy}{dx} = -\frac{F_x}{F_y}.$$

Derivation: Differentiate $F(x, y(x)) = 0$ totally with respect to x:

$$\frac{\partial F}{\partial x} + \frac{\partial F}{\partial y} \cdot \frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = -\frac{F_x}{F_y}.$$

Application to $F(x, y) = x^3 + y^3 - 3xy$:

$$F_x = 3x^2 - 3y,$$
$$F_y = 3y^2 - 3x.$$

Therefore:

$$\frac{dy}{dx} = -\frac{3x^2 - 3y}{3y^2 - 3x} = -\frac{x^2 - y}{y^2 - x}.$$

General form: $dy/dx = -F_x/F_y$, which is option (D).

Why other options fail:

- (A) F_y/F_x: This is the reciprocal of the correct formula (and also missing the negative sign). It would give dx/dy, not dy/dx.
- (B) $F_x \cdot F_y$: A product of partial derivatives has no relationship to the implicit derivative.
- (C) $-F_x \cdot F_y$: Negative product, still not the ratio required by the IFT.

Final Answer: By IFT, $dy/dx = -F_x/F_y \Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#29

Solution

Concept — Pradhan Mantri Jan Dhan Yojana (PMJDY) $\|Chapter : IndianEconomy :$

$PMJDYwaslaunchedon$**28 August 2014**$bytheGovernmentofIndiaasitsnational$**financial inclusion**$n$

Key features:

(i) **Basic savings account: Every household entitled to a zero-balance savings bank account with any bank.**

(ii) **RuPay debit card: All PMJDY account holders receive a RuPay debit card with an in-built accident insurance cover of Rs. 1–2 lakh.**

(iii) **Overdraft facility: Account holders with 6-month satisfactory transaction history are eligible for overdraft (credit) up to Rs. 10,000.**

(iv) **Insurance and pension: Access to Pradhan Mantri Jeevan Jyoti Bima Yojana (life insurance), Pradhan Mantri Suraksha Bima Yojana (accident insurance), and Atal Pension Yojana.**

(v) **Direct Benefit Transfer (DBT): Provides the infrastructure for direct transfer of government subsidies (LPG, fertiliser, MGNREGA wages) to beneficiary accounts.**

Why other options fail:

- **(B): PMJDY's primary goal is universal banking access for all households (especially rural poor), not exclusive micro-credit for urban small businesses.**
- **(C): PMJDY is not a fixed-deposit or tax-exempt savings scheme for senior citizens; it is a financial inclusion scheme for all underbanked households.**
- **(D): PMJDY was launched in August 2014 under the NDA government, not 2010 under UPA (Swabhimaan was a 2011 UPA scheme).**

Final Answer: PMJDY (August 2014): universal banking access — savings, credit, insurance, pension $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#30

Solution

Concept — Bertrand Competition (Homogeneous Goods, Equal MC) $\|Chapter : Microeconomics - - - GameTheory :$

$Inthe$**Bertrand model**$ofpricecompetitionwithhomogeneousgoodsandequalconstantmarginalcost$**c**:

The Bertrand paradox:

- **Any firm charging $P > c$ will be undercut by its rival (which captures the entire market).**
- **Any firm charging $P < c$ makes losses.**
- **The unique Nash equilibrium (NE) is $P_1^* = P_2^* = c$ (price equals marginal cost), yielding zero economic profit.**

This is a "paradox" because perfect competition is achieved with just *two* firms.

Evaluating each option:

- **(A) TRUE: In the Bertrand NE, $P = MC$ and each firm earns $\pi = 0$.**
- **(B) TRUE: With only 2 firms, Bertrand competition delivers the competitive outcome ($P = MC$, $\pi = 0$).**
- **(C) FALSE: In Bertrand equilibrium, $P^{\text{Bert}} = MC \leq P^{\text{Cournot}}$ (Cournot price is above MC). The Bertrand price is *lower*, not higher, than Cournot.**
- **(D) FALSE: With homogeneous goods and identical costs, Bertrand profit is exactly zero, not positive. Positive profits arise only with product differentiation or capacity constraints.**

Final Answer: Options (A) and (B) are correct.

Answer: (AB) ↪ Go Back to Q#31

Solution

Concept — Stackelberg vs. Cournot: MSQ Comparison $\|Chapter : Microeconomics - - - MarketStructure :$

$Using$**P = a - b(q_1 + q_2$**), **MC =** c**, with Firm 1 as Stackelberg leader:**

$$q_1^C = q_2^C = \frac{a-c}{3b}, \quad q_1^S = \frac{a-c}{2b}, \quad q_2^S = \frac{a-c}{4b}.$$

$$Q^S = \frac{3(a-c)}{4b} > Q^C = \frac{2(a-c)}{3b}, \quad P^S < P^C.$$

Profits:

$$\pi_1^S = \frac{(a-c)^2}{8b} > \pi_1^C = \frac{(a-c)^2}{9b} > \pi_2^S = \frac{(a-c)^2}{16b}.$$

Evaluating each option:

- **(A) FALSE: $Q^S > Q^C$, so price is *lower* under Stackelberg, not higher.**
- **(B) FALSE: The *follower's* profit $\pi_2^S < \pi_2^C$; only the leader benefits. Joint profits also fall: $\pi_1^S + \pi_2^S = (a-c)^2(1/8 + 1/16)/b = 3(a-c)^2/(16b) < 2(a-c)^2/(9b)$.**
- **(C) TRUE: The Stackelberg outcome is indeed a NE. The follower's output q_2^S maximises π_2 given q_1^S (it lies on R_2); the leader's q_1^S maximises π_1 given that Firm 2 follows R_2. No unilateral deviation is profitable.**

- **(D) TRUE:** $q_1^S = (a-c)/(2b) > (a-c)/(3b) = q_1^C$, **and** $P^S < P^C$.

Final Answer: Options (C) and (D) are correct.

Answer: (CD) ↪ Go Back to Q#32

Solution

Concept — IS-LM: Effects of Expansionary Fiscal Policy $\|Chapter : Macroeconomics - - - IS - LM Model :$ $In the IS - LM framework, the IS curve represents goods - market equilibrium and the LM curve represents money - market equilibrium (with fixed nominal money su$

Effect of $\Delta G > 0$**:**

Evaluating each option:

- **(A) TRUE: Higher** G **raises autonomous expenditure, shifting the IS curve *rightward*. The horizontal shift equals the simple Keynesian multiplier** $\times \Delta G = \Delta G/(1 - \text{MPC})$**.**
- **(B) TRUE: With the LM curve unchanged (**$\bar{M}$ **fixed), the rightward IS shift raises equilibrium** Y **and requires a higher interest rate** r **to keep money demand equal to fixed** $\bar{M}$**. So** r^* **rises.**
- **(C) TRUE: The rise in** r **reduces private investment** $I(r)$ **(capital costs rise). This is the crowding-out effect: part of the fiscal stimulus is offset by reduced private investment, so the actual** $\Delta Y < \Delta G/(1 - \text{MPC})$**.**
- **(D) FALSE: The LM curve shifts only when the *money supply* changes or the price level changes. An increase in** G **does not directly change** $\bar{M}$**. The higher income *raises demand for money*, which is reflected in the rise in** r **along the existing LM curve (movement along LM, not shift of LM).**

Final Answer: Options (A), (B), and (C) are correct.

Answer: (ABC) ↪ Go Back to Q#33

Solution

Concept — Heckscher-Ohlin (H-O) Model and Stolper-Samuelson Theorem $\|Chapter : International Trade - - - Heckscher - Ohlin Model :$

H-O theorem (Heckscher 1919, Ohlin 1933): $Countries export goods that use their$ ***relatively abunda*** $labour ratios), \textbf{not} technology differences (Ricardo).$

Stolper-Samuelson theorem (1941): A rise in the relative price of a good (say, through trade opening) raises the real return to the factor used intensively in producing that good, and *reduces* the real return to the other factor — even if all goods are consumed.

Evaluating each option:

- (A) FALSE: H-O traces comparative advantage to *factor endowment differences* (capital/labour abundance), not technology differences. The Ricardian model uses technology (labour productivity) differences.
- (B) TRUE: The H-O theorem: country exports the good using its relatively abundant factor intensively (e.g., a capital-abundant country exports capital-intensive goods).
- (C) FALSE: Stolper-Samuelson says free trade *hurts* the scarce factor (its real return falls) and *helps* the abundant factor. It does not benefit all factors; redistribution occurs.
- (D) TRUE: Stolper-Samuelson: $\uparrow p_X \Rightarrow \uparrow \hat{w}_K$ (if X is capital-intensive, where K is used intensively) and $\downarrow \hat{w}_L$. This is the "magnification effect": factor price changes are magnified relative to goods price changes.

Final Answer: Options (B) and (D) are correct.

Answer: (BD) ↪ Go Back to Q#34

Solution

Concept — Prerequisites for Profitable Price Discrimination $\|Chapter : Microeconomics - - - MarketStructure :$

$Pricediscriminationoccurswhenasellerchargesdifferentpricestodifferentbuyers(orgroups)forthesa$

Three necessary conditions:

(i) Market power: The seller must be a price-setter (not a price-taker). In perfect competition, all sellers are price-takers and cannot charge above $P = MC$; discrimination is impossible.

(ii) Market segmentation: The seller must be able to identify (or sort) buyers with different demand elasticities or willingness to pay. Without segmentation, a uniform price is optimal.

(iii) No arbitrage: Low-price buyers must not be able to resell to high-price buyers. If resale is easy, arbitrage equalises prices across segments, defeating the discrimination strategy.

Evaluating each option:

- (A) TRUE: Market power is essential; price discrimination cannot occur in perfect competition.
- (B) FALSE: Identical demand functions would mean equal willingness to pay, making discrimination pointless or impossible. Discrimination requires *heterogeneous* buyers.
- (C) TRUE: Segmentation allows the firm to charge different prices in different

sub-markets (e.g., students vs. non-students, peak vs. off-peak).
- (D) TRUE: Arbitrage prevention is essential; if buyers in the cheap segment resell to buyers in the expensive segment, the price differential collapses.

Final Answer: Options (A), (C), and (D) are correct.

Answer: (ACD) ↪ Go Back to Q#35

Solution

Concept — Characteristics of Oligopoly Markets $\|Chapter : Microeconomics - - - MarketStructure :$

$Oligopoly : amarketstructurewithasmallnumberofsellers, significantbarrierstoentry, andstrategicin$

Evaluating each option:

- (A) FALSE: Oligopoly is characterised by *barriers to entry* (patents, economies of scale, legal restrictions, brand loyalty). These barriers allow oligopolists to earn positive economic profits in the long run. Zero profit in the long run is a feature of perfect competition (and monopolistic competition), not oligopoly.
- (B) TRUE: Strategic interdependence is the defining feature of oligopoly. Each firm's profit depends on the strategies of rivals (output choices in Cournot, price choices in Bertrand), and each must anticipate rivals' reactions when setting its own strategy.
- (C) TRUE: The kinked demand curve model (Sweezy 1939) predicts price rigidity. If a firm raises its price, rivals do *not* follow (more elastic demand above the kink), so the firm loses many customers. If a firm lowers its price, rivals *match* the cut (less elastic demand below the kink), so the firm gains few additional customers. This creates a kink in the demand curve and a discontinuity in MR, making price sticky over a range of MC shifts.
- (D) FALSE: Oligopoly typically results in output below (and price above) the competitive level. The competitive outcome arises only in Bertrand equilibrium with homogeneous goods and equal costs — and even then, it is a special result (the "Bertrand paradox"), not a general feature of oligopoly.

Final Answer: Options (B) and (C) are correct.

Answer: (BC) ↪ Go Back to Q#36

Solution

Concept — Properties of Estimators: Sufficiency, Cramér-Rao Bound, Efficiency $\|Chapter : Statistics\&Econometrics :$

Evaluating each option:

- **(A) TRUE — Sufficiency: A statistic $T(\mathbf{X})$ is sufficient for θ if the conditional distribution of X given $T(\mathbf{X})$ does not depend on θ. Intuitively, T captures all information about θ in the sample. By the *Factorisation Theorem* (Fisher-Neyman): T is sufficient iff the likelihood factors as $L(\theta; \mathbf{x}) = g(T(\mathbf{x}), \theta) \cdot h(\mathbf{x})$.**
- **(B) TRUE — Cramér-Rao Lower Bound (CRLB): For any unbiased estimator $\hat{\theta}$ of θ:**

$$\mathrm{Var}(\hat{\theta}) \geq \frac{1}{nI(\theta)},$$

where $I(\theta) = E\left[(\partial \ln f / \partial\theta)^2\right]$ is the Fisher information. The CRLB gives the *minimum variance* achievable by any unbiased estimator.

- **(C) FALSE: Consistency ($\hat{\theta}_n \xrightarrow{p} \theta$) is an *asymptotic* property and does not guarantee unbiasedness in any finite sample. The MLE of σ^2 (divides by n) is consistent but biased downward in finite samples. A biased-but-consistent estimator is entirely possible.**
- **(D) TRUE — Efficient Estimator: An unbiased estimator that achieves the CRLB (i.e., $\mathrm{Var}(\hat{\theta}) = 1/[nI(\theta)]$) is called an efficient estimator or MVUE (Minimum Variance Unbiased Estimator) within the parametric family. For example, $\bar{X}$ achieves the CRLB for estimating μ in a normal distribution.**

Final Answer: Options (A), (B), and (D) are correct.

Answer: (ABD) ↪ Go Back to Q#37

Solution

Concept — RBI Monetary Policy Instruments vs. Fiscal Instruments $\|Chapter : Macroeconomics - - - MonetaryTheory :$

$Itisessentialtodistinguish$**monetary policy**$(controlledbytheRBI)from$**fiscal policy**$(controlledbytheM$

Evaluating each option:

- **(A) FALSE: Personal income tax rates are set by the *Finance Ministry* in the Union Budget and approved by Parliament. They are a fiscal instrument, not a monetary instrument.**
- **(B) FALSE: Government capital expenditure on infrastructure is a *fiscal* instrument decided by the Finance Ministry. It does not lie within the RBI's purview.**
- **(C) TRUE: The Cash Reserve Ratio (CRR) is a direct quantitative monetary instrument of the RBI. Every scheduled commercial bank must maintain a fraction (CRR) of its Net Demand and Time Liabilities (NDTL) as cash with the RBI. An increase in CRR reduces banks' lendable funds (contracts money supply); a decrease expands them.**
- **(D) TRUE: The Repo rate (repurchase agreement rate) is the primary price-based**

monetary instrument of the RBI. It is the rate at which the RBI lends overnight funds to commercial banks against eligible collateral (government securities). The Monetary Policy Committee (MPC) sets the repo rate. A higher repo rate raises borrowing costs for banks, contracting credit and money supply; a lower rate stimulates borrowing.

Other RBI monetary instruments include: Statutory Liquidity Ratio (SLR), Marginal Standing Facility (MSF) rate, open market operations (OMO), and the reverse repo rate.

Final Answer: Options (C) and (D) are correct.

Answer: (CD) ↪ Go Back to Q#38

Solution

Concept — Leontief Input-Output Model (Leontief 1941) $\|Chapter : Macroeconomics - - - Input - OutputAnalysis :$

$Themodeldescribesinter - industryflowsinaneconomy.Let\mathbf{n}sectorsproducegoods, with\mathbf{x}_i$ = total output of sector i, f_i = final demand for good i, and a_{ij} = direct technical coefficient = units of input from sector i required per unit of output of sector j.

System of equations:

$$x_i = \sum_{j=1}^{n} a_{ij}\, x_j + f_i \quad \Rightarrow \quad \mathbf{x} = A\mathbf{x} + \mathbf{f} \quad \Rightarrow \quad (I - A)\mathbf{x} = \mathbf{f}.$$

If $(I - A)$ is invertible (Hawkins-Simon conditions), the solution is $\mathrm{x} = (I - A)^{-1}\mathbf{f}$.

Evaluating each option:

- (A) TRUE: The input-output model's central purpose is to capture *inter-industry linkages*: the intermediate goods flows from one sector to another. For example, the steel sector uses coal, electricity, and iron ore as inputs from other sectors.
- (B) TRUE: The Leontief inverse $(I - A)^{-1}$ gives the *total* (direct plus all rounds of indirect) requirements. The (i, j) element of $(I - A)^{-1}$ is the total output needed from sector i for one unit of final demand in sector j. This captures supply chain multipliers.
- (C) FALSE: Final demand f is *exogenous* in the standard Leontief model — it is the given demand vector from households, government, and exports. The model solves for the *endogenous* gross output x that satisfies the final demand.
- (D) FALSE: The direct technical coefficient a_{ij} represents only the *direct* input of sector i per unit of output of sector j (first-round requirement only). The *total* (direct plus indirect) requirements are given by the corresponding element of the Leontief inverse $(I - A)^{-1}$, which is typically larger than a_{ij} (it includes all

upstream supply chain effects).

Final Answer: Options (A) and (B) are correct.

Answer: (AB) ↪ Go Back to Q#39

Solution

Concept — Growth Accounting (Solow 1957) $\|Chapter : Macroeconomics - - - EconomicGrowth :$

$Starting from the aggregate production function$**Y = A**$\cdot F(K, L)$ **(where** A **= TFP), differentiate with respect to time to obtain the growth accounting equation:**

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + (1-\alpha)\frac{\dot{L}}{L},$$

where α **= capital's share in national income (under perfect competition,** $\alpha = rK/Y$**).**

Solow residual (TFP growth):

$$\frac{\dot{A}}{A} = \frac{\dot{Y}}{Y} - \alpha\frac{\dot{K}}{K} - (1-\alpha)\frac{\dot{L}}{L}.$$

It is the portion of GDP growth not accounted for by measured factor accumulation.

Evaluating each option:

- **(A) TRUE: The formula correctly states the Solow residual as the difference between output growth and the factor-share-weighted sum of input growths.**
- **(B) FALSE: TFP growth is *not* always positive. During recessions (e.g., 2008-09 global financial crisis), measured TFP growth can be negative. Factors such as resource misallocation, measurement error, and utilisation changes can cause negative TFP growth in the short run.**
- **(C) TRUE: Growth accounting's primary purpose is this three-way decomposition: how much of GDP growth comes from capital accumulation, from labour growth, and from TFP? This framework was pioneered by Solow (1957) for the US and later applied widely.**
- **(D) TRUE: If** $\dot{A}/A = 0$ **(TFP growth is zero) and all observed GDP growth is explained by factor inputs (**$\alpha\dot{K}/K + (1-\alpha)\dot{L}/L = \dot{Y}/Y$**), then there is no technological progress by definition. The economy is simply accumulating more factors without using them more productively.**

Final Answer: Options (A), (C), and (D) are correct.

Answer: (ACD) ↪ Go Back to Q#40

Solution

Concept — Leontief (Perfect Complements) Utility Maximisation $\|Chapter : Microeconomics - - - ConsumerTheory :$

U(x,y) = $\min(3x, 2y)$**,** $p_x = 1$**,** $p_y = 1$**,** $M = 10$**.**

Step 1 — Optimal bundle condition:
With Leontief (perfect complements) preferences, the consumer maximises utility at the *kink* of the indifference curve, where both arguments are equal:

$$3x = 2y \quad \Rightarrow \quad y = \frac{3}{2}x.$$

Step 2 — Apply budget constraint:

$$\begin{aligned} p_x x + p_y y &= M \\ 1 \cdot x + 1 \cdot \frac{3x}{2} &= 10 \\ x + \frac{3x}{2} &= 10 \\ \frac{5x}{2} &= 10 \\ x^* &= 4. \end{aligned}$$

Step 3 — Find y^***:**

$$y^* = \frac{3}{2} \times 4 = 6.$$

Verification: $U(4, 6) = \min(3 \times 4, 2 \times 6) = \min(12, 12) = 12$**. Budget:** $4 + 6 = 10 = M$**.**

Final Answer: $y^* = \boxed{6}$

Answer: (6) ↪ Go Back to Q#41

Answer: (6) ↪ Go Back to Q#42

Solution

Concept — Simple Keynesian Income Determination (Closed Economy) $\|Chapter : Macroeconomics - - - FiscalPolicy :$

C = 40 + 0.8Y,I = 60,G = 50.

Step 1 — Goods market equilibrium:

$$Y = C + I + G = (40 + 0.8Y) + 60 + 50 = 150 + 0.8Y.$$

Step 2 — Solve for Y^*:

$$\begin{aligned} Y - 0.8Y &= 150 \\ 0.2Y &= 150 \\ Y^* &= \frac{150}{0.2} = \boxed{750}. \end{aligned}$$

Multiplier interpretation:

$$\textbf{Multiplier} = \frac{1}{1 - \textbf{MPC}} = \frac{1}{1 - 0.8} = \frac{1}{0.2} = 5.$$

Autonomous expenditure $= I + G = 60 + 50 = 110$ **(plus autonomous consumption** $= 40$**, total** $= 150$**).** $Y^* = 5 \times 150 = 750$**.**

Final Answer: $Y^* = \boxed{750}$

Answer: (750) ↪ Go Back to Q#43

Solution

Concept — $E[(X - \mu)^2]$ **and Variance** $\|Chapter : Statistics\&Probability : Bydefinition, the$**variance**$ofarandomvariable$**X**$withmean\mu$ **is:**

$$\text{Var}(X) = E\big[(X - \mu)^2\big].$$

For $X \sim N(\mu = 10, \sigma^2 = 16)$**:**

$$E\big[(X - 10)^2\big] = \text{Var}(X) = \sigma^2 = \boxed{16}.$$

Alternative derivation:

$$\begin{aligned} E[(X - 10)^2] &= E[X^2 - 20X + 100] \\ &= E[X^2] - 20E[X] + 100 \\ &= (\text{Var}(X) + [E(X)]^2) - 20\mu + 100 \\ &= (16 + 100) - 200 + 100 = 16. \checkmark \end{aligned}$$

Note: $E[(X - c)^2]$ **is minimised at** $c = E[X] = \mu$**, where it equals** $\text{Var}(X)$**. For any other constant** c**:** $E[(X - c)^2] = \text{Var}(X) + (\mu - c)^2 \geq \text{Var}(X)$**.**

Final Answer: $E[(X - 10)^2] = \boxed{16}$

Answer: (16) ↪ Go Back to Q#44

Solution

Concept — Eigenvalues of a 2×2 Matrix $\|Chapter : Mathematics - - - LinearAlgebra$:

For**A =** $\begin{pmatrix} 5 & 2 \\ 2 & 2 \end{pmatrix}, eigenvalues\lambda$ **satisfy** $\det(A - \lambda I) = 0$**.**

Characteristic polynomial:

$$\det \begin{pmatrix} 5-\lambda & 2 \\ 2 & 2-\lambda \end{pmatrix} = (5-\lambda)(2-\lambda) - (2)(2)$$
$$= 10 - 5\lambda - 2\lambda + \lambda^2 - 4$$
$$= \lambda^2 - 7\lambda + 6 = 0.$$

Factorisation:

$$(\lambda - 6)(\lambda - 1) = 0 \quad \Rightarrow \quad \lambda_1 = 6, \quad \lambda_2 = 1.$$

Verification:

- **Trace:** $\lambda_1 + \lambda_2 = 6 + 1 = 7 = 5 + 2 = \text{tr}(A)$**.**
- **Determinant:** $\lambda_1 \times \lambda_2 = 6 \times 1 = 6 = 5 \times 2 - 2 \times 2 = 10 - 4 = 6$**.**

The larger eigenvalue is $\lambda_1 = \boxed{6}$**.**

Final Answer: Larger eigenvalue $= \boxed{6}$

Answer: (6) ↪ Go Back to Q#45

Solution

Concept — Deadweight Loss from Monopoly $\|Chapter : Microeconomics - - - MarketStructure$:

$Inversedemand$:**P = 80 - Q;MC = 20**.

Step 1 — Monopoly optimum ($MR = MC$**):**

$$MR = 80 - 2Q = 20 \quad \Rightarrow \quad 2Q = 60 \quad \Rightarrow \quad Q_m = 30.$$

$$P_m = 80 - 30 = 50.$$

Step 2 — Competitive outcome ($P = MC$**):**

$$80 - Q = 20 \quad \Rightarrow \quad Q_c = 60, \quad P_c = 20.$$

Step 3 — Deadweight loss (DWL):
The DWL is the area of the triangle between Q_m **and** Q_c**, bounded above by the**

demand curve and below by the MC line:

$$DWL = \frac{1}{2}(P_m - MC)(Q_c - Q_m) = \frac{1}{2}(50-20)(60-30) = \frac{1}{2} \times 30 \times 30 = \boxed{450}.$$

Graphical interpretation: The shaded triangle in the diagram has base $= Q_c - Q_m = 30$ **and height** $= P_m - P_c = 50 - 20 = 30$**; area** $= 450$**. This represents the units of output that generate a social surplus (value to consumer exceeds MC) but are not produced under monopoly.**

Final Answer: $DWL = \boxed{450}$

Answer: (450) ↪ Go Back to Q#46

Solution

Concept — Solow Model: Steady-State Consumption per Worker $\|Chapter : Macroeconomics - - - EconomicGrowth :$

y = k$^{0.5}$ (per-worker production function), $s = 0.2$**,** $\delta = 0.05$**.**

Step 1 — Steady-state capital k^***:**
At steady state, investment per worker = depreciation per worker:

$$s\,f(k^*) = \delta\,k^* \quad \Rightarrow \quad 0.2\,(k^*)^{0.5} = 0.05\,k^*.$$

Divide both sides by $(k^*)^{0.5}$ **(assuming** $k^* > 0$**):**

$$0.2 = 0.05\,(k^*)^{0.5} \quad \Rightarrow \quad (k^*)^{0.5} = \frac{0.2}{0.05} = 4 \quad \Rightarrow \quad k^* = 16.$$

Step 2 — Steady-state output y^***:**

$$y^* = (k^*)^{0.5} = \sqrt{16} = 4.$$

Step 3 — Steady-state consumption c^***:**

$$c^* = (1-s)\,y^* = (1-0.2) \times 4 = 0.8 \times 4 = \boxed{3.2}.$$

Verification: $s\,y^* = 0.2 \times 4 = 0.8 = \delta\,k^* = 0.05 \times 16 = 0.8$**.**

Final Answer: $c^* = \boxed{3.2}$

Answer: (3.2) ↪ Go Back to Q#47

Solution

Concept — One-Sample z-Test for a Population Mean $\|Chapter : Statistics\&Probability :$

$Given$:**n = 100**, **= 52**,$\sigma = 10$, $H_0 : \mu = \mu_0 = 50$.

Test statistic:

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{52 - 50}{10/\sqrt{100}} = \frac{2}{10/10} = \frac{2}{1} = \boxed{2}.$$

Step-by-step:

- **Standard error of the mean:** $\text{SE} = \sigma/\sqrt{n} = 10/\sqrt{100} = 10/10 = 1$.
- $z = (\bar{x} - \mu_0)/\text{SE} = (52 - 50)/1 = 2$.

Interpretation: $z = 2$ **lies at the boundary of a two-sided critical region at the 5% level (**$|z_{\alpha/2}| = 1.96$**). Since** $2 > 1.96$**, we reject** H_0 **at the 5% significance level (**p**-value** $= 2\Phi(-2) \approx 0.046$**).**

Final Answer: $z = \boxed{2}$

Answer: (2) ↪ Go Back to Q#48

Solution

Concept — Two-Part Tariff: Optimal Fixed Fee $\|Chapter : Microeconomics - - - MarketStructure :$

P = 100 - Q;MC = 20.

Optimal two-part tariff: Set usage price $= MC = 20$ **(efficient allocation), and charge a fixed fee equal to the entire consumer surplus (extracted as a lump sum).**

Step 1 — Quantity at $P = MC$**:**

$$100 - Q = 20 \quad \Rightarrow \quad Q^* = 80.$$

Step 2 — Consumer surplus (area of the CS triangle):

$$CS = \frac{1}{2} \times \textbf{(intercept} - P^*) \times Q^* = \frac{1}{2}(100 - 20)\,80 = \frac{1}{2} \times 80 \times 80 = \boxed{3200}.$$

Step 3 — Optimal fixed fee $= CS = 3200$.

Profit check: Firm earns:

- **From usage:** $(P - MC) \times Q^* = (20 - 20) \times 80 = 0$ **(zero profit on per-unit sales).**
- **From fixed fee:** 3200.
- **Total profit** $= 3200 > 0$**, so the firm participates.**

The shaded triangle in the diagram with vertices at $(0, 100)$**,** $(0, 20)$**, and** $(80, 20)$ **has area** $= 3200$.

Final Answer: Optimal fixed fee $= \boxed{3200}$

Answer: (3200) ↪ Go Back to Q#49

Answer: (4500) ↪ Go Back to Q#50

Solution

Concept — Monopoly Profit Maximisation $\|Chapter : Microeconomics - - - MarketStructure :$

P = 100 - Q;TC = 20Q + 100; so**MC = 20**.

Step 1 — MR:

$$TR = P \cdot Q = (100 - Q)Q = 100Q - Q^2 \quad \Rightarrow \quad MR = \frac{d(TR)}{dQ} = 100 - 2Q.$$

Step 2 — Profit-maximising output ($MR = MC$):

$$100 - 2Q = 20 \quad \Rightarrow \quad 2Q = 80 \quad \Rightarrow \quad Q^* = 40.$$

Step 3 — Monopoly price:

$$P^* = 100 - 40 = 60.$$

Step 4 — Profit:

$$\begin{aligned} \pi &= TR - TC = P^*Q^* - (20Q^* + 100) \\ &= 60 \times 40 - (20 \times 40 + 100) \\ &= 2400 - 900 = \boxed{1500}. \end{aligned}$$

Verification: $\pi = (P^* - MC) \times Q^* - FC = (60 - 20) \times 40 - 100 = 1600 - 100 = 1500$**.**

Final Answer: Monopolist's maximum profit $= \boxed{1500}$

Answer: (1500) ↪ Go Back to Q#51

Solution

Concept — IS-LM Equilibrium $\|Chapter : Macroeconomics - - - IS - LMModel :$ $IScurve$:**Y = 600 - 50r**. $LMcurve$:**Y = 100 + 75r**.

Step 1 — Equate IS and LM:

$$600 - 50r = 100 + 75r.$$

Step 2 — Solve for r^*:

$$600 - 100 = 75r + 50r$$
$$500 = 125r$$
$$r^* = 4.$$

Step 3 — Solve for Y^*:

$$Y^* = 600 - 50 \times 4 = 600 - 200 = \boxed{400}.$$

Verification via LM: $Y = 100 + 75 \times 4 = 100 + 300 = 400$**.**

Graphical interpretation: The diagram shows IS and LM intersecting at $(Y^*, r^*) = (400, 4)$**. IS: from** $(0, r = 12)$ **to** $(Y = 600, r = 0)$**; LM: from** $(Y = 100, r = 0)$ **upward-sloping.**

Final Answer: $Y^* = \boxed{400}$

Answer: (400) ↪ Go Back to Q#52

Answer: (0.7) ↪ Go Back to Q#53

Solution

Concept — Matrix Multiplication $\|Chapter : Mathematics - - - Linear Algebra :$

A = $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$**,B =** $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

Compute AB**:**

$$AB = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} 1 \cdot 0 + 2 \cdot 1 & 1 \cdot 1 + 2 \cdot 0 \\ 3 \cdot 0 + 4 \cdot 1 & 3 \cdot 1 + 4 \cdot 0 \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}.$$

Element $(1, 2)$ **(row 1, column 2):**

$$(AB)_{12} = 1 \cdot 1 + 2 \cdot 0 = 1 + 0 = \boxed{1}.$$

Note: $(AB)_{ij} = \sum_k A_{ik} B_{kj}$**. Here** $i = 1$**,** $j = 2$**:** $(AB)_{12} = A_{11}B_{12} + A_{12}B_{22} = 1 \times 1 + 2 \times 0 = 1$**.**

Final Answer: $(1, 2)$ **element of** $AB = \boxed{1}$

Answer: (1) ↪ Go Back to Q#54

Solution

Concept — Change in Consumer Surplus from a Price Rise $\|Chapter : Microeconomics - - - WelfareEconomics :$

$Inversedemand$:**P = 80 - 2Q** $\Rightarrow$ $Q = (80 - P)/2 = 40 - P/2$.

Step 1 — Quantities at old and new prices:

$$Q_0 = \frac{80 - 20}{2} = 30; \qquad Q_1 = \frac{80 - 30}{2} = 25.$$

Step 2 — Consumer surplus at each price:

$$CS_0 = \frac{1}{2}(80 - 20) \times 30 = \frac{1}{2} \times 60 \times 30 = 900.$$

$$CS_1 = \frac{1}{2}(80 - 30) \times 25 = \frac{1}{2} \times 50 \times 25 = 625.$$

Step 3 — Decrease in consumer surplus:

$$\Delta CS = CS_1 - CS_0 = 625 - 900 = -275.$$

The decrease in consumer surplus is $|-275| = \boxed{275}$.

Decomposition: The loss in CS consists of:

- **Transfer to producer (rectangle):** $(P_1 - P_0) \times Q_1 = 10 \times 25 = 250$.
- **Deadweight loss (triangle):** $\frac{1}{2}(P_1 - P_0)(Q_0 - Q_1) = \frac{1}{2} \times 10 \times 5 = 25$.
- **Total loss:** $250 + 25 = 275$.

Final Answer: Decrease in consumer surplus $= \boxed{275}$

Answer: (275) ↪ Go Back to Q#55

Answer: (130) ↪ Go Back to Q#56

Solution

Concept — Coefficient of Determination R^2 $\|Chapter : Statistics\&Econometrics :$

$Inasimplelinearregressionof$**Y**$on$**X**$, thecoefficientofdetermination$**R**^{2} **equals the square of the sample correlation coefficient** r**:**

$$R^2 = r^2.$$

Calculation:

$$R^2 = (0.6)^2 = \boxed{0.36}.$$

Interpretation: $R^2 = 0.36$ **means that 36% of the total variation in** Y **is explained**

by the linear regression on X; the remaining 64% is unexplained (residual).

Why $R^2 = r^2$ in simple regression:

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} = \frac{SS_{reg}}{SS_{tot}} = \frac{(\hat{\beta}_1)^2 \, S_{xx}}{S_{yy}} = \frac{(S_{xy})^2}{S_{xx} \, S_{yy}} = r_{XY}^2,$$

where $r_{XY} = S_{xy}/\sqrt{S_{xx} S_{yy}}$ is the Pearson correlation coefficient.

Note: In *multiple* regression, R^2 is the squared multiple correlation between Y and the fitted values $\hat{Y}$; it does not equal the square of any single bivariate r.

Final Answer: $R^2 = \boxed{0.36}$

Answer: (0.36) ↪ Go Back to Q#57

Solution

Concept — First-Order Discrete Dynamic Equation $\|Chapter : Mathematics - - - Difference Equations :$

y(t) = 2 y(t-1) $with$ **y(0) = 1**.

General solution: This is a homogeneous first-order difference equation $y(t) = A^t \, y(0)$ where $A = 2$:

$$y(t) = 2^t \cdot y(0) = 2^t \cdot 1 = 2^t.$$

Iterative computation:

$$\begin{aligned} y(0) &= 1, \\ y(1) &= 2 \times 1 = 2, \\ y(2) &= 2 \times 2 = 4, \\ y(3) &= 2 \times 4 = 8, \\ y(4) &= 2 \times 8 = \boxed{16}. \end{aligned}$$

Stability note: Since $|A| = 2 > 1$, the equilibrium $y^* = 0$ is *unstable*: trajectories diverge geometrically (exponential growth). This system exhibits explosive growth — consistent with a doubling process (e.g., compound interest at 100% or exponential population growth).

Final Answer: $y(4) = \boxed{16}$

Answer: (16) ↪ Go Back to Q#58

Solution

Concept — Long-Run Equilibrium in Monopolistic Competition $\|Chapter : Microeconomics - - - MarketStructure :$

TC = 10Q + 100, so**MC = 10** and **AC = 10 + 100/Q**.

$Inversedemand$:**P = 30 - Q**, so**MR = 30 - 2Q**.

Long-run equilibrium conditions:

(i) Profit maximisation: $MR = MC$.

(ii) Zero profit (free entry): $P = AC$.

Step 1 — MR = MC:

$$30 - 2Q = 10 \quad \Rightarrow \quad 2Q = 20 \quad \Rightarrow \quad Q^* = 10.$$

Step 2 — Check $P = AC$ **at** $Q^* = 10$**:**

$$P^* = 30 - 10 = 20; \qquad AC(10) = 10 + \frac{100}{10} = 10 + 10 = 20.$$

$P^* = AC(10) = 20$. **Zero profit confirmed.**

Step 3 — Profit:

$$\pi = TR - TC = 20 \times 10 - (10 \times 10 + 100) = 200 - 200 = 0. \checkmark$$

Interpretation: At $Q = 10$**, the firm is at the minimum of its average cost curve for this particular demand curve and cost structure (the demand curve is tangent to the AC curve at this point). The firm is in long-run equilibrium with zero economic profit.**

Final Answer: Long-run equilibrium output $= \boxed{10}$

Answer: (10) ↪ Go Back to Q#59

Solution

Concept — Gini Coefficient $\|Chapter : Statistics\&IndianEconomy - - - Inequality :$

$Incomes$:$\mathbf{y}_1 = 20$, $y_2 = 40$, $y_3 = 60$, $y_4 = 80$ **(in Rs. thousand).**

$n = 4$, $\bar{y} = (20 + 40 + 60 + 80)/4 = 200/4 = 50$.

Formula:

$$G = \frac{1}{2n^2\bar{y}} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|.$$

Step 1 — Compute all pairwise absolute differences $|y_i - y_j|$**:**

$\lvert y_i - y_j \rvert$	$y_1 = 20$	$y_2 = 40$	$y_3 = 60$	$y_4 = 80$
$y_1 = 20$	**0**	**20**	**40**	**60**
$y_2 = 40$	**20**	**0**	**20**	**40**
$y_3 = 60$	**40**	**20**	**0**	**20**
$y_4 = 80$	**60**	**40**	**20**	**0**

Step 2 — Sum all entries:

$$\sum_{i,j} |y_i - y_j| = (0 + 20 + 40 + 60) + (20 + 0 + 20 + 40) + (40 + 20 + 0 + 20) + (60 + 40 + 20 + 0)$$

$$= 120 + 80 + 80 + 120 = 400.$$

Step 3 — Compute G:

$$G = \frac{400}{2 \times 4^2 \times 50} = \frac{400}{2 \times 16 \times 50} = \frac{400}{1600} = \boxed{0.25}.$$

Interpretation: $G = 0.25$ indicates moderate inequality. For a perfectly equal distribution $G = 0$; for maximum inequality $G \to 1$. The incomes $\{20, 40, 60, 80\}$ form an arithmetic progression, yielding a symmetric (but non-zero) level of inequality.

Final Answer: Gini coefficient $G = \boxed{0.25}$

Answer: (0.25) ↪ Go Back to Q#60

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	A	4	D	5	B
6	C	7	A	8	D	9	B	10	C
11	A	12	C	13	B	14	D	15	A
16	D	17	C	18	B	19	A	20	C
21	D	22	A	23	B	24	C	25	D
26	A	27	B	28	C	29	D	30	A
31	AB	32	CD	33	ABC	34	BD	35	ACD
36	BC	37	ABD	38	CD	39	AB	40	ACD
41	6	42	6	43	750	44	16	45	6
46	450	47	3.2	48	2	49	3200	50	4500
51	1500	52	400	53	0.7	54	1	55	275
56	130	57	0.36	58	16	59	10	60	0.25