IIT JAM Economics

Sample Paper – 3

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 Hicksian (compensated) demand?

(A) Hicksian demand is derived by maximising utility subject to a budget constraint.

(B) Hicksian demand is derived by minimising expenditure subject to a fixed utility level.

(C) Hicksian demand always coincides with Marshallian demand for all goods.

(D) Hicksian demand slopes upward for all goods with negative income effects.

Q2. Under the expenditure approach to measuring GDP, which of the following is **NOT** included?

(A) Government expenditure on defence and public services.

(B) Gross fixed capital formation (domestic investment).

(C) Transfer payments by the government (e.g., pensions, unemployment benefits).

(D) Net exports of goods and services.

Q3. Let A_1, A_2, A_3 be mutually exclusive and exhaustive events with $P(A_1) = 0.2$, $P(A_2) = 0.5$, $P(A_3) = 0.3$. If $P(B \mid A_1) = 0.4$, $P(B \mid A_2) = 0.6$, $P(B \mid A_3) = 0.8$, then $P(B)$ equals:

(A) 0.48

(B) 0.56

(C) 0.60

(D) 0.62

Q4. Which of the following statements about sequences of real numbers is **correct**?

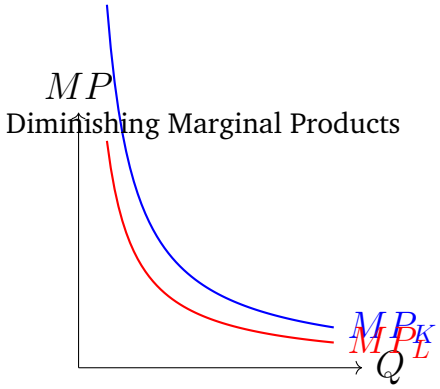
(A) Every monotonically increasing sequence of real numbers converges.

(B) Every bounded monotonically increasing sequence of real numbers converges.

(C) Every bounded sequence of real numbers is monotone.

(D) A convergent sequence need not be bounded.

Q5. Consider the Cobb-Douglas production function $Q = AK^{\alpha}L^{1-\alpha}$, where $0 < \alpha < 1$. In a competitive economy, the parameter α equals:



(A) Capital's share in total output: $\alpha = rK/(PQ)$.

(B) Labour's share in total output: $\alpha = wL/(PQ)$.

(C) The elasticity of output with respect to total factor productivity A.

(D) The ratio of the marginal product of capital to the marginal product of labour.

Q6. The long-run Phillips curve is vertical at the:

(A) Natural rate of inflation.

(B) Full-employment level of output (Y^*).

(C) Expected rate of inflation.

(D) Non-Accelerating Inflation Rate of Unemployment (NAIRU).

Q7. As per the Reserve Bank of India's guidelines, which of the following is **NOT** classified as part of the priority sector for bank lending?

(A) Agriculture and allied activities.

(B) Micro, Small and Medium Enterprises (MSMEs).

(C) Large infrastructure projects (power, highways, ports).

(D) Education loans up to specified limits.

Q8. A random variable X follows an Exponential distribution with parameter $\lambda > 0$. The **memoryless property** of this distribution states that, for all $s, t > 0$:

(A) $P(X > s + t \mid X > s) = P(X > t)$.

(B) The mean of X equals its median.

(C) The distribution is symmetric around $1/\lambda$.

(D) $\mathrm{Var}(X) = [E(X)]^2$ only when $\lambda = 1$.

Q9. For any two $n \times n$ matrices A and B, which of the following identities is **always** true?

(A) $\det(A + B) = \det(A) + \det(B)$.

(B) $\det(A - B) = \det(A) - \det(B)$.

(C) $\mathrm{rank}(AB) = \mathrm{rank}(A) + \mathrm{rank}(B)$.

(D) $\det(AB) = \det(A) \cdot \det(B)$.

Q10. The **Poverty Head Count Ratio (HCR)** is defined as:

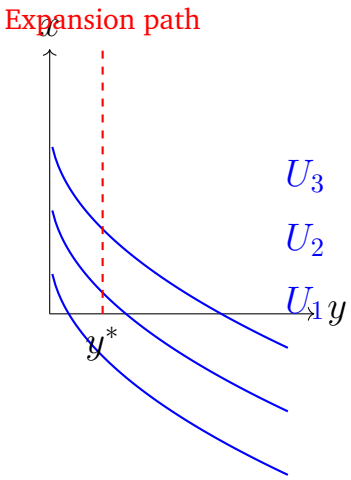
(A) The average income shortfall of the poor from the poverty line, as a fraction of the poverty line.

(B) The proportion of the population whose income or consumption falls below the poverty line.

(C) The total income gap of the poor expressed as a fraction of GDP.

(D) The square of the normalised income shortfall of the poor, averaged across the population.

Q11. Consider a consumer with quasi-linear preferences represented by $U(x, y) = x + v(y)$, where $v'(y) > 0$ and $v''(y) < 0$. Which of the following is **correct**?



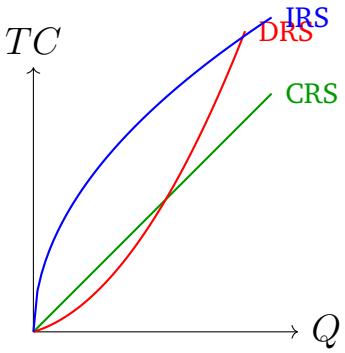
(A) Both the demand for x and the demand for y depend on income.

(B) The optimal demand for x is independent of income (no income effect on x).

(C) The optimal demand for y is independent of income (no income effect on y), and the compensated and Marshallian demands for y are identical.

(D) Quasi-linear preferences imply homothetic indifference curves.

Q12. A competitive firm has total cost function $TC = aQ$ where $a > 0$ is a constant. The diagram below shows three possible shapes of the TC curve. If TC is linear in Q (as in this case), the underlying technology exhibits:



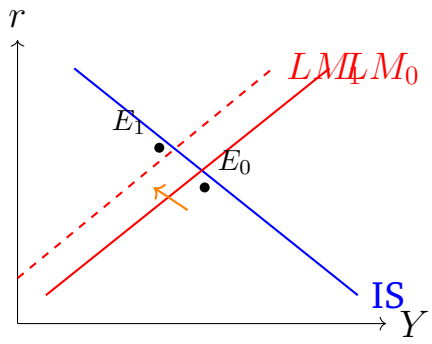
(A) Constant returns to scale (CRS).

(B) Decreasing returns to scale (DRS).

(C) Increasing returns to scale (IRS).

(D) Non-homothetic technology with variable returns to scale.

Q13. In the IS-LM model, a **contractionary monetary policy** (reduction in nominal money supply) causes:



(A) Rightward shift of the LM curve, lower interest rate, higher income.

(B) Leftward shift of the LM curve, higher interest rate, lower income.

(C) Rightward shift of the IS curve, higher interest rate, higher income.

(D) Leftward shift of the IS curve, lower interest rate, lower income.

Q14. In the Harrod-Domar growth model, the **warranted growth rate** (g_w) is given by:

(A) $g_w = s \cdot v$, where s is the savings rate and v is the capital-output ratio.

(B) $g_w = v/s$.

(C) $g_w = s + v$.

(D) $g_w = s/v$.

Q15. In the classical linear regression model $Y = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k + \varepsilon$, the **F-statistic** is used to test:

(A) Whether any single slope coefficient $\beta_j = 0$ (individual significance).

(B) Whether the residuals $\hat{\varepsilon}_i$ are normally distributed.

(C) Whether all slope coefficients jointly equal zero: $H_0 : \beta_1 = \beta_2 = \cdots = \beta_k = 0$ (overall significance of the regression).

(D) Whether the error variance $\sigma^2 = 1$.

Q16. Let $V^*(\alpha) = \max_x f(x, \alpha)$ be the value function of an unconstrained optimisation problem, and let $x^*(\alpha)$ be the optimiser. According to the **Envelope Theorem**, $dV^*/d\alpha$ equals:

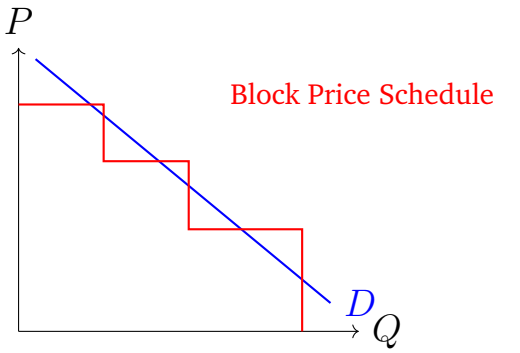
(A) $\dfrac{\partial f\big(x^*(\alpha),\, \alpha\big)}{\partial \alpha}$ (partial derivative of f with respect to α, evaluated at the optimum).

(B) The total derivative $df/d\alpha$ evaluated along the optimal path.

(C) $\dfrac{\partial^2 f}{\partial x\, \partial \alpha}$ evaluated at $x^*(\alpha)$.

(D) Zero, because V^* is already at a maximum.

Q17. A seller who **cannot observe individual buyer types** but designs a menu of (quantity, total price) packages so that buyers self-select according to their willingness to pay is practising which form of price discrimination?



(A) First-degree (perfect) price discrimination.

(B) Second-degree price discrimination (block pricing / quantity discounts).

(C) Third-degree price discrimination (market segmentation by group).

(D) Bundling with a linear two-part tariff observable to the seller.

Q18. Keynes' **Absolute Income Hypothesis** (AIH) specifies the aggregate consumption function as:

(A) $C = \kappa \cdot Y^P$, where Y^P is permanent income (Friedman's PIH).

(B) $C_t = \gamma \cdot \bar{Y}_t^r$, based on relative income compared to a reference group (Duesenberry).

(C) $C = \frac{1}{T}\big(W + Y \cdot T\big)$, based on lifetime wealth (Modigliani's LCH).

(D) $C = a + bY$, where $a > 0$ is autonomous consumption and $0 < b < 1$ is the marginal propensity to consume.

Q19. A researcher constructs a 95% confidence interval for a population mean μ. The **correct** frequentist interpretation is:

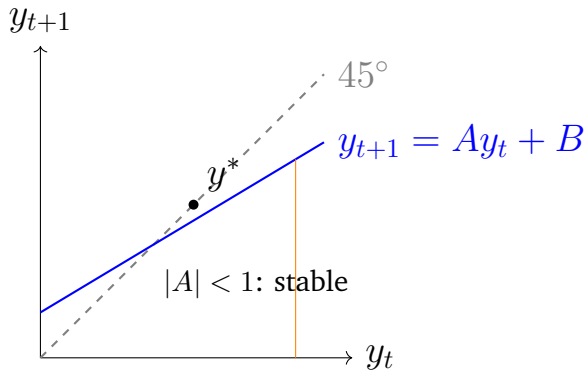
(A) There is a 95% probability that the true mean μ lies within this particular computed interval.

(B) 95% of the individual observations in the population lie within this interval.

(C) If the sampling procedure were repeated many times, 95% of the resulting intervals would contain the true mean μ.

(D) The true mean μ is guaranteed to lie within this interval with 95% certainty once computed.

Q20. For the first-order linear difference equation $y(t) = A \cdot y(t-1) + B$ (with A, B constants), the equilibrium $y^* = B/(1-A)$ is **asymptotically stable** if and only if:



(A) $|A| < 1$.

(B) $A < 0$.

(C) $|A| > 1$.

(D) $A = 1$.

Q21. Which of the following statements about **Iterated Elimination of Dominated Strategies (IEDS)** is **correct**?

(A) IEDS may yield different outcomes depending on the order in which dominated strategies are eliminated.

(B) If IEDS yields a unique outcome, that outcome is the unique Nash equilibrium of the game.

(C) IEDS always yields a unique outcome in every finite game.

(D) A strategy that survives IEDS is always a best response to some pure strategy of the opponent.

Q22. **Stagflation** — simultaneous high inflation and high unemployment — is best explained in the AS-AD framework by:

(A) A positive demand shock combined with an expansionary monetary policy response.

(B) A rightward shift of the short-run aggregate demand (AD) curve.

(C) Movement along the short-run Phillips curve due to demand pull.

(D) An adverse supply shock (e.g., sharp rise in oil prices) that shifts the short-run aggregate supply (SRAS) curve leftward.

Q23. For a random sample $x_1, x_2, \ldots, x_n$ drawn from a Poisson distribution with parameter $\lambda > 0$, the **Maximum Likelihood Estimator (MLE)** of λ is:

(A) The sample median.

(B) The sample variance s^2.

(C) The sample mean $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$.

(D) $n \Big/ \sum_{i=1}^{n} x_i$.

Q24. For an $m \times n$ matrix A over $\mathbb{R}$, the **Rank-Nullity Theorem** states that:

(A) $\text{rank}(A) + \text{nullity}(A) = n$ (number of columns of A).

(B) $\text{rank}(A) + \text{nullity}(A) = m$ (number of rows of A).

(C) $\text{rank}(A) \times \text{nullity}(A) = mn$.

(D) $\text{rank}(A) = \text{nullity}(A)$ for all matrices.

Q25. The Foreign Exchange Management Act (FEMA), 1999 replaced which earlier legislation, and what was the key policy shift?

(A) It replaced the SEBI Act, 1992, shifting regulation from equities to foreign exchange.

(B) It replaced the Foreign Exchange Regulation Act (FERA), 1973, shifting from a criminal to a civil-law framework for foreign exchange violations.

(C) It replaced the RBI Act, 1934, transferring exchange-rate management from the government to the central bank.

(D) It replaced the Banking Regulation Act, 1949, to liberalise current-account convertibility.

Q26. The **Usual Principal and Subsidiary Status (UPSS)** employed in India's National Sample Survey employment data classifies workers by:

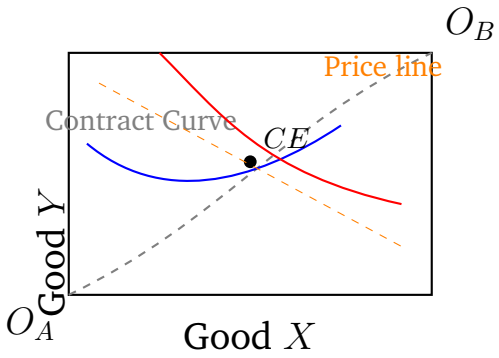
(A) Average daily wage earnings over the survey reference week.

(B) Whether the individual is employed in the organised or unorganised sector.

(C) Only the principal (dominant) activity pursued for the majority of the reference year.

(D) Both the principal activity (pursued for the longest duration) and the subsidiary activity (pursued for at least 30 days) during the reference year.

Q27. The **First Fundamental Theorem of Welfare Economics** states that, under standard assumptions (complete markets, no externalities, no public goods):



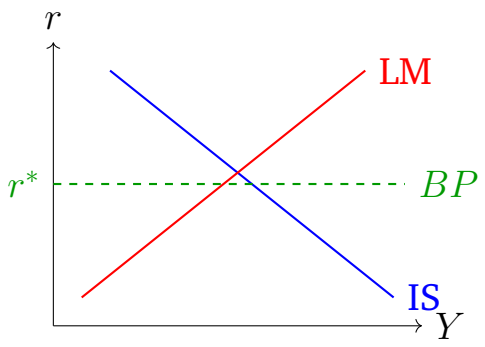
(A) Any Pareto-efficient allocation can be supported as a competitive equilibrium after appropriate lump-sum transfers.

(B) A competitive equilibrium maximises a weighted sum of all individuals' utilities.

(C) Every competitive equilibrium allocation is Pareto efficient.

(D) Government intervention is necessary to achieve Pareto efficiency in the presence of externalities and public goods.

Q28. In the **Mundell-Fleming model** with perfect international capital mobility, the balance-of-payments (BP) curve in the (Y, r) plane is:



(A) Horizontal at the world interest rate r^* (any domestic interest rate above r^* causes infinite capital inflows).

(B) Vertical at the full-employment level of income Y^*.

(C) Upward-sloping, paralleling the IS curve.

(D) Downward-sloping, reflecting a trade-off between income and interest rate on the BP.

Q29. Let $F(K, L)$ be a production function that is **homogeneous of degree one** (constant returns to scale). Which of the following is true about its marginal products F_K and F_L?

(A) F_K and F_L are also homogeneous of degree one.

(B) F_K and F_L are homogeneous of degree zero: they depend only on the capital-labour ratio K/L.

(C) F_K and F_L are homogeneous of degree two.

(D) The marginal products of a CRS function are not necessarily homogeneous.

Q30. Among major Indian states, which state has **consistently ranked lowest** on the Human Development Index (HDI) in successive National Human Development Reports?

(A) Uttar Pradesh.

(B) Rajasthan.

(C) Odisha.

(D) Bihar.

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 **Nash equilibrium** are **correct**?

(A) Every finite strategic-form game has at least one Nash equilibrium, possibly in mixed strategies (Nash, 1950).

(B) A Nash equilibrium always maximises aggregate social welfare.

(C) Nash equilibrium is necessarily unique in every finite game.

(D) In a Nash equilibrium, no player can increase their payoff by unilaterally changing their own strategy.

Q32. [MSQ — one or more options may be correct.] Which of the following statements about a **profit-maximising monopolist** are **correct**?

(A) The monopolist chooses output at which marginal revenue equals marginal cost ($MR = MC$).

(B) At the monopoly equilibrium, price exceeds marginal cost ($P > MC$).

(C) Monopoly produces a deadweight welfare loss relative to the competitive outcome.

(D) A monopolist always earns strictly positive economic profit in the long run.

Q33. [MSQ — one or more options may be correct.] Which of the following changes cause the **IS curve** to shift?

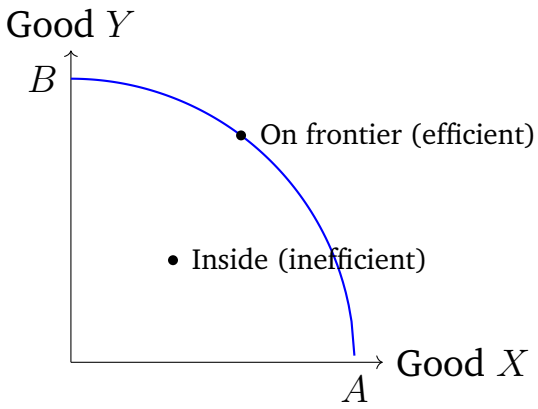
(A) An increase in the nominal money supply.

(B) An increase in autonomous government expenditure (G).

(C) A fall in the domestic price level.

(D) An autonomous increase in net exports (NX).

Q34. [MSQ — one or more options may be correct.] Which of the following statements about the **Production Possibility Frontier (PPF)** are **correct**?



(A) The PPF shows the maximum attainable combinations of two goods given available resources and technology.

(B) Points strictly inside the PPF represent productively efficient allocations.

(C) The PPF is typically concave to the origin due to the law of increasing opportunity cost as resources are reallocated.

(D) Economic growth (expansion of resources or improved technology) shifts the PPF inward.

Q35. [MSQ — one or more options may be correct.] Which of the following statements about demand functions are **correct**?

(A) Marshallian (uncompensated) demand is derived by minimising expenditure subject to a utility constraint.

(B) Hicksian (compensated) demand is derived by minimising expenditure subject to achieving a fixed utility level.

(C) The Slutsky equation decomposes the total (Marshallian) price effect into a substitution effect and an income effect.

(D) For a **normal good**, the Hicksian (compensated) demand curve is steeper than the Marshallian (uncompensated) demand curve.

Q36. [MSQ — one or more options may be correct.] Which of the following statements about **public goods** are **correct**?

(A) A pure public good is **non-rival**: one person's consumption does not reduce the amount available to others.

(B) Pure public goods are always provided efficiently by competitive markets.

(C) Club goods are **non-excludable**: it is impossible to prevent non-payers from consuming them.

(D) Because a pure public good is non-excludable, rational agents have an incentive to free-ride, leading to under-provision.

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

(A) The LM curve slopes downward in income-interest rate (Y, r) space.

(B) An increase in the nominal money supply shifts the LM curve rightward (or equivalently downward), lowering the interest rate for a given income level.

(C) A rise in the domestic price level reduces the real money supply and shifts the LM curve leftward (upward).

(D) The LM curve is derived from equilibrium conditions in the goods market.

Q38. [MSQ — one or more options may be correct.] Which of the following are **properties of the Maximum Likelihood Estimator (MLE)**?

(A) **Consistency**: the MLE $\hat{\theta}_n$ converges in probability to the true parameter θ_0 as $n \to \infty$.

(B) **Asymptotic efficiency**: under regularity conditions, the MLE achieves the Cramér-Rao lower bound asymptotically.

(C) **Finite-sample unbiasedness**: the MLE is always an unbiased estimator in any finite sample.

(D) **Invariance**: if $\hat{\theta}$ is the MLE of θ, then $g(\hat{\theta})$ is the MLE of $g(\theta)$ for any function g.

Q39. [MSQ — one or more options may be correct.] Which of the following statements about **Indian agriculture after Independence** are **correct**?

(A) The Green Revolution led to an overall decline in food grain production in India during the late 1960s.

(B) Land reforms after Independence successfully eliminated the zamindari system uniformly across all Indian states.

(C) The Green Revolution was geographically concentrated, with the greatest impact in Punjab, Haryana, and western Uttar Pradesh.

(D) Agricultural subsidies (on fertilisers, electricity, and irrigation water) have constituted a significant burden on government fiscal resources.

Q40. [MSQ — one or more options may be correct.] Which of the following statements about **endogenous growth models** are **correct**?

(A) In the **AK model** ($Y = AK$, where K encompasses all reproducible capital including human capital), the long-run per-capita growth rate equals $sA - \delta$ and is positively related to the savings rate s.

(B) In **Romer's (1990)** model, ideas (new designs) are non-rival goods: the same idea can be used by many firms simultaneously without diminishing its value.

(C) In the **Solow model**, a permanently higher savings rate raises the long-run growth rate of per-capita income.

(D) In the **Harrod-Domar model**, the knife-edge problem implies that the actual, warranted, and natural growth rates naturally converge to equilibrium without any policy intervention.

Section C — Numerical Answer Type (NAT)

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

Q41. A consumer has utility function $U(x, y) = x + 2\sqrt{y}$ and faces prices $p_x = 1$, $p_y = 1$ with income $M = 12$. The utility-maximising quantity of good y is _____.

Q42. A competitive firm operates with total cost $TC = Q^2 + 5Q + 100$ in a market where the price is $P = 25$. The **profit** (π) at the profit-maximising output equals _____.

Q43. In a small open economy, the marginal propensity to consume is $MPC = 0.6$ and the marginal propensity to import is $MPM = 0.1$. If autonomous government expenditure increases by $\Delta G = 50$, the resulting change in equilibrium income ΔY equals _____.

Q44. A random variable X follows an Exponential distribution with rate parameter $\lambda = 0.5$. The expected value $E[X]$ equals _____.

Q45. Consider the matrix

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 0 & 1 & 0 \end{pmatrix}.$$

The **rank** of A equals _____.

Q46. A monopolist faces inverse demand $P = 80 - 2Q$ and has total cost $TC = 20 + 10Q$. The **profit-maximising output** Q^* equals _____.

Q47. In the Harrod-Domar framework, the savings rate is $s = 0.15$ and the capital-output ratio is $v = 3$. The **warranted growth rate** (in %) equals _____.

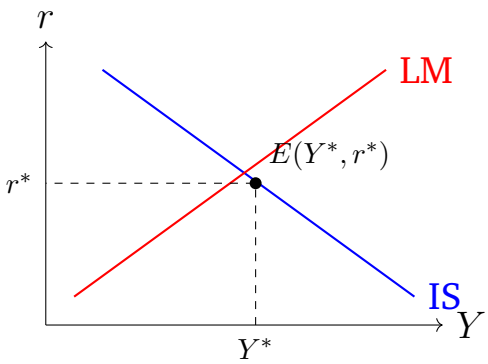
Q48. In a goodness-of-fit test, the observed frequencies are $O = [20,\ 30]$ and the expected frequencies are $E = [25,\ 25]$. The **chi-square statistic** $\chi^2 = \sum \dfrac{(O_i - E_i)^2}{E_i}$ equals _____.

Q49. In a competitive market, demand is $Q^d = 100 - 2P$ and supply is $Q^s = 10 + 3P$. The **equilibrium price** P^* equals _____.

Q50. In a three-sector economy, the value added at factor cost are: Agriculture $= 300$, Industry $= 400$, Services $= 500$ (all in Rs. crore). Indirect taxes net of subsidies $= 50$. The **GDP at market prices** (in Rs. crore) equals _____.

Q51. A competitive firm has total cost $TC = Q^2 + 10$ and faces market price $P = 30$. The **producer surplus** at the profit-maximising equilibrium equals _____.

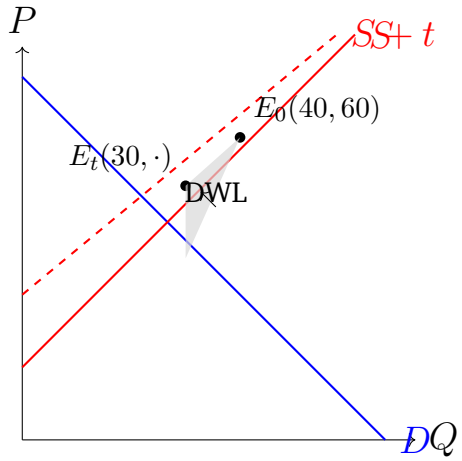
Q52. In an IS-LM model, the IS curve is $Y = 1200 - 60r$ and the LM curve is $Y = 300 + 90r$. The **equilibrium level of income** Y^* equals _____.



Q53. Let $X \sim \text{Binomial}(n = 4,\ p = 0.5)$. The probability $P(X = 2)$ equals _____.

Q54. Consider the matrix $M = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$. The **product of all eigenvalues** of M equals _____.

Q55. In a competitive market, demand is $P = 100 - Q$ and supply is $P = 20 + Q$. The government imposes a specific tax of $t = 20$ per unit. The **deadweight loss (DWL)** caused by the tax equals _____.



Q56. Using the **growth accounting framework** (Solow residual), GDP growth is 6%, capital stock growth is 4%, labour force growth is 2%, and the capital share in output is $\alpha = 0.4$. The **Total Factor Productivity (TFP) growth rate** (in %) equals _____.

Q57. In a simple linear regression $Y = \beta_0 + \beta_1 X + \varepsilon$, a sample of $n = 5$ observations yields: $\sum x_i = 15$, $\sum y_i = 25$, $\sum x_i y_i = 85$, $\sum x_i^2 = 55$. The OLS estimate $\hat{\beta}_1$ equals _____.

Q58. Consider the first-order difference equation $y(t+1) = 0.5\, y(t) + 10$ with initial condition $y(0) = 0$. The **long-run equilibrium** value $y^* = \lim_{t\to\infty} y(t)$ equals _____.

Q59. Two firms in a duopoly face inverse market demand $P = 120 - Q$, where $Q = q_1 + q_2$ is total output, and each firm has constant marginal cost $MC = 20$ with no fixed costs. Under **full collusion** (joint profit maximisation), the **profit earned by each firm** equals _____.

Firm 1 \ Firm 2	Firm 2: Collude	Firm 2: Deviate
Firm 1: Collude	(1250, 1250)	
Firm 1: Deviate		(2500, 0)

Q60. In a four-person economy, individual incomes are 10, 20, 30, and 40 (in Rs. thousand). The **coefficient of variation** $CV = (\sigma/\mu) \times 100\%$ (rounded to one decimal place) equals _____.

Detailed Solutions

Solution

Concept — Hicksian (Compensated) Demand $\|Chapter : Microeconomics - - - ConsumerTheory :$

$Demandtheorydistinguishestwoapproachestoconsumeroptimisation.The$**Marshallian**$(ordinary)$

Step 1 — Formal problem:

$$\min_{x,y} \; p_x x + p_y y \quad \textbf{s.t.} \quad U(x,y) \geq \bar{U}.$$

The solution $h(p_x, p_y, \bar{U})$ is the Hicksian demand. It slopes downward solely due to the substitution effect.

Why other options are wrong:

Sol.1.

- **Option A: Maximising utility subject to a budget constraint yields *Marshallian* demand, not Hicksian.**
- **Option C: Hicksian and Marshallian demands coincide only for goods with zero income effect (e.g., quasi-linear preferences for the numeraire).**
- **Option D: Hicksian demand always slopes downward (substitution effect is always non-positive); it cannot slope upward by construction.**

Final Answer: Hicksian demand minimises expenditure at fixed utility $\Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#1

Answer: (C) ↪ Go Back to Q#2

Solution

Concept — Law of Total Probability $\|Chapter : Statistics\&Probability :$

If**A**$_1, A_2, A_3$ **partition the sample space (mutually exclusive and exhaustive), then for any event B:**

$$P(B) = \sum_{i=1}^{3} P(B \mid A_i)\, P(A_i).$$

Step 1 — Substitute given values:

$$P(B) = P(B \mid A_1)\,P(A_1) + P(B \mid A_2)\,P(A_2) + P(B \mid A_3)\,P(A_3)$$
$$= 0.4 \times 0.2 \;+\; 0.6 \times 0.5 \;+\; 0.8 \times 0.3$$
$$= 0.08 + 0.30 + 0.24 \;=\; 0.62.$$

Why other options are wrong:

- **Option A (0.48): This is a simple average of conditional probabilities, ignoring the weights.**
- **Option B (0.56): Arithmetic error in weighting.**
- **Option C (0.60): Off by one term or rounding error.**

Final Answer: $P(B) = 0.08 + 0.30 + 0.24 = 0.62 \Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#3

Solution

Concept — Monotone Convergence Theorem $\|Chapter : Mathematics - - - Real Analysis :$

$A fundamental result of real analysis (Monotone Convergence Theorem) states :$ ***every bounded monotone sequence converges***$. Both conditions - - - bounded AND monotone - - - are required together.$

Step 1 — Verify each option:

- **Option A: *False*. The sequence $y_n = n$ is monotonically increasing but diverges to $+\infty$ (unbounded).**
- **Option B: *True*. Bounded + monotonically increasing $\Rightarrow$ converges (to its supremum).**
- **Option C: *False*. The sequence $1, -1, 1, -1, \ldots$ is bounded but not monotone.**
- **Option D: *False*. Every convergent sequence is bounded (standard theorem).**

Final Answer: Every bounded monotonically increasing sequence converges $\Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#4

Solution

Concept — Factor Shares in Cobb-Douglas $\|Chapter : Microeconomics - - - Production Theory :$

For**Q = AK$^{\alpha}L^{1-\alpha}$ under perfect competition, firms pay each factor its marginal product. The marginal product of capital is** $MP_K = \alpha\, AK^{\alpha-1}L^{1-\alpha} = \alpha\, Q/K$**, and**

$r = MP_K$ **in equilibrium. Hence:**

$$rK = \alpha Q \implies \alpha = \frac{rK}{PQ} \quad (\textbf{at } P = 1),$$

so α is exactly capital's share in total output.

Step 1 — Eliminate other options:

- **Option B: Labour's share is $wL/(PQ) = 1 - \alpha$, not α.**
- **Option C: α is capital's output elasticity, not TFP's elasticity.**
- **Option D: The ratio $MP_K/MP_L = \frac{\alpha}{1-\alpha} \cdot \frac{L}{K}$, which depends on K/L and is not a constant equal to α.**

Final Answer: $\alpha = rK/(PQ)$, capital's share in output $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#5

Solution

Concept — Long-Run Phillips Curve (LRPC) $\|Chapter : Macroeconomics - - - Inflation\&PhillipsCurve :$

$Friedman(1968)andPhelpsarguedthatmonetarypolicycannotpermanentlyreduceunemploymentbelowi$
$offbetweeninflationandunemployment.TheLRPCistherefore$**a vertical line**$atthe$**Non-Accelerating**

Step 1 — Identify the correct anchoring point:
The LRPC is vertical at the NAIRU (also called the natural rate of unemployment), not at some level of output or expected inflation. Any inflation rate is compatible with the NAIRU in the long run.

Why other options are wrong:

- **Option A: The LRPC is anchored at a rate of *unemployment*, not a rate of inflation.**
- **Option B: Y^* (full-employment output) is a goods-market concept; the Phillips curve is in inflation–unemployment space.**
- **Option C: The expected inflation rate shifts the short-run Phillips curve; it does not define the vertical LRPC.**

Final Answer: LRPC is vertical at the NAIRU $\Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#6

Solution

Concept — RBI Priority Sector Lending (PSL) $\|Chapter: IndianEconomy:$

$TheReserveBankofIndiamandatesthatscheduledcommercialbankslendaspecifiedproportion(40\%for$
$Agricultureandalliedactivities, MSMEs, Exportcredit, Education(uptospecifiedlimits), Housing(upt$

Why other options are wrong:

- **Option A: Agriculture is the *core* priority sector category.**
- **Option B: MSMEs are explicitly listed under priority sector guidelines.**
- **Option D: Education loans up to RBI-specified limits are a priority sector sub-category.**

Final Answer: Large infrastructure projects are NOT priority sector $\Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#7

Solution

Concept — Memoryless Property of Exponential Distribution $\|Chapter: Statistics\&Probability:$

$TheExponentialdistributionistheonlycontinuousdistributionwiththememorylessproperty.Intuitively,$

Step 1 — Formal statement:

$$P(X > s+t \mid X > s) = \frac{P(X > s+t)}{P(X > s)} = \frac{e^{-\lambda(s+t)}}{e^{-\lambda s}} = e^{-\lambda t} = P(X > t).$$

Why other options are wrong:

- **Option B: Mean $= 1/\lambda$, median $= \ln 2/\lambda$; they are not equal unless $\ln 2 = 1$, which is false.**
- **Option C: The exponential distribution is right-skewed, not symmetric around $1/\lambda$.**
- **Option D: For Exp(λ), Var$(X) = 1/\lambda^2 = [E(X)]^2$ for *all* $\lambda > 0$, not only $\lambda = 1$.**

Final Answer: $P(X > s+t \mid X > s) = P(X > t) \Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#8

Solution

Concept — Multiplicativity of the Determinant $\|Chapter: Mathematics---LinearAlgebra:$

$Amongthekeypropertiesofdeterminants, the$**product rule**$\det(AB) = \det(A) \cdot \det(B)$ **holds for *all* square matrices A and B of the same dimension. This follows from**

the definition of the determinant as an alternating multilinear form on columns.

Step 1 — Check each option with a 2×2 counterexample:

Let $A = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$.

- **Option A:** $\det(A+B) = \det(I) = 1 \neq 0+0 = \det(A) + \det(B)$**. *False*.**
- **Option B:** $\det(A-B) = \det\left(\begin{smallmatrix} 1 & 0 \\ 0 & -1 \end{smallmatrix}\right) = -1 \neq 0$**. *False*.**
- **Option C:** **rank**$(AB) =$ **rank**$(0) = 0 \neq 1+1$**. *False*.**
- **Option D:** $\det(AB) = \det(A) \cdot \det(B)$ **— always true.**

Final Answer: $\det(AB) = \det(A) \cdot \det(B)$ **always** $\Rightarrow$ **(D)**

Answer: (D) ↪ Go Back to Q#9

Solution

Concept — Foster-Greer-Thorbecke Poverty Measures $\|Chapter : IndianEconomy :$ The**Head Count Ratio(P$_0$) is the simplest and most widely used poverty measure. It counts the fraction of the population whose income or consumption falls below the official poverty line** z**:**

$$HCR = P_0 = \frac{q}{n},$$

where q **= number of people below the poverty line,** n **= total population.**

Why other options are wrong:

- **Option A: The *average income shortfall* as a fraction of the poverty line is the Poverty Gap Index (**P_1**).**
- **Option C: Total income gap as a fraction of GDP is neither a standard FGT measure nor commonly used.**
- **Option D: Squaring the normalised shortfall and averaging yields the Poverty Severity Index (**P_2**), which is sensitive to inequality among the poor.**

Final Answer: HCR = proportion of population below the poverty line $\Rightarrow$ **(B)**

Answer: (B) ↪ Go Back to Q#10

Answer: (C) ↪ Go Back to Q#11

Solution

Concept — Cost Function and Returns to Scale $\|Chapter : Microeconomics - - - ProductionTheory :$

$Thereisadirectdualitybetweenafirm'scostfunctionanditsproductiontechnology.Alineartotalcostfunct$
= **a**$Q implies that average cost$**AC** **=** **a**$and marginal cost$**MC** **=**

a$arebothconstant, independentofoutput. Thisisthehallmarkof$**Constant Returns to Scale (CRS)** : $doublinginputsdoublesoutput, sounitcostsremainfixed.$

Step 1 — Contrast with other returns:

- **DRS** $\Rightarrow MC$ **rising** $\Rightarrow TC$ **convex (curving upward).**
- **IRS** $\Rightarrow MC$ **falling** $\Rightarrow TC$ **concave (curving below the straight line).**
- **CRS** $\Rightarrow MC = AC = a$ **(constant)** $\Rightarrow TC$ **is linear through the origin.**

Why other options are wrong:

- **Option B: DRS gives a convex** TC **curve, rising** MC**.**
- **Option C: IRS gives a concave** TC **curve, falling** MC**.**
- **Option D: A non-homothetic technology would have** AC **varying with output in a non-linear pattern.**

Final Answer: Linear $TC = aQ$ **corresponds to Constant Returns to Scale** $\Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#12

Solution

Concept — IS-LM: Monetary Policy Transmission $\|Chapter : Macroeconomics - - - IS - LMModel :$ $IntheIS - LMmodel, theLMcurverepresentsmoneymarketequilibrium$ **:M/P = L(Y,r)**$.Acontractionarymonetarypolicyreducesthenominalmoneysupply$**M**$.Foragivenpricelevel$**P**$, thisr$

Step 1 — Direction of LM shift:

$$\frac{M^{\downarrow}}{P} = L(Y, r) \implies \textbf{LM shifts leftward (upward).}$$

Moving along the IS curve, a leftward LM gives a new equilibrium with higher r **and lower** Y**.**

Why other options are wrong:

- **Option A: A rightward LM shift and lower** r **describe *expansionary* monetary policy.**
- **Option C: Contractionary monetary policy does not shift the IS curve.**
- **Option D: The IS curve is unaffected by monetary policy (it comes from the goods market).**

Final Answer: LM shifts left $\Rightarrow$ **higher** r**, lower** Y $\Rightarrow$ **(B)**

Answer: (B) ↪ Go Back to Q#13

Solution

Concept — Harrod-Domar Growth Model $\|Chapter : Macroeconomics - - - EconomicGrowth :$

$IntheHarrod-Domarframework, growthrequiresinvestmenttomatchsavings.Define$**s**$=savingsrate$**(S/Y)**$and$**v**$= incrementalcapital - outputratio(\Delta K/\Delta Y)$**. For the capital stock to grow in line with output:**

$$g_w = \frac{s}{v},$$

where g_w is the warranted growth rate — the rate at which firms are satisfied with their investment decisions and the economy grows steadily.

Step 1 — Derivation:
Investment $I = \Delta K = v\,\Delta Y$. Savings $S = sY$. Setting $S = I$:

$$sY = v\,\Delta Y \implies \frac{\Delta Y}{Y} = \frac{s}{v} = g_w.$$

Why other options are wrong:

- **Option A: $s \cdot v$ has units (dimensionless $\times$ ratio) and gives a period of time, not a growth rate.**
- **Option B: v/s is the inverse of the warranted rate.**
- **Option C: $s + v$ has no meaningful economic interpretation in this model.**

Final Answer: Warranted growth rate $g_w = s/v \Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#14

Answer: (C) ↪ Go Back to Q#15

Solution

Concept — Envelope Theorem $\|Chapter : Mathematics - - - Optimization :$

$TheEnvelopeTheoremstatesthatthetotalderivativeoftheoptimalvaluefunction$**V**$^*(\alpha) = f(x^*(\alpha), \alpha)$ **with respect to a parameter α equals the *partial* derivative of the objective function with respect to α, holding x fixed at its optimal level. The indirect effect through $x^*(\alpha)$ vanishes by the first-order condition.**

Step 1 — Proof sketch:

$$\frac{dV^*}{d\alpha} = \underbrace{\left.\frac{\partial f}{\partial x}\right|_{x^*}}_{=0\ \textbf{(FOC)}} \cdot \frac{dx^*}{d\alpha} + \left.\frac{\partial f}{\partial \alpha}\right|_{x^*} = \frac{\partial f(x^*(\alpha), \alpha)}{\partial \alpha}.$$

Why other options are wrong:

- **Option B: The total derivative $df/d\alpha$ would include the indirect effect $\partial f/\partial x \cdot dx^*/d\alpha$, but this term is zero by FOC, so the result reduces to Option A — not a distinct answer.**
- **Option C: $\partial^2 f/\partial x\,\partial\alpha$ is the cross-partial, not what the envelope theorem gives.**
- **Option D: $dV^*/d\alpha = 0$ only if α does not appear in f; in general it is non-zero.**

Final Answer: $dV^*/d\alpha = \partial f(x^*(\alpha), \alpha)/\partial\alpha \Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#16

Answer: (B) ↪ Go Back to Q#17

Answer: (D) ↪ Go Back to Q#18

Solution

Concept — Frequentist Interpretation of Confidence Intervals $\|Chapter : Statistics\&Probability :$

$Infrequentiststatistics, aparameter\mu$ **is a *fixed* (non-random) unknown constant. Once a confidence interval is computed from the data, μ either lies in it or it does not; one cannot assign a probability to this. The correct interpretation is procedural: if the sampling procedure were repeated indefinitely, 95% of the resulting intervals would contain μ.**

Step 1 — Identify the frequentist statement:
Option C states exactly this: "If the sampling procedure were repeated many times, 95% of the resulting intervals would contain the true mean μ." This reflects the long-run frequency property of the procedure.

Why other options are wrong:

- **Option A: A Bayesian credible interval assigns probability to μ lying in an interval; a frequentist CI does not.**
- **Option B: Prediction intervals (not confidence intervals) describe where individual observations fall.**
- **Option D: Once computed, a specific interval either contains μ or it does not — there is no probabilistic guarantee for a single realised interval.**

Final Answer: 95% of repeated intervals contain μ (procedural interpretation) $\Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#19

Solution

Concept — Stability of First-Order Linear Difference Equations $\|Chapter : Mathematics - - - DifferenceEquations :$

For**y(t) = A y(t-1) + B**$, the equilibrium$**y**$^* = B/(1-A)$ **(when** $A \neq 1$**) is asymptotically stable if and only if the solution** $y(t) - y^* = A^t [y(0) - y^*]$ **converges to zero as** $t \to \infty$**. This requires** $|A|^t \to 0$**, which holds iff** $|A| < 1$**.**

Step 1 — General solution:

$$y(t) = A^t \big[y(0) - y^*\big] + y^*.$$

$|A|^t \to 0 \iff |A| < 1$**. If** $|A| > 1$**, deviations amplify (unstable); if** $|A| = 1$**, oscillations or unit root.**

Why other options are wrong:

- **Option B:** $A < 0$ **alone does not ensure stability;** $A = -2$ **gives** $|A| = 2 > 1$**, which is unstable with oscillating divergence.**
- **Option C:** $|A| > 1$ **means** $|A|^t \to \infty$ **— the equilibrium is *unstable*.**
- **Option D:** $A = 1$ **is the unit-root (random walk) case; no finite equilibrium exists.**

Final Answer: Asymptotically stable iff $|A| < 1 \Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#20

Solution

Concept — Iterated Elimination of Dominated Strategies (IEDS) $\|Chapter : Microeconomics - - - GameTheory :$

$IEDS removes strictly dominated strategies one by one. When it eliminates all strategies and leaves a$**unique**

Step 1 — Verify option B:
If IEDS yields a unique outcome (s_1^*, s_2^*)**: (i) it survives IEDS, (ii) every NE survives IEDS, (iii) if** (s_1^*, s_2^*) **is the only survivor, it is the only NE, and it is indeed a NE.**

Why other options are wrong:

- **Option A: For *strict* dominance, the order of elimination does not matter (same result regardless of order).**
- **Option C: IEDS need not yield a unique outcome; many games have multiple strategies surviving (e.g., Matching Pennies).**
- **Option D: A strategy surviving IEDS via *weak* dominance need not be a best response to any pure strategy; this holds for strict dominance only.**

Final Answer: Unique IEDS outcome $\Rightarrow$ **unique Nash equilibrium** $\Rightarrow$ **(B)**

Answer: (B) ↪ Go Back to Q#21

Solution

Concept — Stagflation in the AS-AD Framework $\|Chapter: Macroeconomics --- AggregateSupply\&Demand:$

$Stagflation --- high inflation$ **combined** $with high unemployment and low output --- cannot be explained by demand-side shocks alone (which move inflation and output in the same direction). It$ $AD diagram, an adverse shock (e.g., oil price spike) shifts the$ **Short-Run Aggregate Supply (SRAS)** $curve$

Step 1 — 1973 Oil Crisis example:
OPEC oil embargo $\Rightarrow$ production costs rise $\Rightarrow$ SRAS shifts left $\Rightarrow$ $P\uparrow$, $Y\downarrow$, unemployment $\uparrow$. This matches the stagflation of 1973–75.

Why other options are wrong:

- **Option A: Positive demand shock raises both P and Y; unemployment falls — no stagflation.**
- **Option B: Rightward AD shift gives demand-pull inflation with rising output, opposite to stagflation.**
- **Option C: Movement along the SR Phillips curve from demand-pull raises inflation but *lowers* unemployment — opposite of stagflation.**

Final Answer: Adverse supply shock shifts SRAS left $\Rightarrow$ stagflation $\Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#22

Solution

Concept — Maximum Likelihood Estimation for Poisson(λ) $\|Chapter: Statistics\&Probability:$

$The Poisson PMF is$ **f(x;λ)** $= e^{-\lambda}\lambda^x/x!$. **For a random sample $x_1, \ldots, x_n$, the log-likelihood is:**

$$\ell(\lambda) = \sum_{i=1}^{n} [-\lambda + x_i \ln \lambda - \ln(x_i!)] = -n\lambda + \left(\sum x_i\right) \ln \lambda + \textbf{const}.$$

Step 1 — Maximise:

$$\frac{d\ell}{d\lambda} = -n + \frac{\sum x_i}{\lambda} = 0 \implies \hat{\lambda}_{MLE} = \frac{\sum_{i=1}^{n} x_i}{n} = \bar{x}.$$

The second derivative $d^2\ell/d\lambda^2 = -\sum x_i/\lambda^2 < 0$, confirming a maximum.

Why other options are wrong:

- **Option A: Sample median is not the MLE for Poisson (it is for the Laplace distri-**

bution).

- Option B: Sample variance s^2 coincidentally equals the sample mean for Poisson data on average, but it is not the MLE.
- Option D: $n/\sum x_i = 1/\bar{x}$ is the MLE for an Exponential distribution, not Poisson.

Final Answer: MLE for Poisson λ is the sample mean $\bar{x} \Rightarrow$ (C)

Answer: (C) ↪ Go Back to Q#23

Solution

Concept — Rank-Nullity Theorem $\|Chapter : Mathematics - - - Linear Algebra :$

$For any$**m**$\times n$ real matrix A, the Rank-Nullity Theorem (also called the Dimension Theorem) states:

$$\textbf{rank}(A) + \textbf{nullity}(A) = n,$$

where n is the number of columns, rank$(A) = \dim($column space$)$, and nullity$(A) = \dim(\ker A)$ (dimension of the null space).

Step 1 — Intuition:

The n input dimensions split: some are mapped to non-zero output (contributing to rank), the rest collapse to zero (contributing to nullity). Together they account for all n dimensions of the domain $\mathbb{R}^n$.

Why other options are wrong:

- Option B: The sum equals the number of *columns* n, not the number of rows m.
- Option C: There is no multiplicative version; rank $\times$ nullity $\neq mn$ in general.
- Option D: Rank equals nullity only for specific matrices; it is not a universal identity.

Final Answer: rank(A) + nullity$(A) = n$ (number of columns) $\Rightarrow$ (A)

Answer: (A) ↪ Go Back to Q#24

Answer: (B) ↪ Go Back to Q#25

Answer: (D) ↪ Go Back to Q#26

Answer: (C) ↪ Go Back to Q#27

Solution

Concept — BP Curve under Perfect Capital Mobility $\|Chapter : Macroeconomics - - - International Finance :$

$In the Mundell - Fleming open - economy IS - LM model, the BP curve represents external balance (curre$

$capital account = 0$). $Under$ **perfect international capital mobility**, $capital flows are infinitely elastic w$ $foreign interest rate differential. Any domestic interest rate above the world rate$ **r*** **attracts infinite inflows; below** r^***, infinite outflows. Consequently, the BP curve is a horizontal line at** $r = r^*$ **in the** (Y, r) **plane.**

Step 1 — Economic logic:
If $r > r^*$**: unlimited capital inflows** $\Rightarrow$ **balance of payments surplus until** r **falls to** r^***. If** $r < r^*$**: outflows until** r **rises. Equilibrium requires** $r = r^*$ **for any level of** Y**, giving a horizontal BP.**

Why other options are wrong:

- **Option B: A vertical BP would mean the external balance is independent of** r **— appropriate for zero capital mobility.**
- **Option C: Upward-sloping BP arises with imperfect capital mobility (higher income raises imports, requiring a higher** r **to attract capital).**
- **Option D: A downward-sloping BP has no standard economic justification.**

Final Answer: BP is horizontal at world interest rate r^* **under perfect capital mobility** $\Rightarrow$ **(A)**

Answer: (A) ↪ Go Back to Q#28

Solution

Concept — Euler's Theorem and Homogeneous Functions $\|Chapter : Mathematics - - - Calculus :$

If **F(K,L)** $is homogeneous of degree 1, then by definition$ **F(**$\lambda K, \lambda L) = \lambda F(K, L)$ **for all** $\lambda > 0$**. Differentiating both sides with respect to** K **(holding** λ **fixed) and then setting** $\lambda = 1/L$**:**

$$F_K(\lambda K, \lambda L) = \lambda^{1-1} F_K(K, L) = F_K(K, L),$$

which shows F_K **is homogeneous of degree zero:** $F_K(\lambda K, \lambda L) = F_K(K, L)$**. Equivalently,** $F_K = F_K(K/L)$ **depends only on the capital-labour ratio.**

Step 1 — Formal statement:
If F **is homogeneous of degree** k**, its first-order partial derivatives are homogeneous of degree** $k - 1$**. For** $k = 1$**: marginal products are homogeneous of degree** 0**.**

Why other options are wrong:

- **Option A: Degree-1 marginal products would mean doubling inputs doubles** MP **— inconsistent with diminishing marginal products.**
- **Option C: Degree 2 is also incorrect by the above theorem.**
- **Option D: The theorem guarantees homogeneity of degree 0 for any CRS function**

with differentiable MPs.

Final Answer: F_K and F_L are homogeneous of degree zero, depending only on K/L $\Rightarrow$ (B)

Answer: (B) ↪ Go Back to Q#29

Solution

Concept — Human Development Index Rankings across Indian States $\|Chapter : IndianEconomy :$

$India'sNationalHumanDevelopmentReports(2001, 2011)andassociatedUNDPsub-nationalanalysesconsistentlyplace$**Bihar**$atornearthebottomoftheHDIrankingamongmajorIndianstatcapitaincome, allofwhichdepressitscompositeHDIscorebelowotherlargestates.$

Step 1 — Comparative rankings (2011 NHDR):
High-HDI states: Kerala, Himachal Pradesh, Punjab. Mid-tier: Maharashtra, Tamil Nadu. Lower-tier: Odisha, Rajasthan, Uttar Pradesh. Lowest: Bihar (consistently the worst performer on all three HDI dimensions).

Why other options are wrong:

- **Option A: Uttar Pradesh has low HDI but generally ranks above Bihar.**
- **Option B: Rajasthan has improved its HDI over successive reports and is not the lowest.**
- **Option C: Odisha has seen significant improvements; while historically low, it typically ranks above Bihar.**

Final Answer: Bihar consistently ranks lowest on HDI among major Indian states $\Rightarrow$ (D)

Answer: (D) ↪ Go Back to Q#30

Solution

Concept — Nash Equilibrium (Nash, 1950) $\|Chapter : Microeconomics - - - GameTheory :$

$ANashequilibriumisastrategyprofilewherenoplayercanstrictlyimprovetheirpayoffbyunilaterallydev$

Step 1 — Evaluate each option:

- **(A) Correct: Nash's (1950) existence theorem guarantees at least one Nash equilibrium (possibly in mixed strategies) in every finite strategic-form game. Proof uses a fixed-point argument (Kakutani's theorem).**
- **(B) Incorrect: The Prisoner's Dilemma is the classic counterexample: the unique**

NE (Defect, Defect) is Pareto-dominated. Nash equilibria need not be socially optimal.

- (C) Incorrect: Many finite games have multiple Nash equilibria. The Battle of the Sexes has two pure NE and one mixed NE.
- (D) Correct: This is the definition of Nash equilibrium: no player has a profitable unilateral deviation.

Final Answer: Correct options are (A) and (D).

Answer: (AD) ↪ Go Back to Q#31

Solution

Concept — Profit-Maximising Monopolist $\|Chapter : Microeconomics - - - Market Structure :$

$A monopolist faces the entire market demand and sets$ **MR = MC** $to maximise profit.$

Step 1 — Evaluate each option:

- (A) Correct: $MR = MC$ is the standard profit-maximisation condition for any firm.
- (B) Correct: Since the monopolist's demand curve is downward-sloping, $MR < P$ at every quantity, so when $MR = MC$, we have $P > MC$. This is the "mark-up" that characterises monopoly power.
- (C) Correct: Monopoly restricts output below the competitive level ($P = MC$), causing deadweight loss — the welfare triangle between the competitive and monopoly quantities.
- (D) Incorrect: A monopolist can earn *zero* or even negative profit in the short run if fixed costs are very high or demand is insufficient. The monopoly position does not guarantee profit; it only means the firm *cannot* be undercut, but demand may be too low to cover costs.

Final Answer: Correct options are (A), (B), and (C).

Answer: (ABC) ↪ Go Back to Q#32

Solution

Concept — IS Curve: Goods Market Equilibrium $\|Chapter : Macroeconomics - - - IS - LM Model :$

$The IS curve plots combinations of$ **(Y, r)** $such that output equals aggregate demand$ **:Y = C(Y) + I(r) + G + NX.** $The IS curve shifts when any$ ***autonomous*** $component of demand changes (holding$

Step 1 — Evaluate each option:

- **(A) Incorrect: An increase in the nominal money supply shifts the *LM* curve (money market), not the IS curve.**
- **(B) Correct: Higher autonomous G raises aggregate demand at every (Y, r), shifting IS rightward.**
- **(C) Incorrect: A fall in the price level increases real money balances M/P, shifting LM rightward/downward. It does not directly shift IS (in the standard model without the Pigou/real-balance effect in the goods market).**
- **(D) Correct: An autonomous increase in net exports (e.g., foreign demand boom, not price-level-driven) raises aggregate demand, shifting IS rightward.**

Final Answer: Correct options are (B) and (D).

Answer: (BD) ↪ Go Back to Q#33

Solution

Concept — Production Possibility Frontier (PPF) $\|Chapter : Microeconomics - - - ProductionTheory :$

$ThePPFshowsthemaximumattainableoutputcombinationsfortwogoodsgivenfixedresourcesandtechn$

Step 1 — Evaluate each option:

- **(A) Correct: The PPF is defined as the *frontier* of feasible output combinations — points on it are productively efficient (maximum output from available resources).**
- **(B) Incorrect: Points *inside* the PPF represent inefficient (not efficient) allocations — some resources are unemployed or misallocated.**
- **(C) Correct: The PPF is typically concave (bowed outward) because resources are not perfectly substitutable across industries. As more of Good X is produced, the opportunity cost (in terms of Good Y foregone) rises — the law of increasing opportunity cost.**
- **(D) Incorrect: Economic growth (more resources or better technology) shifts the PPF *outward*, not inward.**

Final Answer: Correct options are (A) and (C).

Answer: (AC) ↪ Go Back to Q#34

Solution

Concept — Demand Functions and the Slutsky Equation $\|Chapter : Microeconomics - - - ConsumerTheory :$

$Twodemandconceptsarisefromdifferentoptimisationproblems, linkedbytheSlutskyequation.$

Step 1 — Evaluate each option:

- **(A) Incorrect: *Marshallian* demand is derived by maximising utility subject to a budget constraint, not by minimising expenditure.**
- **(B) Correct: Hicksian demand is derived by minimising expenditure $p_x x + p_y y$ subject to $U(x, y) \geq \bar{U}$. It isolates the pure substitution effect.**
- **(C) Correct: The Slutsky equation decomposes the total (Marshallian) price effect: $\partial x^M / \partial p_x = \partial x^H / \partial p_x - x^M \cdot \partial x^M / \partial M$. The first term is the substitution effect (negative) and the second is the income effect.**
- **(D) Correct: For a normal good, a price rise has a negative income effect (reduces demand further). The Marshallian demand therefore responds more strongly to price changes than Hicksian demand, making the Marshallian curve *flatter* — equivalently, the Hicksian curve is *steeper* (less elastic).**

Final Answer: Correct options are (B), (C), and (D).

Answer: (BCD) ↪ Go Back to Q#35

Solution

Concept — Pure Public Goods: Non-rivalry and Non-excludability $\|Chapter : Microeconomics - - - PublicEconomics :$

$Apurepublicgoodhastwodefiningproperties :$ **non-rivalry**$(oneperson'sconsumptiondoesnotreduceavail$
$payersfromconsuming).$

Step 1 — Evaluate each option:

- **(A) Correct: Non-rivalry is a defining property of pure public goods. National defence, clean air, and broadcast signals are classic examples.**
- **(B) Incorrect: Because of non-excludability, rational agents free-ride and *underprovide* public goods via markets. Competitive markets systematically fail to provide them efficiently (market failure).**
- **(C) Incorrect: *Club goods* (e.g., streaming services, toll roads) are excludable (access can be restricted to paying members) but non-rival up to a congestion point. The statement reverses this.**
- **(D) Correct: Non-excludability creates the free-rider problem: rational individuals wait for others to pay, resulting in underprovision of the public good relative to the socially optimal level.**

Final Answer: Correct options are (A) and (D).

Answer: (AD) ↪ Go Back to Q#36

Solution

Concept — LM Curve: Money Market Equilibrium $\|Chapter: Macroeconomics---IS-LM Model:$

$The LM curve plots$ **(Y,r)** $pairs at which money demand equals real money supply:$ **M/P = L(Y, r)**, $with$ **$L_Y > 0$ (transactions demand) and $L_r < 0$ (speculative demand). This gives an *upward-sloping* LM in (Y, r) space.**

Step 1 — Evaluate each option:

- **(A) Incorrect: The LM curve slopes upward. Higher Y raises money demand, requiring a higher r to restore money market equilibrium.**
- **(B) Correct: Higher M (nominal money supply) increases M/P, creating excess money supply at the original (Y, r). To restore equilibrium, either Y rises or r falls — the LM shifts rightward (equivalently downward).**
- **(C) Correct: A rise in the price level reduces M/P (real money supply), creating excess money *demand*. To restore equilibrium, r must rise (or Y must fall) — the LM shifts leftward (upward).**
- **(D) Incorrect: The LM curve is derived from the money market, not the goods market. The IS curve comes from goods market equilibrium.**

Final Answer: Correct options are (B) and (C).

Answer: (BC) ↪ Go Back to Q#37

Solution

Concept — Asymptotic Properties of the MLE $\|Chapter: Statistics\&Econometrics:$

$Under regularity conditions, the Maximum Likelihood Estimator has several important large-sample properties.$

Step 1 — Evaluate each option:

- **(A) Correct: Consistency: $\hat{\theta}_{MLE} \xrightarrow{p} \theta_0$ as $n \to \infty$. As sample size grows, the MLE converges to the true parameter.**
- **(B) Correct: Asymptotic efficiency: the MLE achieves the Cramér-Rao lower bound in large samples, i.e., $\sqrt{n}(\hat{\theta} - \theta_0) \xrightarrow{d} N(0, I(\theta_0)^{-1})$, where $I(\theta_0)$ is the Fisher information.**
- **(C) Incorrect: MLEs are *not* generally unbiased in finite samples. A classic example: for a normal distribution, the MLE of σ^2 is $\frac{1}{n}\sum(x_i - \bar{x})^2$, which is biased (the unbiased version divides by $n - 1$).**
- **(D) Correct: Invariance: If $\hat{\theta}$ is the MLE of θ, then $g(\hat{\theta})$ is the MLE of $g(\theta)$ for any (measurable) function g. This is a powerful and unique property of MLEs.**

Final Answer: Correct options are (A), (B), and (D).

Answer: (ABD) ↪ Go Back to Q#38

Solution

Concept — Indian Agriculture Post-Independence $\|Chapter: IndianEconomy: Indianagriculturalhistoryinvolveslandreforms, theGreenRevolution(1960s-70s), andpolicysubsidies.$

Step 1 — Evaluate each option:

- **(A) Incorrect: The Green Revolution led to a dramatic increase in food grain production (especially wheat and rice). India moved from food deficit to self-sufficiency by the early 1970s.**
- **(B) Incorrect: Land reforms (zamindari abolition) were implemented unevenly across states. Many states had poor implementation, large-scale benami transactions, and legal challenges. The system was not uniformly eliminated.**
- **(C) Correct: The Green Revolution was geographically concentrated in the high-rainfall, irrigated regions of Punjab, Haryana, and western Uttar Pradesh, creating regional imbalances and bypassing rain-fed areas like eastern UP, Bihar, and Odisha.**
- **(D) Correct: Input subsidies on fertilisers, electricity (for irrigation pumps), and canal water have grown substantially over decades, placing a significant and persistent burden on central and state government finances.**

Final Answer: Correct options are (C) and (D).

Answer: (CD) ↪ Go Back to Q#39

Solution

Concept — Endogenous vs. Exogenous Growth Models $\|Chapter: Macroeconomics---EconomicGrowth:$

$Endogenousgrowthmodels(AKmodel, Romer1990)generatelong-rungrowthfromwithinthemodel, unliketheSolowmodelwherelong-rungrowthisexogenous(determinedbyTFPgrowth).$

Step 1 — Evaluate each option:

- **(A) Correct: In the AK model, $Y = AK$ and $\dot{K} = sY - \delta K$. Per-capita growth rate: $g = \dot{k}/k = sA - \delta$. This is permanently higher when s is higher — savings rate affects *long-run growth*, not just levels.**
- **(B) Correct: In Romer's (1990) model, ideas (designs for intermediate goods) are non-rival: once discovered, they can be used by any number of firms without diminishing availability. This generates increasing returns and is the engine of**

sustained growth.

- (C) Incorrect: In the Solow model, a permanently higher savings rate raises the steady-state *level* of per-capita income, but not the long-run *growth rate* (which equals exogenous TFP growth). This is the classic "level effect vs. growth effect" distinction.
- (D) Incorrect: The Harrod-Domar knife-edge problem states that the warranted, actual, and natural growth rates do *not* naturally converge. Any deviation is self-reinforcing (unstable), requiring policy intervention to keep them aligned.

Final Answer: Correct options are (A) and (B).

Answer: (AB) ↪ Go Back to Q#40

Solution

Concept — Utility Maximisation with Quasi-linear Preferences $\|Chapter : Microeconomics - - - ConsumerTheory :$

For**U(x,y) = x + 2**$\sqrt{y}$ **with** $p_x = p_y = 1$ **and** $M = 12$**, the interior optimum requires** $MRS = p_y/p_x$**.**

Step 1 — Compute MRS and set equal to price ratio:

$$MRS_{xy} = \frac{MU_y}{MU_x} = \frac{1/\sqrt{y}}{1} = \frac{1}{\sqrt{y}}.$$

Setting $MRS = p_y/p_x = 1$**:**

$$\frac{1}{\sqrt{y^*}} = 1 \implies y^* = 1.$$

Step 2 — Find x^* **from budget constraint:**

$$x^* + 1 \cdot y^* = 12 \implies x^* = 12 - 1 = 11.$$

Step 3 — Verify interior solution:
$x^* = 11 > 0$ **and** $y^* = 1 > 0$**, so the interior solution is valid.**

Final Answer: Utility-maximising quantity of good y **is** $y^* = 1$**.**

Answer: (1) ↪ Go Back to Q#41

Solution

Concept — Profit Maximisation in Competitive Market $\|Chapter : Microeconomics - - - MarketStructure :$

$Aprice - taking firm sets$**P = MC**$to maximise profit \pi = TR - TC$**.**

Step 1 — Find profit-maximising output:

$TC = Q^2 + 5Q + 100$, **so** $MC = 2Q + 5$. **Setting** $P = MC$**:**

$$25 = 2Q + 5 \implies 2Q = 20 \implies Q^* = 10.$$

Step 2 — Compute profit:

$$TR = P \cdot Q^* = 25 \times 10 = 250.$$
$$TC = (10)^2 + 5(10) + 100 = 100 + 50 + 100 = 250.$$
$$\pi = TR - TC = 250 - 250 = 0.$$

Step 3 — Interpretation:
The firm exactly breaks even. The $\$100$ **fixed cost is covered by revenues; there is zero economic profit. This is consistent with long-run competitive equilibrium where** $P = AC_{min}$**.**

Final Answer: Profit at profit-maximising output is $\pi = 0$**.**

Answer: (0) ↪ Go Back to Q#42

Answer: (100) ↪ Go Back to Q#43

Solution

Concept — Expected Value of Exponential Distribution $\|Chapter : Statistics\&Probability :$

For**X** $\sim$ **Exponential**(λ)**, the PDF is** $f(x) = \lambda e^{-\lambda x}$ **for** $x \geq 0$**. The mean and variance are:**

$$E[X] = \frac{1}{\lambda}, \qquad \textbf{Var}(X) = \frac{1}{\lambda^2}.$$

Step 1 — Apply to $\lambda = 0.5$**:**

$$E[X] = \frac{1}{\lambda} = \frac{1}{0.5} = 2.$$

Step 2 — Verify by integration:

$$E[X] = \int_0^\infty x \cdot 0.5\, e^{-0.5x}\, dx = \frac{1}{0.5} = 2 \quad \textbf{(standard result)}.$$

Final Answer: $E[X] = 2$**.**

Answer: (2) ↪ Go Back to Q#44

Solution

Concept — Rank of a Matrix via Row Reduction $\|Chapter : Mathematics - - - Linear Algebra :$

$The rank of a matrix equals the number of non - zero rows in its row echelon form (= number of linearly independent rows).$

Step 1 — Observe row dependence:

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 0 & 1 & 0 \end{pmatrix}.$$

Row 2 $= 2\times$ **Row 1, so Row 2 is linearly dependent. Apply** $R_2 \leftarrow R_2 - 2R_1$**:**

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}.$$

Step 2 — Swap R_2 **and** R_3**:**

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}.$$

There are 2 non-zero rows, so rank$(A) = 2$**.**

Step 3 — Verify:
The two independent rows are $[1, 2, 3]$ **and** $[0, 1, 0]$**; the third row** $[2, 4, 6] = 2[1, 2, 3]$ **is dependent.**

Final Answer: rank$(A) = 2$**.**

Answer: (2) ↪ Go Back to Q#45

Solution

Concept — Monopoly Profit Maximisation $(MR = MC)$ $\|Chapter : Microeconomics - - - Market Structure :$

$A monopolist with inverse demand$ **P = 80 - 2Q** $has total revenue$ **TR = PQ = 80Q - 2Q^2.**

Step 1 — Derive marginal revenue:

$$MR = \frac{d(TR)}{dQ} = 80 - 4Q.$$

Step 2 — Set $MR = MC$**:**

$MC = d(TC)/dQ = 10$ **(from** $TC = 20 + 10Q$**).**

$$80 - 4Q = 10 \implies 4Q = 70 \implies Q^* = 17.5.$$

Step 3 — Find monopoly price:

$$P^* = 80 - 2(17.5) = 80 - 35 = 45.$$

Profit $= (45 - 10) \times 17.5 - 20 = 35 \times 17.5 - 20 = 612.5 - 20 = 592.5$**.**

Final Answer: Profit-maximising output $Q^* = 17.5$**.**

Answer: (17.5) ↪ Go Back to Q#46

Solution

Concept — Harrod-Domar Warranted Growth Rate $\|Chapter : Macroeconomics - - - EconomicGrowth :$

$Thewarrantedgrowthrateis$**g**$_w = s/v$**, where** s **is the savings rate and** v **is the incremental capital-output ratio (ICOR).**

Step 1 — Substitute given values:

$$g_w = \frac{s}{v} = \frac{0.15}{3} = 0.05.$$

Step 2 — Convert to percentage:

$$g_w = 0.05 \times 100 = 5\%.$$

Step 3 — Economic interpretation:
The economy must grow at 5% **per year for firms to be satisfied that their investment plans are validated — the warranted (or "desired") growth rate. Departure from this rate leads to cumulative instability (the knife-edge property).**

Final Answer: Warranted growth rate $= 5\%$**.**

Answer: (5) ↪ Go Back to Q#47

Answer: (2) ↪ Go Back to Q#48

Solution

Concept — Competitive Market Equilibrium $\|Chapter : Microeconomics - - - MarketStructure :$

Set**Q**$^d = Q^s$ **to find the equilibrium price** P^***.**

Step 1 — Equate demand and supply:

$$100 - 2P = 10 + 3P.$$

Step 2 — Solve for P^*:

$$100 - 10 = 3P + 2P \implies 90 = 5P \implies P^* = 18.$$

Step 3 — Find equilibrium quantity:

$$Q^* = 100 - 2(18) = 100 - 36 = 64 \quad \textbf{(verify: } Q^s = 10 + 3(18) = 10 + 54 = 64\checkmark).$$

Final Answer: Equilibrium price $P^* = 18$.

Answer: (18) ↪ Go Back to Q#49

Answer: (1250) ↪ Go Back to Q#50

Solution

Concept — Producer Surplus in a Competitive Market $\|Chapter : Microeconomics - - - WelfareEconomics :$

$Producersurplus(PS)istheareaabovethesupplycurve(MC)andbelowthemarketprice, uptotheprofit-maximisingquantity.$

Step 1 — Find profit-maximising output ($P = MC$):
$TC = Q^2 + 10 \implies MC = 2Q$. **Setting $MC = P = 30$:**

$$2Q = 30 \implies Q^* = 15.$$

Step 2 — Compute producer surplus:

$$PS = P \cdot Q^* - \int_0^{Q^*} MC\, dQ = 30 \times 15 - \int_0^{15} 2Q\, dQ.$$

$$\int_0^{15} 2Q\, dQ = \left[Q^2\right]_0^{15} = 225.$$

$$PS = 450 - 225 = 225.$$

Step 3 — Reconcile with profit:
Profit $= TR - TC = 450 - (225 + 10) = 215$. **PS = Profit + Fixed Cost** $= 215 + 10 = 225$ **(PS excludes fixed costs from the integral but includes them through the price-cost gap).** ✓

Final Answer: Producer surplus $= 225$.

Answer: (225) ↪ Go Back to Q#51

Solution

Concept — IS-LM Simultaneous Equilibrium $\|Chapter: Macroeconomics---IS-LM Model:$

$Equilibrium requires both goods market (IS) and money market (LM) to clear simultaneously.$

Step 1 — Set IS = LM:

$$1200 - 60r = 300 + 90r.$$

Step 2 — Solve for equilibrium interest rate:

$$1200 - 300 = 90r + 60r \implies 900 = 150r \implies r^* = 6.$$

Step 3 — Solve for equilibrium income:

$$Y^* = 1200 - 60(6) = 1200 - 360 = 840.$$

Verify via LM: $Y^* = 300 + 90(6) = 300 + 540 = 840$. ✓

Step 4 — Interpretation:
At $Y^* = 840$ and $r^* = 6\%$, both the goods market and the money market are in equilibrium simultaneously.

Final Answer: Equilibrium income $Y^* = 840$.

Answer: (840) ↪ Go Back to Q#52

Solution

Concept — Binomial Probability $\|Chapter: Statistics \& Probability:$

For**X ~ Binomial**(n, p)**, the PMF is:**

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}.$$

Step 1 — Apply with $n = 4$, $p = 0.5$, $k = 2$:

$$P(X = 2) = \binom{4}{2} (0.5)^2 (0.5)^{4-2} = 6 \times 0.25 \times 0.25 = 6 \times 0.0625 = 0.375.$$

Step 2 — Verify using full distribution:
$P(X = 0) = 0.0625$, $P(X = 1) = 0.25$, $P(X = 2) = 0.375$, $P(X = 3) = 0.25$, $P(X = 4) = 0.0625$. **Sum** $= 1$. ✓

Step 3 — Note:

For $p = 0.5$, the binomial distribution is symmetric around $n/2 = 2$, which is why $P(X = 2)$ is the highest.

Final Answer: $P(X = 2) = 0.375$.

Answer: (0.375) ↪ Go Back to Q#53

Solution

Concept — Determinant as Product of Eigenvalues $\|Chapter : Mathematics - - - Linear Algebra :$

$For any square matrix, \det(M) = \prod_i \lambda_i$ **(product of all eigenvalues, counting multiplicity). For a triangular matrix, the eigenvalues are simply the diagonal entries.**

Step 1 — Identify eigenvalues:

$M = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$ **is upper triangular. Eigenvalues are the diagonal elements:** $\lambda_1 = 3$, $\lambda_2 = 2$.

Step 2 — Compute product:

$$\lambda_1 \times \lambda_2 = 3 \times 2 = 6.$$

Step 3 — Verify via determinant:

$$\det(M) = 3 \times 2 - 1 \times 0 = 6. \quad \checkmark$$

Final Answer: Product of eigenvalues $= \det(M) = 6$.

Answer: (6) ↪ Go Back to Q#54

Solution

Concept — Deadweight Loss from a Specific Tax $\|Chapter : Microeconomics - - - Welfare Economics :$

$A specific tax t per unit drives a wedge between the consumer price (P_d)$ **and the producer price** ($P_s = P_d - t$). **The DWL is the welfare triangle lost due to the reduction in equilibrium quantity.**

Step 1 — Pre-tax equilibrium:

$P = 100 - Q$ **(demand) and** $P = 20 + Q$ **(supply). Setting equal:**

$$100 - Q = 20 + Q \implies Q_0 = 40, \quad P_0 = 60.$$

Step 2 — Post-tax equilibrium with $t = 20$**:**

New supply (from producer's perspective, seller receives $P_d - 20$**):** $P_d - 20 = 20 +$

$Q \implies P_d = 40 + Q$. **Equate with demand:**

$$100 - Q = 40 + Q \implies Q_1 = 30, \quad P_d = 70, \quad P_s = 50.$$

Step 3 — Compute DWL:

$$DWL = \frac{1}{2} \times t \times (Q_0 - Q_1) = \frac{1}{2} \times 20 \times (40 - 30) = \frac{1}{2} \times 20 \times 10 = 100.$$

Final Answer: Deadweight loss = 100.

Answer: (100) ↪ Go Back to Q#55

Answer: (3.2) ↪ Go Back to Q#56

Solution

Concept — OLS Estimator for Slope $\|Chapter : Statistics\&Econometrics :$ $The OLS estimator for \beta_1$ **in** $Y = \beta_0 + \beta_1 X + \varepsilon$ **is:**

$$\hat{\beta}_1 = \frac{\sum x_i y_i - n\bar{x}\bar{y}}{\sum x_i^2 - n\bar{x}^2}.$$

Step 1 — Compute sample means:
$n = 5$, $\sum x_i = 15 \implies \bar{x} = 3$; $\sum y_i = 25 \implies \bar{y} = 5$.

Step 2 — Compute numerator (S_{xy}):

$$S_{xy} = \sum x_i y_i - n\bar{x}\bar{y} = 85 - 5 \times 3 \times 5 = 85 - 75 = 10.$$

Step 3 — Compute denominator (S_{xx}):

$$S_{xx} = \sum x_i^2 - n\bar{x}^2 = 55 - 5 \times 9 = 55 - 45 = 10.$$

Step 4 — Compute slope:

$$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}} = \frac{10}{10} = 1.$$

Final Answer: OLS slope estimate $\hat{\beta}_1 = 1$.

Answer: (1) ↪ Go Back to Q#57

Solution

Concept — Long-Run Equilibrium of a Difference Equation $\|Chapter: Mathematics---DifferenceEquations:$

$For the difference equation$ **y(t+1) = Ay(t) + B** $with$ **|A| < 1**, $the system is stable and converges to a unique long-run equilibrium$ $\mathbf{y^*}$ **where** $y(t+1) = y(t) = y^*$**.**

Step 1 — Find equilibrium:

$$y^* = A\,y^* + B \implies y^*(1-A) = B \implies y^* = \frac{B}{1-A}.$$

With $A = 0.5$ **and** $B = 10$**:**

$$y^* = \frac{10}{1-0.5} = \frac{10}{0.5} = 20.$$

Step 2 — Verify stability:

$|A| = 0.5 < 1$**, so the equilibrium is asymptotically stable. Starting from** $y(0) = 0$**:**

$$y(t) = 20\big(1 - 0.5^t\big) \xrightarrow{t\to\infty} 20. \quad \checkmark$$

Final Answer: Long-run equilibrium $y^* = 20$**.**

Answer: (20) ↪ Go Back to Q#58

Solution

Concept — Collusive (Joint) Profit Maximisation in Duopoly $\|Chapter: Microeconomics---GameTheory:$

$Under full collusion, two firms act as a joint monopolist, maximising total industry profit and then splittin$

Step 1 — Joint monopoly problem:

$P = 120 - Q$ **(where** $Q = q_1 + q_2$**),** $MC = 20$ **for each firm. Joint** $TR = (120 - Q)Q$**.**

$$MR = 120 - 2Q. \quad \textbf{Set } MR = MC: \quad 120 - 2Q = 20 \implies Q^* = 50.$$

Step 2 — Monopoly price:

$$P^* = 120 - 50 = 70.$$

Step 3 — Total industry profit:

$$\pi_{total} = (P^* - MC) \times Q^* = (70 - 20) \times 50 = 50 \times 50 = 2500.$$

Step 4 — Each firm's profit (equal split):

$q_1 = q_2 = 25$ **(symmetric collusion).**

$$\pi_i = (70 - 20) \times 25 = 50 \times 25 = 1250.$$

Final Answer: Each firm's profit under full collusion = 1250.

Answer: (1250) ↪ Go Back to Q#59

Solution

Concept — Coefficient of Variation (CV) $\|Chapter : Statistics\&Probability :$ $TheCVisarelativemeasureofdispersion$ **:CV = $(\sigma/\mu) \times 100\%$.**

Step 1 — Compute the mean:
Incomes: $10, 20, 30, 40$ **(in Rs. thousand).**

$$\mu = \frac{10 + 20 + 30 + 40}{4} = \frac{100}{4} = 25.$$

Step 2 — Compute variance:

$$\sigma^2 = \frac{(10 - 25)^2 + (20 - 25)^2 + (30 - 25)^2 + (40 - 25)^2}{4}$$
$$= \frac{225 + 25 + 25 + 225}{4} = \frac{500}{4} = 125.$$

Step 3 — Compute standard deviation:

$$\sigma = \sqrt{125} = 5\sqrt{5} \approx 11.180.$$

Step 4 — Compute CV:

$$CV = \frac{\sigma}{\mu} \times 100 = \frac{11.180}{25} \times 100 = 44.72\% \approx \mathbf{44.7\%}.$$

Final Answer: Coefficient of variation $CV \approx 44.7\%$.

Answer: (44.7) ↪ Go Back to Q#60

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	D	4	B	5	A
6	D	7	C	8	A	9	D	10	B
11	C	12	A	13	B	14	D	15	C
16	A	17	B	18	D	19	C	20	A
21	B	22	D	23	C	24	A	25	B
26	D	27	C	28	A	29	B	30	D
31	AD	32	ABC	33	BD	34	AC	35	BCD
36	AD	37	BC	38	ABD	39	CD	40	AB
41	1	42	0	43	100	44	2	45	2
46	17.5	47	5	48	2	49	18	50	1250
51	225	52	840	53	0.375	54	6	55	100
56	3.2	57	1	58	20	59	1250	60	44.7