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01

MICROECONOMICS

Consumer theory

Difficulty: Easy | Reviewed practice | MCQ · 1 mark

For a strictly risk-averse individual, the von Neumann–Morgenstern utility function over wealth is:

A. Strictly concave in wealth

B. Linear in wealth

C. Strictly convex in wealth

D. S shaped in wealth

EXPLANATION

Correct answer: A

Risk aversion compares a risky wealth outcome with receiving its expected value for certain. Write W for uncertain wealth, $E[W]$ for its probability-weighted average, and $u(W)$ for utility from wealth. A strictly risk-averse person prefers the certain average to any nonconstant lottery with that average.

For example, suppose wealth is equally likely to be 100 or 400 and utility is $u(W) = \sqrt{W}$. The lottery gives expected utility $(10 + 20)/2 = 15$, while certain wealth of 250 gives utility $\sqrt{250} \approx 15.81$. Averaging wealth before taking utility therefore gives a higher value than averaging the two utilities.

Strict concavity is the general property behind this comparison. The utility of a weighted average lies strictly above the corresponding weighted average of utilities when the wealth outcomes differ. Hence

$u(E[W]) > E[u(W)]$.

This is the strict form of Jensen's inequality. Economically, diminishing marginal utility makes the utility lost from a downside outweigh the gain from an equally sized upside.

- **B:** Linear utility makes the two averages equal. Such a person is risk neutral.
- **C:** Strictly convex utility reverses the inequality, making the lottery preferable to its certain average; this represents risk seeking.
- **D:** An S-shaped utility function changes curvature across regions. It cannot represent strict risk aversion over the entire wealth domain.

KEYWORDS risk aversion | concave utility | jensen inequality

02

MICROECONOMICS

Perfect competition and partial equilibrium

Difficulty: Easy | Reviewed practice | MCQ · 2 marks

A price-taking firm faces price 12 and cost $C(q) = 4 + 2q + q^2$ for $0 \le q \le 3$, including unavoidable fixed cost 4. Find its maximum economic profit.

A. 12

B. -4

C. 21

D. 17

EXPLANATION

Correct answer: D

Economic profit deducts the complete cost from revenue:

$\pi(q) = 12q - (4 + 2q + q^2) = 10q - q^2 - 4.$

Completing the square gives $\pi(q) = 21 - (q - 5)^2$. The feasible output closest to five is the upper boundary three, so it maximizes profit over the restricted interval. The unrestricted optimizer five cannot be chosen.

At the feasible maximizer $q = 3$,

$\pi(3) = 36 - (4 + 6 + 9) = 17.$

This exceeds shutdown profit -4. Price exceeds marginal cost at capacity because the firm cannot expand further; an interior price-equals-marginal-cost condition need not hold at that boundary.

- **A:** Profit at output two is $24 - (4 + 4 + 4) = 12$. This leaves profitable feasible expansion unused.
- **B:** The fixed-cost loss -4 is profit at shutdown. Positive feasible production yields more.
- **C:** Ignoring the capacity limit gives output five and profit 21. The same number also results from omitting fixed cost at capacity; neither is feasible maximum economic profit.

KEYWORDS: capacity constrained supply | boundary profit maximum | economic profit

03 MICROECONOMICS

Consumer theory

Difficulty: Easy | Reviewed practice | MCQ · 1 mark

Which utility over nonnegative goods can make ordinary demand for good 1 fall when only price p_2 rises, at fixed income $m > 0$ and positive prices p_1, p_2?

A. $u = x1 + x2.$

B. $u = x1x2.$

C. $u = \min\{x_1, x_2\}.$

D. $u = \max\{x_1, x_2\}.$

EXPLANATION

Correct answer: C

Ordinary demand holds money income fixed when a price changes. It does not hold purchasing power or utility fixed. Making good 1 relatively cheaper therefore need not increase its ordinary demand.

For $u(x_1, x_2) = \min\{x_1, x_2\}$, utility counts matched pairs. Extra units of either good without matching units of the other add no utility. At positive prices, the optimal bundle has $x_1 = x_2 = t$ and exhausts income:

$$(p_1 + p_2)t = m, \qquad x_1 = x_2 = \frac{m}{p_1+p_2}.$$

A matched pair costs $p1 + p2$. Raising the second price makes each pair more expensive and reduces the number of pairs affordable. In particular,

$$\frac{\partial x1}{\partial p2} = -\frac{m}{(p1+p2)^2} < 0.$$

Fixed nominal income leaves an income effect because the higher price reduces what the same money can buy.

- **A:** The goods are perfect substitutes. The consumer buys only good 2 when $p_2 < p_1$ and only good 1 when $p_1 < p_2$. Raising p_2 can shift purchases toward good 1, but cannot lower its demand. At equal prices, all budget-exhausting bundles are optimal; moving above that tie selects all of good 1.
- **B:** The expenditure shares are one half on each good, so $x_1 = m/(2p_1)$. Its demand is unchanged when only p_2 increases.
- **D:** Since $\max\{x1, x2\} \le x1 + x2 \le m/\min\{p1, p2\}$, buying only the cheaper good attains the maximum. At equal prices, either all-good corner is optimal. Raising p_2 can shift the optimum toward good 1, but cannot reduce its quantity.

KEYWORDS: ordinary cross price effect | perfect complements demand | nominal real income

04

MICROECONOMICS

Market failure and government policy

Difficulty: Easy | 2024 · Q19 | MCQ · 2 marks

Suppose high quality and low quality products are sold at the same price to the buyers. The buyers have less information to determine the quality of the product compared to the sellers at the time of purchase. Which of the following problems arises in this situation?

A. Moral hazard problem

B. Market signaling problem

C. Principal-agent problem

D. Adverse selection problem

EXPLANATION

Correct answer: D

Adverse selection occurs when one side of a transaction has better information about a relevant characteristic before the agreement. Here sellers know product quality, while buyers pay a common price without being able to identify which goods are better.

That common price may not compensate a high-quality seller enough to remain in the market. Lower-quality sellers are more willing to accept it, so the mix of products offered can deteriorate. The problem concerns selection of products into trade because of hidden quality.

- **A:** Moral hazard concerns an unobserved action under a contract, such as taking less care after obtaining insurance. The situation describes pre-existing quality, not a change in behavior after purchase.
- **B:** Signaling is an informed party's way of credibly conveying hidden information, for example through a costly warranty. No signaling action is described; the question identifies the information problem that a signal might help address.
- **C:** A principal-agent problem involves delegated decisions and potentially conflicting incentives, such as an employer relying on an employee's effort. No such delegation is specified here. Although adverse selection can arise within principal-agent models, it is the precise diagnosis of this hidden-quality sale.

KEYWORDS: adverse selection | hidden quality | pooled price

05 MICROECONOMICS

Consumer theory

Difficulty: Easy | 2024 · Q2 | MCQ · 1 mark

Let x and y be two consumption bundles, assumed to be non-negative and perfectly divisible. Further, the assumptions of completeness, transitivity, reflexivity, non-satiation, continuity, and strict convexity are satisfied. Then, which of the following statements is NOT CORRECT?

A. Either $x \succsim y$, or $y \succsim x$, or both

B. $y \succ x$ if y contains more of at least one good and no less of any other

C. x is not indifferent to itself

D. For x (or y), its better set is strictly convex

EXPLANATION

Correct answer: C

Reflexivity says that a bundle is at least as good as itself: $x \succsim x$. Indifference means that each of two bundles is at least as good as the other. Applying this definition to the same bundle gives $x \sim x$. Thus the statement that a bundle is not indifferent to itself contradicts reflexivity.

The symbols distinguish weak preference ($\succsim$), strict preference ($\succ$) and indifference ($\sim$). Confusing weak preference with strict preference is the mistake behind denying self-indifference.

- **A:** Completeness allows every pair of bundles to be compared. Either one is weakly preferred to the other or both comparisons hold, in which case the bundles are indifferent.
- **B:** This is the "more is better" convention for non-satiation used here: increasing at least one good without reducing another makes the bundle preferable. In more formal treatments, local non-satiation is a weaker condition and does not by itself imply this componentwise comparison; the two definitions should not be conflated.
- **D:** Under strictly convex preferences, mixtures of distinct equally desirable bundles are preferred to those bundles. This is the preference-theoretic meaning of the strictly convex better set: mixing bundles does not create an inward dent in the set of desirable choices.

The direct contradiction is in C. The interpretation of non-satiation as "more is better" is needed when reading B, whereas reflexivity gives self-indifference without that convention.

KEYWORDS: preference reflexivity | self indifference | preference completeness

06

MICROECONOMICS

Imperfect competition and market structure

Difficulty: Medium | Reviewed practice | MCQ · 2 marks

Two firms simultaneously price a homogeneous good on $p_i \in \{0, 0.1, 0.2, \ldots\}$, with unit costs $c_1 = 3, c_2 = 2$. Demand $\max\{10 - \min(p_1, p_2), 0\}$ is split equally among lowest-price firms, which must supply it. Which listed price profile is Nash?

A. $(p_1, p_2) = (2, 2)$

B. $(p_1, p_2) = (3, 2)$

C. $(p_1, p_2) = (3, 2.9)$

D. $(p_1, p_2) = (3, 3)$

EXPLANATION

Correct answer: C

A Nash equilibrium requires that neither firm can raise its profit by changing its own price while the rival's price stays fixed. The price grid matters: the closest permitted price below 3 is 2.9.

At C, firm 1 charges 3 and sells nothing, earning zero. To obtain sales against price 2.9 it must match or undercut 2.9. Every such price is below its marginal cost of 3, so sales would make a loss. Any higher price still gives zero sales and no improvement.

Firm 2 charges 2.9, captures all demand $10 - 2.9 = 7.1$, and earns

$\pi_2 = (2.9 - 2)(7.1) = 6.39.$

For any winning price $p < 3$, its profit is $(p - 2)(10 - p)$. The derivative is $12 - 2p > 0$ throughout that interval, so the highest available winning price, 2.9, is best among all lower prices. Matching the rival at 3 gives only half the market and profit $(3 - 2)(10 - 3)/2 = 3.5$. Charging above 3 gives no sales. Thus firm 2 also has no profitable deviation.

- **A:** At the common price 2, firm 1 must supply half the demand despite its unit cost 3. It loses $(2 - 3)(8/2) = -4$ and can improve to zero by raising its price and making no sales.
- **B:** Firm 2 wins the market but earns zero margin at price 2. Raising its price to 2.9 still undercuts firm 1 and raises profit to 6.39.
- **D:** Firm 2 earns 3.5 from sharing demand at price 3. Undercutting by one grid step gives profit 6.39, so the tie is unstable.

A continuous-price argument about an arbitrarily small undercut cannot replace the discrete choices specified here.

KEYWORDS: asymmetric bertrand grid | unilateral price deviation | undercutting profit | tie split demand

07 MICROECONOMICS

Consumer theory

Difficulty: Medium | 2021 · Q4 | MCQ · 1 mark

You have a budget of Rs. 4000 and would like to purchase LPG cylinders from a local seller who charges Rs. 50 per cylinder. The seller has a subsidy scheme by which if you return the empty cylinder purchased from him, you will get a refund of Rs. 20 per cylinder. You cannot borrow money from anyone. The maximum number of cylinders you can purchase is

A. 131

B. 132

C. 133

D. 134

EXPLANATION

Correct answer: B

There are two different amounts to track: the net cost after a return and the cash required before a purchase. Because borrowing is forbidden, having enough money for the eventual net cost is not sufficient. You must be able to pay the full purchase price each time and receive the refund only afterward.

Each completed purchase-and-return cycle uses Rs. 30: the cylinder costs Rs. 50 and the empty cylinder brings back Rs. 20. However, the next purchase still requires Rs. 50 in hand. A refund received afterward cannot finance that purchase in advance.

If N cylinders are purchased, the first $N-1$ refunds can help finance the last purchase. The cash needed is therefore

$$50N - 20(N-1) = 30N + 20.$$

The budget condition is $30N + 20 \leq 4000$, giving $N \leq 132.66\ldots$. Since only whole cylinders can be bought, the maximum is 132.

After 131 completed cycles, Rs. 70 remains. The 132nd purchase is possible: paying Rs. 50 leaves Rs. 20, and its later refund raises the balance to Rs. 40. That is still less than the Rs. 50 needed for a 133rd purchase. This final cash sequence shows exactly why dividing 4000 by 30 and rounding down gives one cylinder too many.

- **A:** Buying 131 cylinders requires Rs. 3,950 before the last refund. One more cylinder is affordable, so 131 is not the maximum.
- **C:** Buying 133 requires Rs. 4,010. Dividing Rs. 4,000 by the net cost of Rs. 30 overlooks the cash needed before the final refund.
- **D:** Buying 134 requires Rs. 4,040, which exceeds the budget by Rs. 40.

KEYWORDS liquidity constraint | refundable deposit | integer budget constraint

08

MICROECONOMICS

Theory of production and cost

Difficulty: Medium | Reviewed practice | MCQ · 2 marks

A production-function family is defined for $L, K > 0$ by

$$Q(L,K) = (L^{\alpha} + K^{\alpha})^{\beta/\alpha}, \qquad \alpha < 1, \quad \alpha \neq 0, \quad \beta > 0.$$

Which statement is NOT a valid general property of this family?

A. The production function is homogeneous of degree β.

B. It has increasing returns to scale when $\beta > 1$, constant returns when $\beta = 1$, and decreasing returns when $0 < \beta < 1$.

C. The elasticity of substitution between labour and capital is $1/(1-\alpha)$.

D. The elasticity of substitution between labour and capital is $\beta/(1-\alpha)$.

EXPLANATION

Correct answer: D

Returns to scale and elasticity of substitution describe different changes. Returns to scale concern increasing labour and capital in the same proportion. Substitution elasticity concerns changing their proportions while keeping output fixed.

To find returns to scale, multiply both inputs by $t > 0$:

$$Q(tL, tK) = [t^{\alpha}(L^{\alpha} + K^{\alpha})]^{\beta/\alpha} = t^{\beta} Q(L,K).$$

A function with this scaling rule is called homogeneous of degree β. Doubling both inputs, for example, multiplies output by 2^{β}. This is more than double when $\beta > 1$, exactly double when $\beta = 1$, and less than double when $0 < \beta < 1$.

For substitution, let MP_L and MP_K denote the marginal products: the additional output from a small increase in the corresponding input. Differentiation gives

$$MP_L = \beta(L^{\alpha} + K^{\alpha})^{\beta/\alpha - 1} L^{\alpha - 1}, \qquad MP_K = \beta(L^{\alpha} + K^{\alpha})^{\beta/\alpha - 1} K^{\alpha - 1}.$$

The common factor cancels when we divide:

$$\frac{MP_L}{MP_K} = \left(\frac{L}{K}\right)^{\alpha - 1} = \left(\frac{K}{L}\right)^{1-\alpha}.$$

This ratio is the magnitude of the isoquant's slope when labour is on the horizontal axis. Along an isoquant, substitution elasticity measures the proportional response of K/L to a proportional change in MP_L/MP_K. Taking logarithms therefore gives

$$\ln(MP_L/MP_K) = (1-\alpha)\ln(K/L), \qquad \sigma = \frac{d\ln(K/L)}{d\ln(MP_L/MP_K)} = \frac{1}{1-\alpha}.$$

The restriction $\alpha < 1$ makes this elasticity finite and positive. The scale parameter cancels from the marginal-product ratio, so it cannot determine this elasticity.

- **A:** This is the degree obtained from the scaling calculation. The inner expression has degree α, and raising it to the power β/α gives degree β.
- **B:** For $t > 1$, output rises more than proportionally if $\beta > 1$, proportionally if $\beta = 1$, and less than proportionally if $0 < \beta < 1$.
- **C:** This is the elasticity obtained from the isoquant's marginal-product ratio. It depends on the curvature parameter α.

D incorrectly retains the scale factor β in the substitution elasticity. That factor is common to both marginal products and cancels from their ratio. For example, $\alpha = 1/2$ and $\beta = 2$ give substitution elasticity 2, whereas D gives 4. The two expressions coincide when $\beta = 1$, but D is not a general identity.

KEYWORDS: ces production | returns to scale | elasticity of substitution | homogeneity

09

MICROECONOMICS

General equilibrium and welfare

Difficulty: Easy | Reviewed practice | MCQ · 2 marks

The feasible set is $\{(U_1, U_2) : U_1, U_2 \geq 0,\ U_1^2 + U_2 \leq 16\}$. For $X = (2, 10)$ and $Z = (3, 7)$, which Pareto-efficiency comparison holds?

A. Both are efficient.

B. Only X is efficient.

C. Only Z is efficient.

D. Neither is efficient.

EXPLANATION

Correct answer: C

A Pareto improvement raises at least one utility while lowering neither. A point is Pareto efficient if no feasible point improves it in this sense.

At $X = (2, 10)$, the resource expression is $2^2 + 10 = 14 < 16$. Keeping $U_1 = 2$ and raising U_2 to 12 gives a feasible utility pair $(2, 12)$ and improves person 2 without harming person 1. Hence X is inefficient.

At $Z = (3, 7)$, $3^2 + 7 = 16$. If a new pair has $U_1 \geq 3$ and $U_2 \geq 7$, with at least one strict inequality, then $U_1^2 + U_2 > 16$. Such a pair is infeasible. Thus no Pareto improvement over Z exists, and Z is efficient.

The direct X-to-Z move helps person 1 but harms person 2. That particular comparison is not itself a Pareto improvement; X's inefficiency follows from the different feasible pair $(2, 12)$.

- **A:** It overlooks the slack at X and the feasible increase in person 2's utility.
- **B:** It reverses both findings: X admits a Pareto improvement, while Z's binding frontier excludes one.
- **D:** It treats a trade-off between X and Z as evidence that both are inefficient. At Z, every weak improvement with one strict violates feasibility.

KEYWORDS: pareto improvement | feasible utility set | frontier efficiency | resource slack

10

MICROECONOMICS

Introductory Game theory

Difficulty: Medium | 2024 · Q16 | MCQ · 2 marks

In a two-player game, player 1 can choose either M or N as strategies. Player 2 can choose either X, Y, or Z as strategies. The payoff matrix is as follows (player 1, player 2):

Player 1 / Player 2	X	Y	Z
M	(3, 1)	(0, 0)	(-1, 2)
N	(0, 0)	(1, 3)	(0.5, 1)

Which set of strategy profiles survives iterated elimination of strictly dominated strategies?

A. (N, Y)

B. (M, X)

C. (N, Z)

D. (M, Z)

EXPLANATION

Correct answer: A

A strategy is strictly dominated when another available strategy gives its player a strictly higher payoff against every remaining action of the opponent. Iterated elimination repeats this comparison after removing dominated strategies.

First compare player 2's X and Z columns using the second payoff. Against M, Z gives 2 instead of 1; against N, Z gives 1 instead of 0. Thus Z strictly dominates X, which is removed.

With only Y and Z left, compare player 1's rows using the first payoff. Against Y, N gives 1 rather than 0; against Z, N gives 0.5 rather than -1. Therefore N strictly dominates M in this reduced game, so remove M.

With only N remaining, player 2 gets 3 from Y and 1 from Z. Remove Z. The sole surviving profile is (N, Y).

- **B:** X was eliminated at the first step because Z is better against either row. M cannot be preserved by a column the opponent would never use after that elimination.
- **C:** N survives, but Z does not: once M is removed, player two gains by choosing Y instead of Z.
- **D:** After eliminating X, player one prefers N to M against both remaining columns, so this M profile cannot survive.

The order of reasoning matters: N does not initially dominate M against X. Its dominance becomes valid after X has been removed.

KEYWORDS: iterated elimination | strict dominance | reduced game

11

MICROECONOMICS

Consumer theory

Difficulty: Easy | Reviewed practice | MCQ · 1 mark

Which statement about indifference curves for two desirable goods is NOT generally true?

A. With convex preferences, indifference curves are convex to the origin.

B. For perfect complements, indifference curves are right-angled.

C. For perfect substitutes, indifference curves are downward-sloping straight lines.

D. For any two normal goods, indifference curves must be straight lines.

EXPLANATION

Correct answer: D

A normal good is one whose demand increases when income rises, holding prices fixed. This describes an income response. It does not require a particular rate of substitution between goods, so it does not force straight indifference curves.

For example, take $u(x, y) = xy$ with positive prices p_x, p_y and income m. The utility-maximizing quantities are $x = m/(2p_x)$ and $y = m/(2p_y)$. Both rise with income, so both goods are normal. Yet an indifference curve at utility $\bar{u} > 0$ satisfies $y = \bar{u}/x$, a hyperbola. This counterexample disproves D.

The remaining statements express the standard shape relationships:

- **A:** Convex preferences mean mixtures are weakly preferred to equally ranked extremes. For desirable goods, this yields the usual weakly convex-to-the-origin indifference curves; straight lines are a permitted limiting case.
- **B:** Perfect complements are useful in fixed proportions. Increasing only the already abundant good does not improve utility, giving horizontal and vertical segments that meet at a right-angle kink.
- **C:** Perfect substitutes exchange at a constant utility-preserving rate. For two desirable goods their indifference curves are downward-sloping straight lines.

Normality concerns movement between optimal bundles after income changes. Indifference-curve shape concerns substitutions that keep utility constant.

KEYWORDS: normal goods | income response | indifference curve shape | perfect substitutes

12

MICROECONOMICS

Theory of production and cost

Difficulty: Easy | 2024 · Q26 | MCQ · 2 marks

Consider the production function: $Q(K, L) = (2\sqrt{K} + 3\sqrt{L})^2$ where Q is the output, K is capital, and L is labour. If ηK and ηL denote the output elasticities with respect to capital and labour, respectively, then the value of $(\eta K + \eta L)$ is

A. 2

B. 1

C. 4

D. 0.5

EXPLANATION

Correct answer: B

An output elasticity is a percentage output response to a one percent increase in one input, holding the other fixed. For example, $\eta K = Q_K K/Q$. Their sum measures the response when both inputs expand proportionately.

If capital and labour both multiply by t, each square root multiplies by $\sqrt{t}$. Squaring the bracket then gives

$$Q(tK, tL) = \left[\sqrt{t}(2\sqrt{K} + 3\sqrt{L})\right]^2 = tQ(K, L).$$

Output increases in the same proportion as both inputs: the function is homogeneous of degree one. Euler's theorem says $KQ_K + LQ_L = Q$ for such a differentiable function. Dividing by output gives $\eta K + \eta L = 1$.

A direct check is also possible. At positive inputs, differentiating gives

$$\eta K = \frac{2\sqrt{K}}{2\sqrt{K}+3\sqrt{L}}, \qquad \eta L = \frac{3\sqrt{L}}{2\sqrt{K}+3\sqrt{L}}.$$

Their numerators add to the denominator.

- **A:** The outer square alone does not determine scale. It acts on terms of degree one-half, giving degree $2(1/2) = 1$ rather than two.
- **C:** A sum of four would imply much greater scale responsiveness than the identity $Q(tK, tL) = tQ(K, L)$ permits; coefficients inside the bracket are not elasticities to add or square.
- **D:** One-half is the degree of the inner square-root expression before the outer square is applied. Omitting that square understates the total response.

KEYWORDS: euler theorem | output elasticity | constant returns to scale

13 MICROECONOMICS
Consumer theory

Difficulty: Easy | 2025 · Q21 | MCQ · 2 marks

Consider a consumer with the utility function, $U(x, y) = y + \sqrt{x}$ where x and y are quantity of two commodities consumed. Which one of the following is TRUE?

A. Income elasticity of demand for both goods is 1.

B. Income elasticity of demand for good x is 0.

C. Income elasticity of demand for good y is 0.

D. Income elasticity of demand for good x is 0.5 and good y is 1.

EXPLANATION

Correct answer: B

Under the interior-demand interpretation, both goods are purchased. Income elasticity measures the percentage change in demand when income rises by one percent, with prices unchanged. For this quasilinear utility, income does not affect the interior choice of the nonlinear good x.

To derive that result, let income be m and prices be $p_x, p_y > 0$. Marginal utilities are $MU_x = 1/(2\sqrt{x})$ and $MU_y = 1$. Equal marginal utility per rupee implies

$$\frac{1}{2p_x\sqrt{x}} = \frac{1}{p_y}, \qquad x^* = \left(\frac{p_y}{2p_x}\right)^2.$$

The formula contains no income. Consequently $(\partial x^*/\partial m)(m/x^*) = 0$. Remaining income buys $y = (m - p_x x^*)/p_y$, so increases in income are absorbed by good y.

This interior result requires $m > p_x x^*$. At lower income, the consumer buys only x, and its quantity can depend on income. Zero income elasticity should therefore not be treated as a universal statement at every possible income.

- **A:** Unit income elasticity for both goods would mean both quantities grow proportionately with income. Here interior demand for x stays fixed instead.
- **C:** Demand for the linear good increases by $1/p_y$ per extra income unit; its interior income elasticity is $m/(m - p_x x^*)$, not zero.
- **D:** The exponent one-half in utility is not an income elasticity. The interior demand calculation gives zero for x, while the positive spending on x makes the income elasticity of y greater than one.

KEYWORDS: quasilinear utility | income elasticity | interior consumer optimum

14

MICROECONOMICS

General equilibrium and welfare

Difficulty: Medium | Reviewed practice | MCQ · 2 marks

Consumers have $U_R = \beta \log(x_R^2 y_R)$, $U_S = (x_S y_S^2)^\alpha$, $\alpha, \beta > 0$. Totals are $x_R + x_S = A > 0$, $y_R + y_S = B > 0$. Which equation gives their interior contract curve?

A. $4Ay_R - Bx_R - 3x_R y_R = 0.$

B. $4Ay_R - Bx_R + 3x_R y_R = 0.$

C. $Ay_R - 4Bx_R + 3x_R y_R = 0.$

D. $Ay_R - Bx_R = 0.$

EXPLANATION

Correct answer: A

The contract curve contains feasible Pareto-efficient allocations. In the positive interior, smooth preferences require equal marginal rates of substitution (MRS): otherwise a small trade can benefit both consumers.

Positive α and β make the given utilities increasing transformations of $2\log x_R + \log y_R$ and $\log x_S + 2\log y_S$. Their MRS values are therefore

$$\text{MRS}_R = \frac{2y_R}{x_R}, \qquad \text{MRS}_S = \frac{y_S}{2x_S}.$$

Substitute feasibility, $x_S = A - x_R$ and $y_S = B - y_R$, into their equality:

$$\frac{2y_R}{x_R} = \frac{B - y_R}{2(A - x_R)}, \qquad 4y_R(A - x_R) = x_R(B - y_R).$$

Expanding and collecting terms gives $4Ay_R - Bx_R - 3x_R y_R = 0.$

These tangencies are efficient, not just stationary. A positive weighted sum of the two equivalent log utilities is strictly concave. A Pareto improvement would increase that same positive weighted sum, contradicting optimality.

- **B:** It gives the cross-product term the wrong sign. Expansion produces $-4x_R y_R + x_R y_R = -3x_R y_R$.
- **C:** It reverses the consumers' expenditure-share ratios, as if R had MRS $y_R/(2x_R)$ and S had MRS $2y_S/x_S$.
- **D:** It is the equal-share contract curve. Here the consumers have different relative preferences, so the cross-product terms do not cancel.

KEYWORDS: contract curve | marginal rate of substitution | differing cobb douglas shares | pareto efficiency

15

MICROECONOMICS

Consumer theory

Difficulty: Medium | 2021 · Q13 | MCQ · 2 marks

The utility from wealth (w) for an individual is given by $u(w) = \sqrt{w}$. The individual owns a risky asset that is equally likely to yield either Rs. 400 or Rs. 900. The risk premium of the asset (in Rs.) is

A. 5

B. 25

C. 625

D. 650

EXPLANATION

Correct answer: B

A risk premium is the amount of expected wealth a person would give up to avoid uncertainty. Find it by subtracting the certainty equivalent from expected wealth. The certainty equivalent is a sure amount that provides the same utility as the risky asset.

With equal probabilities, expected wealth is

$$E[w] = \tfrac{1}{2}(400) + \tfrac{1}{2}(900) = 650.$$

Expected utility averages the utilities of the outcomes, not the outcomes themselves:

$$E[u(w)] = \tfrac{1}{2}\sqrt{400} + \tfrac{1}{2}\sqrt{900} = \tfrac{1}{2}(20 + 30) = 25.$$

If the certainty equivalent is c, then $\sqrt{c} = 25$, so $c = 625$. Thus the risk premium is $650 - 625 = 25$, or Rs. 25. The square-root utility function is concave: additional wealth brings progressively smaller utility gains. This risk aversion explains why the consumer values the risky asset below its expected monetary payoff.

- **A:** Rs. 5 is not the wealth sacrificed to remove the risk. Utility differences and monetary differences have different units; the utility level must first be converted back to wealth.
- **C:** Rs. 625 is the certainty equivalent itself, not the difference between expected wealth and the certainty equivalent.
- **D:** Rs. 650 is expected wealth. It averages monetary outcomes but makes no deduction for the consumer's dislike of risk.

KEYWORDS: expected utility | certainty equivalent | risk premium | risk aversion

16

MICROECONOMICS

Imperfect competition and market structure

Difficulty: Easy | Reviewed practice | MSQ · 2 marks

A monopolist faces inverse demand $P = 80 - 3Q$ and total cost $TC = 120 + 8Q$ for $0 \leq Q \leq 80/3$. Which of the following is/are CORRECT?

A. Maximum revenue is 312.

B. Maximum revenue occurs at $Q = 12$.

C. Total revenue at $Q = 12$ is 528.

D. Profit is maximized at $Q = 12$.

EXPLANATION

Correct answer: C, D

Revenue is the money received from sales, whereas profit subtracts production cost. Total revenue here is $TR = PQ = 80Q - 3Q^2$, so marginal revenue is $MR = 80 - 6Q$. Marginal cost is 8; the fixed cost of 120 does not change when output changes.

- **A:** Incorrect. Substituting the revenue-maximizing output into revenue gives $80(40/3) - 3(40/3)^2 = 1600/3$, approximately 533.33. The number 312 is instead the maximum profit: $528 - (120 + 8(12)) = 312$. Subtracting costs changes the objective from revenue to profit.
- **B:** Incorrect. To maximize revenue alone, set $MR = 0$, giving $80 - 6Q = 0$ and $Q = 40/3$. At output 12, marginal revenue remains positive, so increasing output would still raise revenue.
- **C:** Correct. At output 12 the price is $80 - 3(12) = 44$. Multiplying price by quantity gives revenue $44(12) = 528$. Subtracting costs would instead give profit, a different quantity.
- **D:** Correct. Profit is $\pi = 72Q - 3Q^2 - 120$. Its derivative is $72 - 6Q$, which vanishes at $Q = 12$. The second derivative is -6, and this output is feasible, so it is the profit maximum.

Revenue keeps increasing after profit peaks at 12. Between 12 and $40/3$, marginal revenue is positive and below the marginal cost of 8.

KEYWORDS: profit maximization | revenue maximization | marginal revenue | fixed cost

17

MICROECONOMICS

Theory of production and cost

Difficulty: Medium | Reviewed practice | MSQ · 2 marks

Technology is $f(x_1, x_2, x_3, x_4) = \min\{x_1, x_2\} + \min\{x_3, x_4\}$, with nonnegative inputs and positive prices w_i. Minimum cost for target $q > 0$ is $C(q, w)$. Which of the following is/are CORRECT?

A. If $w_1 + w_2 = w_3 + w_4$, the unique cost-minimizing plan uses all four inputs in quantities $q/2$.

B. $C(q, w) = q \min\{w_1 + w_2, w_3 + w_4\}$.

C. The production function has constant returns to scale.

D. At $q = 1$ and $w = (1, 2, 3, 4)$, the unique cost-minimizing input bundle is $(1, 1, 0, 0)$.

EXPLANATION

Correct answer: B, C, D

The firm has two production routes. The first uses inputs one and two in matched pairs; the second uses inputs three and four in matched pairs. Within a route, an unmatched extra input raises cost without raising output, so strictly positive prices rule out such waste at the optimum.

If the first route produces z_1 and the second produces z_2, the least-cost inputs are (z_1, z_1, z_2, z_2). Output is $z_1 + z_2$, and cost is

$(w1 + w2)z1 + (w3 + w4)z2.$

Because both route costs are positive, optimal total output equals the target q. The two routes are perfect substitutes in delivering that output, so the cheaper unit-cost route can supply everything.

- **A:** Incorrect. When the two route costs tie, every split has the same total cost. The full set of minimizing bundles is $(z, z, q - z, q - z)$ for $0 \le z \le q$. The equal split $z = q/2$ is one optimum, but the corner splits are optimal too.
- **B:** Correct. Allocating all output to a cheapest route gives $C(q, w) = q \min\{w_1 + w_2, w_3 + w_4\}$. Any use of a more expensive route would increase cost.
- **C:** Correct. For every positive scale factor t, $\min\{tx_i, tx_j\} = t \min\{x_i, x_j\}$. Applying this to both terms gives $f(tx) = tf(x)$: all inputs doubled produce exactly twice the output, and similarly for any common scale.
- **D:** Correct. The two route costs are $1 + 2 = 3$ and $3 + 4 = 7$. All of the unit target goes through route one, giving $(1, 1, 0, 0)$. Strictly different route costs and positive prices make this input bundle unique.

Complementarity within each pair does not prevent substitution between the two production routes; these are different relationships among the inputs.

KEYWORDS: complementary input routes | least cost route selection | constant returns to scale | tied route nonuniqueness

18

MICROECONOMICS

Perfect competition and partial equilibrium

Difficulty: Easy | Reviewed practice | MSQ · 2 marks

Demand is $Q = 100 - 2P$ at price $P = 20$ monetary units. Which of the following is/are CORRECT?

A. If price rises to 30, consumer surplus falls by 300 monetary units.

B. Consumer surplus at the current price is 1800 monetary units.

C. The consumer-surplus region at the current price is triangular.

D. The choke price is 50.

EXPLANATION

Correct answer: C, D

Consumer surplus measures buyers' willingness to pay above their actual spending. On a demand diagram it is the area below inverse demand and above the market price, up to the quantity purchased. A straight downward-sloping demand curve makes this area a triangle.

- **A:** Incorrect. At price 30, quantity is 40 and surplus is $\frac{1}{2}(50 - 30)(40) = 400$. The decline is $900 - 400 = 500$, not 300. The 40 units still bought cost 10 more each. The 20 units no longer bought account for another $\frac{1}{2}(20)(10) = 100$ of lost surplus.
- **B:** Incorrect. At price 20, quantity is $100 - 2(20) = 60$. The triangle has height $50 - 20 = 30$ and base 60, so surplus is $\frac{1}{2}(30)(60) = 900$, not 1800.
- **C:** Correct. Inverse demand is $P = 50 - Q/2$. Its straight line, the horizontal price line at 20 and the vertical price axis bound a triangle above the price paid.
- **D:** Correct. The choke price is the price at which demand reaches zero. Setting $100 - 2P = 0$ gives $P = 50$.

KEYWORDS consumer surplus triangle | choke price | surplus change

19

MICROECONOMICS

Consumer theory

Difficulty: Medium | 2024 · Q32 | MSQ · 2 marks

Consider the following three utility functions: $F = (4x_1 + 2x_2)$, $G = \min(4x_1, 2x_2)$ and $H = (\sqrt{x1} + x_2)$, where x_1 and x_2 are two goods available at unit prices p_{x1} and p_{x2}, respectively. Which of the following is/are CORRECT for the above utility functions?

A. The marginal rate of substitution is given by -1, -2, and $-0.5\sqrt{x1}$ for the utility functions F, G, and H, respectively

B. If $p_{x1} = p_{x2}$, then the utility maximisation problem with utility function F has a corner solution

C. If income is 100 and $p_{x1} = p_{x2} = 2$, then in the utility maximisation problem with utility function G, the sum of the optimal values of x_1 and x_2 is 50

D. If income is 100, $p_{x1} = 5$, and $p_{x2} = 5000$, then in the utility maximisation problem with utility function H, the optimal value of x_2 is 20

EXPLANATION

Correct answer: B, C

The three utility functions require different methods. Linear utility describes perfect substitutes, a minimum describes goods used together in a fixed proportion, and the square-root function has diminishing marginal utility from good one. An interior marginal-utility condition cannot be imposed automatically on corners or kinks.

- **A:** For F, the indifference-curve slope is $-MU_1/MU_2 = -4/2 = -2$, not -1. For G, indifference curves are L-shaped: one arm is horizontal, the other vertical, and there is no unique slope at the kink. For H, the slope is $-1/(2\sqrt{x1})$ when $x1 > 0$, not $-0.5\sqrt{x1}$. Thus the proposed list is false.
- **B:** At equal positive prices, good one yields four utility units per physical unit while good two yields two. Every rupee therefore buys twice as much utility through good one. Spending everything on good one gives a corner solution.
- **C:** For G, avoid an unused excess of either good by choosing $4x1 = 2x2$, or $x2 = 2x1$. The budget is $2x1 + 2x2 = 100$. Substitution gives $x1 = 50/3$ and $x2 = 100/3$, whose sum is 50. More simply, the exhausted budget itself implies this sum.
- **D:** Twenty units of good two would cost 100,000 against income of only 100, so the proposed bundle is infeasible.

KEYWORDS: perfect substitutes | perfect complements | corner solution | marginal rate of substitution

20

MICROECONOMICS

Imperfect competition and market structure

Difficulty: Easy | 2025 · Q37 | MSQ · 2 marks

In the case of first-degree price discrimination, which of the following statements is/are CORRECT in long run?

A. Total surplus is equal to firm's profit.

B. Consumer surplus is equal to zero.

C. Deadweight loss is positive.

D. Producer surplus is zero.

EXPLANATION

Correct answer: A, B

First-degree price discrimination means charging each buyer their maximum willingness to pay for each unit. The seller needs enough information and the ability to prevent resale. No buyer retains a gap between willingness to pay and payment.

Unlike a uniform-price monopolist, the seller can sell an extra unit without reducing receipts on earlier units. Its marginal revenue for that unit is therefore the buyer's marginal willingness to pay. It sells every unit for which willingness to pay covers marginal cost, reaching the efficient quantity where the two are equal.

- **A:** With consumer surplus fully extracted, the firm receives the entire net surplus. If total buyer benefit is V and long-run total economic cost is C, receipts equal V and both total surplus and profit equal $V - C$. This counts all relevant long-run costs.
- **B:** Each unit's price exhausts that unit's willingness to pay, so consumer surplus is zero.
- **C:** Deadweight loss is the value of mutually beneficial trades that do not occur. Here all such units are sold, so the usual monopoly output restriction and its deadweight loss disappear.
- **D:** Surplus is transferred to the producer, not eliminated. The firm's ability to capture buyers' gains does not force producer surplus to zero.

Efficient output does not mean consumers receive a share of the gains. Also distinguish long-run net surplus from the short-run convention $PS = TR - VC$: if a separately fixed cost is retained, that short-run producer-surplus measure exceeds profit by the fixed cost. A uses the long-run net-cost accounting in the question.

KEYWORDS: first degree price discrimination | consumer surplus | deadweight loss | producer surplus

21

MICROECONOMICS

Consumer theory

Difficulty: Easy | 2025 · Q57 | NAT · 2 marks

Demand curve for a commodity in your consumption basket is given by $P^2Q^5 = 392.67$. The absolute value of your own price elasticity of demand for this commodity is _____ (rounded off to one decimal place).

Accepted answer: **0.4**

EXPLANATION

Correct answer: 0.4

Own-price elasticity compares the percentage change in quantity demanded with the percentage change in its own price. For positive price and quantity, it equals the logarithmic derivative $d\ln Q/d\ln P$.

Taking logarithms of the demand equation separates its powers:

$2\ln P + 5\ln Q = \ln(392.67).$

The right side is constant. Differentiating with respect to $\ln P$ gives

$2 + 5\frac{d\ln Q}{d\ln P} = 0, \qquad e = -\frac{2}{5} = -0.4.$

The negative sign describes a fall in demand when price rises. The question asks for the absolute value, so report **0.4** to one decimal place. Demand is inelastic: locally, a one percent price increase reduces quantity by about 0.4 percent.

Equivalently, solve directly for quantity: $Q = 392.67^{1/5}P^{-2/5}$. The price exponent is the elasticity; the constant only scales the demand level. Taking $5/2$ instead would reverse the direction of the derivative and confuse the elasticity of price with respect to quantity with the requested quantity response.

KEYWORDS: constant elasticity demand | logarithmic differentiation | absolute price elasticity

22

MICROECONOMICS

Theory of production and cost

Difficulty: Medium | Reviewed practice | NAT · 2 marks

To produce exactly 10 units, a firm opens integer $n \geq 1$ plants. An open plant producing $q_i \geq 0$ costs $9 + q_i^2$; closed plants cost zero. Output is freely splittable. The number of plants n that minimizes total cost is _____ (in integer).

Accepted answer: **3**

EXPLANATION

Correct answer: 3

Opening more plants spreads production and lowers the sum of quadratic operating costs, but each additional plant adds a fixed cost of nine. Both effects matter.

For a fixed number n, output should be divided equally. Indeed,

$$\sum_{i=1}^{n} q_i^2 \geq \frac{\left(\sum_{i=1}^{n} q_i\right)^2}{n} = \frac{100}{n},$$

with equality when each plant produces $10/n$. Minimized cost for that plant count is therefore

$$C(n) = 9n + \frac{100}{n}.$$

Temporarily treating n as continuous, its derivative is $9 - 100/n^2$. Cost falls until $n = 10/3$ and rises afterward. Since the number of plants must be an integer, only the adjacent integers three and four need comparison:

$$C(3) = 27 + \frac{100}{3} = \frac{181}{3}, \qquad C(4) = 36 + 25 = 61.$$

Three plants cost about 60.33, less than 61. All smaller integers lie on the decreasing side and all larger ones on the increasing side, so no other count can do better. The integer restriction requires this comparison; simply rounding a continuous optimizer is not a general cost-minimization rule.

KEYWORDS: integer plant count | fixed opening cost | equal output allocation

23

MICROECONOMICS

Introductory Game theory

Difficulty: Easy | Reviewed practice | NAT · 1 mark

Player 1 chooses rows and Player 2 columns; payoffs are (Player 1, Player 2), with $k \geq 0$.

	Left	Right
Top	(3,0)	(0,2)
Bottom	(0,2)	(3,0)
Middle	$(k, 0)$	$(k, 0)$

Proposed mixtures:

- Player 1: half Top, half Bottom, zero Middle.
- Player 2: half Left, half Right.

The largest k for which this profile is a Nash equilibrium is _____ (round off to 1 decimal place).

Accepted answer: **1.4 to 1.6 (inclusive)**

EXPLANATION

Correct answer: [1.4, 1.6]

Actions used with positive probability must be best responses, not merely tied with each other. Any unused action must also give no higher payoff.

Against Player 2's equal mixture, Player 1 receives $3/2$ from Top and $3/2$ from Bottom. The proposed row mixture therefore gives $3/2$, while a deviation to Middle gives k. Player 1 has no profitable deviation exactly when
$k \leq \frac{3}{2}$.

Against Player 1's proposed mixture, Player 2 receives
$\frac{1}{2}(0) + \frac{1}{2}(2) = 1$

from Left, and also 1 from Right. Thus the column mixture is a best response regardless of k, since Middle is assigned zero probability in the proposed profile.

The largest admissible parameter is consequently **1.5**. Equality is allowed: at $k = 1.5$, Middle ties the used rows but does not offer a strict gain. A best response need not assign positive probability to every action that ties for the highest payoff.

KEYWORDS: off support deviation | mixed equilibrium parameter bound | unused best response tie

24

MICROECONOMICS

Market failure and government policy

Difficulty: Easy | Reviewed practice | NAT · 1 mark

Each potential seller owns one good. A share $\theta \in (0,1)$ of the goods is high quality. Sellers know their own good's quality, but buyers cannot distinguish quality. Buyers are competitive and risk-neutral, and sellers trade when indifferent. The smallest θ supporting participation by all sellers at a pooled price is _____ (round off to three decimal places).

Quality	Buyer valuation	Seller reservation value
High	100	70
Low	40	20

Accepted answer: **0.499 to 0.501 (inclusive)**

EXPLANATION

Correct answer: [0.499, 0.501]

In a pooling outcome, buyers pay a common price because they cannot distinguish quality. If all sellers participate, the high-quality fraction among goods offered is the original fraction θ. The competitive bid is then

$$p = 100\theta + 40(1-\theta) = 40 + 60\theta.$$

Low-quality sellers accept this price for every feasible θ, since it is at least 40, above their reservation value 20. High-quality sellers participate only if

$$40 + 60\theta \geq 70, \qquad \theta \geq \frac{1}{2}.$$

At the minimum share $\theta = \mathbf{0.500}$, the common price equals 70. High-quality sellers sell at their reservation price of 70. Low-quality sellers also sell because 70 exceeds their reservation price of 20. The price therefore supports participation by both types.

Below it, a price based on all potential sellers would be too low for high-quality sellers. Their withdrawal would change the quality mix actually offered, so that original pooled average could not support the proposed outcome.

KEYWORDS hidden quality pooling | seller participation threshold | endogenous offered quality

25

MICROECONOMICS

Theory of production and cost

Difficulty: Medium | Reviewed practice | NAT · 2 marks

Plant costs are $C_1(q_1) = q_1^2$, $C_2(q_2) = 2q_2^2$, with $q_1 + q_2 = Q$, $0 \le q_1 \le 4$ and $q_2 \ge 0$. Let $C(Q)$ denote minimum total cost. The value of $C'(10)$ is _____ (in integer).

Accepted answer: **24**

EXPLANATION

Correct answer: 24

When output can move freely between plants, cost minimization equalizes their marginal costs. A binding capacity limit can prevent that equality, so it must be checked first.

Without the limit, marginal-cost equality would give

$$2q_1 = 4q_2, \qquad q_1 + q_2 = 10,$$

hence $q_1 = 20/3$ and $q_2 = 10/3$. Plant 1 cannot produce that much. Substituting $q_2 = 10 - q_1$ into total cost gives a derivative $6q_1 - 40$, which is negative throughout $0 \le q_1 \le 4$. Cost therefore falls until plant 1 reaches its limit.

The optimum is $q_1 = 4$, $q_2 = 6$. For total outputs near ten, the first plant remains at capacity and the second supplies every extra unit. Thus

$$C(Q) = 16 + 2(Q - 4)^2, \qquad C'(10) = 4(10 - 4) = \mathbf{24}.$$

Plant 1's marginal cost is only eight at the optimum, but it cannot expand. Plant 2 supplies the extra output and determines the firm's marginal cost.

KEYWORDS: multiplant cost allocation | binding output capacity | aggregate marginal cost

26

MICROECONOMICS

Imperfect competition and market structure

Difficulty: Easy | 2024 · Q55 | NAT · 2 marks

An industry has 6 firms in Cournot competition. Each of the 6 firms has zero fixed costs, and a constant marginal cost equal to 20. The product is homogenous and the industry inverse demand function is given by $P = 230 - Q$, where P is the market price and Q is the industry output (sum of outputs of the 6 firms). The market price under Cournot-Nash equilibrium is equal to _____ (in integer).

Accepted answer: **50**

EXPLANATION

Correct answer: 50

A Cournot firm chooses output while holding rivals' output fixed. Let one firm's quantity be q_i and its five rivals' combined quantity be Q_{-i}. Its price is $230 - q_i - Q_{-i}$ and its marginal cost is 20, so

$$\pi_i = (210 - q_i - Q_{-i})q_i.$$

The first-order condition is $210 - 2q_i - Q_{-i} = 0$. Identical firms have equal equilibrium quantities q, so $Q_{-i} = 5q$ and the condition becomes $210 - 7q = 0$. Therefore each firm produces 30 units.

Industry output includes all six firms: $Q = 6(30) = 180$. Substitute this total into the demand equation to obtain the market price:

$$P = 230 - 180 = 50.$$

Each firm's profit is strictly concave in its own output, with second derivative -2, so these positive quantities are best responses. Substituting one firm's output into industry demand would incorrectly give 200; demand depends on the combined output.

KEYWORDS: cournot competition | symmetric firms | equilibrium price

27

MICROECONOMICS

Perfect competition and partial equilibrium

Difficulty: Easy | Reviewed practice | NAT · 1 mark

Market demand is $Q = 100 - P$, with P in rupees. Marginal cost is ₹20. A cartel raises the competitive price of ₹20 to ₹60. Consumer surplus falls by ₹_____ (in integer).

Accepted answer: **2400**

EXPLANATION

Correct answer: 2400

Consumer surplus is the difference between buyers' total willingness to pay and their expenditure. For a linear demand curve it is a triangle above the price line and below demand. The maximum willingness to pay, where quantity is zero, is ₹100.

Under competition, the triangle has height $100 - 20 = 80$ rupees and base 80 units. Thus $CS_C = \frac{1}{2}(100 - 20)(80) = 3200$.

Under the cartel, price is ₹60 and quantity is 40, giving $CS_M = \frac{1}{2}(100 - 60)(40) = 800$.

The question asks for the fall, so subtract the remaining surplus from the original surplus: $3200 - 800 = 2400$ rupees.

The full ₹2,400 loss is not deadweight loss. Consumers pay an additional $40 \times 40 = 1600$ rupees to producers on units still sold. The other ₹800 is the lost benefit from mutually worthwhile trades that the output restriction prevents. It equals the deadweight-loss triangle $\frac{1}{2}(80 - 40)(60 - 20) = 800$. Confusing the transfer or the remaining surplus with the entire consumer loss would understate the requested amount.

KEYWORDS: consumer surplus | cartel output restriction | surplus transfer | deadweight loss

28

MICROECONOMICS

Consumer theory

Difficulty: Medium | 2024 · Q51 | NAT · 2 marks

An individual owns a mobile phone, currently valued at Rs. 40,000. The current wealth of the individual is Rs. 2,00,000 (including the value of the mobile phone). According to reports, there is a 20 percent chance of mobile phone theft and an actuarially fair insurance policy is available to insure the loss of the mobile phone against a theft. The individual's von-Neumann-Morgenstern utility of wealth function is given by $U(W) = \sqrt{W}$, where W is the wealth. Then, the maximum willingness to pay for such an actuarially fair insurance policy is Rs. _____ (rounded off to nearest integer).

Accepted answer: **8355 to 8358 (inclusive)**

EXPLANATION

Correct answer: 8357

The individual's maximum willingness to pay and the insurer's actuarially fair price are different amounts. The fair price equals expected compensation, $0.2(40000) = 8000$ rupees.

Maximum willingness to pay depends on how the consumer values removal of the risk.

Without insurance, wealth is 200,000 if the phone is not stolen and $200000 - 40000 = 160000$ if it is stolen. The phone's value is already included in total wealth, so it must not be added again. Expected utility is

$$EU = 0.8\sqrt{200000} + 0.2\sqrt{160000}.$$

Full insurance reimburses the entire loss. If the premium is p, final wealth becomes $200000 - p$ in either state. At the largest acceptable premium, insured and uninsured utilities are equal:

$$\sqrt{200000 - p} = EU.$$

Squaring both sides and rearranging gives

$$p = 200000 - \left(0.8\sqrt{200000} + 0.2\sqrt{160000}\right)^2 = 8356.6597\ldots.$$

The nearest integer is Rs. 8,357. This is the requested maximum valuation; the available fair policy costs Rs. 8,000, so it would be purchased.

Concave square-root utility makes the individual risk averse. The extra willingness to pay above the expected loss is approximately $8356.66 - 8000 = 356.66$ rupees. Reporting 8,000 would answer the insurer's fair-price question, while reporting 356.66 would give only the additional payment for avoiding risk, not the total insurance premium.

KEYWORDS: certainty equivalent | maximum insurance premium | actuarially fair insurance | risk aversion

29

MICROECONOMICS

Market failure and government policy

Difficulty: Easy | Reviewed practice | NAT · 1 mark

For Q public trees, individual marginal benefits are $\max\{100 - 0.5Q, 0\}$ for 5 residents and $\max\{50 - 0.25Q, 0\}$ for 10. Marginal cost is ₹25 per tree. The efficient number of trees Q is _____ (in integer).

Accepted answer: **195**

EXPLANATION

Correct answer: 195

A public good provides the same quantity to everyone. One additional tree benefits all 15 residents, so its social marginal benefit is the sum of their willingness to pay for that same tree. This is vertical addition of marginal benefits, unlike adding private-good quantities at a common price.

Each benefit formula reaches zero at $Q = 200$. While $0 \le Q \le 200$, both groups therefore contribute to the sum:

$$SMB = 5(100 - 0.5Q) + 10(50 - 0.25Q) = 1000 - 5Q.$$

Efficient provision adds trees as long as their combined marginal benefit exceeds marginal cost. At the optimum,

$$1000 - 5Q = 25, \qquad 5Q = 975, \qquad Q^* = 195.$$

The candidate lies below 200, so the active-benefit calculation is valid. At 195 trees, each high-benefit resident values the marginal tree at $100 - 0.5(195) = 2.5$ rupees and each other resident at $50 - 0.25(195) = 1.25$ rupees. Their sum is $5(2.5) + 10(1.25) = 25$, exactly its marginal cost.

Social net marginal benefit is positive below 195 and negative above it; beyond 200 all marginal benefits are zero while cost remains positive. Thus 195 is the global surplus-maximizing quantity.

Using just one resident's benefit would ignore the gains enjoyed by everyone else. Counting only two benefit curves would likewise omit the group sizes. The cost is paid once per tree; it is not multiplied by the number of beneficiaries.

KEYWORDS: public good vertical aggregation | samuelson provision condition | group marginal benefits

30

MICROECONOMICS

Consumer theory

Difficulty: Easy | 2025 · Q50 | NAT · 1 mark

Suppose utility function of a consumer is $u(x, y) = xy$, where x and y are quantities of the two commodities consumed. If price of x is Re.1 and that of y is Rs.2, and income of the consumer is Rs.100, utility maximizing quantity consumption of x is _____.

Accepted answer: **50**

EXPLANATION

Correct answer: 50

Both goods contribute positively to $u = xy$ when the other is present, so an optimum with positive utility uses the full budget. The budget is $x + 2y = 100$, which implies $y = (100 - x)/2$.

Substituting the affordable quantity of y into utility reduces the problem to one variable:

$$u(x) = \frac{x(100-x)}{2} = 50x - \frac{x^2}{2}, \qquad 0 \le x \le 100.$$

Differentiate to find the stationary point: $u'(x) = 50 - x = 0$ gives $x = 50$. Since $u''(x) = -1 < 0$, the curve is concave and this is its maximum. The associated quantity is $y = (100 - 50)/2 = 25$, and spending is $50 + 2(25) = 100$.

The same result follows from the equal expenditure shares of this symmetric Cobb-Douglas utility: each good receives Rs. 50. Equal expenditure does not mean equal quantities, because good two costs twice as much. The requested consumption of good one is exactly 50 units; 25 is the quantity of good two.

KEYWORDS: cobb douglas demand | equal expenditure shares | budget constraint

Coverage at a glance.

30 questions · 90 practice minutes · Wrong MCQs lose one-third of their marks. MSQs and NATs have no negative marking; MSQs need all correct options and no others.

Subject	Questions
Microeconomics	30

Answer key

1 · A	2 · D	3 · C	4 · D	5 · C	6 · C	7 · B	8 · D	9 · C	10 · A
11 · D	12 · B	13 · B	14 · A	15 · B	16 · C, D	17 · B, C, D	18 · C, D	19 · B, C	20 · A, B
21 · 0.4	22 · 3	23 · 1.4 to 1.6 (inclusive)	24 · 0.499 to 0.501 (inclusive)	25 · 24	26 · 50	27 · 2400	28 · 8355 to 8358 (inclusive)	29 · 195	30 · 50

Selected from the reviewed IIT JAM question bank. Includes previous-year and original practice questions.

Topic breakdown.

Question counts in this practice resource, not predicted exam weightages.

Consumer theory	11
Market failure and government policy	3
Theory of production and cost	5
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Perfect competition and partial equilibrium	3
Imperfect competition and market structure	4
General equilibrium and welfare	2

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