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AP MICROECONOMICS · COURSE REVIEW AND PRACTICE

Bonus Practice Exam.

A second full-length AP Microeconomics exam: multiple choice and free response, with full explanations and scoring guidance.

INSIDE

Section I Multiple Choice · Section II Free Response · Answers and Explanations · Scoring Guide



Table of Contents.

A bonus full-length practice exam with explanations and scoring.

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Each section has an explanation, worked examples, and practice problems. Answers and explanations close every chapter. Click any entry to jump to that page.

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Take it under timed conditions, then study every explanation.

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How to Use This Exam

Take the exam in one sitting under AP timing, without notes. Score Section I with the answer key, then score each free-response question against the point-by-point guide.

After the exam

Read the explanation for every question, including the ones you got right. Log each miss by unit and by reason (content gap, careless error, misread graph) and revisit those sections in the main book.

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A second full-length practice exam in the AP format: multiple choice and free response, with full explanations and scoring guidance.

E2 Practice Exam 2

A second full-length AP Microeconomics practice exam, with extra weight on imperfect competition, factor markets, and market failure, and explained answers.

Section I has 60 multiple-choice questions (suggested time 70 minutes, two-thirds of the score) with extra weight on imperfect competition, factor markets, and market failure. Choose the best answer for each question; there is no penalty for guessing. Section II has 3 free-response questions (suggested time 60 minutes, one-third of the score): one long question worth 10 points and two short questions worth 4 points each. Read each stem, label graphs fully, and show calculations. To estimate your score, multiply your free-response raw points by 30/18 and add your multiple-choice total for a composite out of 90; roughly 60 or more is in the range of a 5, 48 to 59 a 4, 37 to 47 a 3, and 27 to 36 a 2 (a rough guide, not an official conversion).

Section	Questions	Suggested time	Weight	Raw points
I Multiple choice	60	70 min	66.7%	60
II FRQ 1 (long)	5 parts	25 min	16.7%	10
II FRQ 2 (short)	4 parts	12 min	8.3%	4
II FRQ 3 (short)	4 parts	13 min	8.3%	4

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SECTION I, PART A Multiple Choice: Questions 1-20

Choose the best answer. Questions that refer to a table or graph use the data shown.

1. The straight-line production possibilities curve shown has intercepts of 40 bicycles and 80 scooters. The opportunity cost of producing the 10th bicycle is



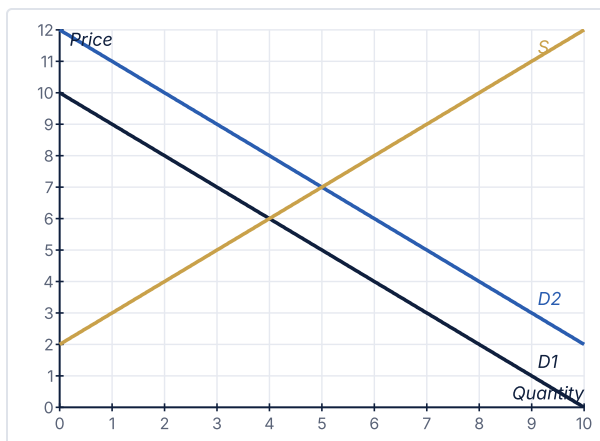
- (A) 0.5 scooter (B) 1 scooter (C) 2 scooters
(D) 40 scooters (E) 80 scooters
2. The usual PPC is bowed outward (concave to the origin). This shape reflects
- (A) increasing opportunity costs, because resources are not equally well suited to producing both goods.
(B) unemployment, because the economy is inside its frontier.
(C) constant opportunity costs, because all resources are interchangeable.
(D) decreasing opportunity costs, because of economies of scale.
(E) technological progress, because the curve has shifted outward.
3. In one hour, Maria can bake 4 loaves of bread or 2 cakes, and Jon can bake 3 loaves or 2 cakes. Which arrangement allows both to gain from trade?
- | Baker | Loaves per hour | Cakes per hour |
|-------|-----------------|----------------|
| Maria | 4 | 2 |
| Jon | 3 | 2 |
- (A) Jon specializes in cakes and Maria specializes in bread.
(B) Maria specializes in both goods.
(C) Neither should specialize because they produce the same number of cakes.
(D) Maria specializes in cakes because she is faster at baking.
(E) Jon specializes in bread because he bakes fewer loaves.
4. Which of the following would shift an economy's production possibilities curve outward?
- (A) A change in consumers' tastes toward one good
(B) A decrease in the price of one of the goods
(C) A decrease in unemployment
(D) A move from a point inside the curve to a point on it
(E) An increase in the size of the labor force
5. A family bought non-refundable concert tickets for \$60 each. On the evening of the concert, one member is ill and the others find that going costs them \$20 each in travel and food and is worth \$35 to them. A rational decision-maker would
- (A) go, because the \$60 ticket price is a sunk cost and should be ignored, and the \$35 benefit exceeds the \$20 cost.
(B) stay home, because the tickets cannot be refunded.
(C) stay home, because the total cost of \$80 exceeds the \$35 value.
(D) go only if the ticket price was less than \$35.
(E) be indifferent, since the money is already spent.

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6. Which of the following is a positive statement?
- (A) Society ought to value work more highly.
 - (B) It is unfair that some workers earn the minimum wage.
 - (C) The minimum wage should be raised to help the poor.
 - (D) A higher minimum wage will reduce teen employment.
 - (E) Workers deserve a living wage.
7. The graph shows demand shifting from D1 to D2 in the market for a normal good. Which event could cause this shift?



- (A) A fall in the price of the good
 - (B) A fall in the price of a substitute
 - (C) A rise in consumer income
 - (D) A rise in the price of a complement
 - (E) A decrease in the cost of producing the good
8. A poor harvest reduces the supply of coffee beans. At the same time, a medical report on the benefits of coffee raises demand. What happens to the equilibrium price and quantity of coffee beans?
- (A) Price and quantity both fall.
 - (B) Price falls; the change in quantity is indeterminate.
 - (C) Quantity rises; the change in price is indeterminate.
 - (D) Price and quantity both rise.
 - (E) Price rises; the change in quantity is indeterminate.
9. The price of a product falls from \$5 to \$4 and quantity demanded rises from 100 to 110 units. Total revenue changes by
- (A) a decrease of \$ 60
 - (B) a decrease of \$ 10
 - (C) no change
 - (D) an increase of \$ 40
 - (E) an increase of \$ 60
10. Which of the following goods most likely has the most price-elastic demand?
- (A) Gasoline in the short run
 - (B) Electricity for a household
 - (C) Table salt
 - (D) Insulin for diabetics
 - (E) One particular brand of breakfast cereal

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11. The graph shows a competitive market. If the government sets a minimum price of \$14 and buys the entire surplus at that price, the cost to the government is



- (A) \$9 (B) \$14 (C) \$56 (D) \$126 (E) \$140
12. In the market shown, a price ceiling of \$6 is imposed. The deadweight loss is



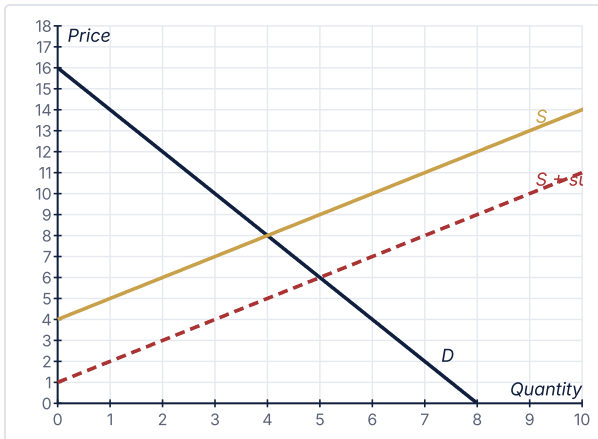
- (A) 2 (B) 3 (C) 6 (D) 9 (E) 12
13. A per-unit tax is placed on a good for which supply is perfectly inelastic. The burden of the tax falls
- (A) equally on buyers and sellers. (B) entirely on sellers.
 (C) on the government. (D) mostly on buyers, because the price rises.
 (E) entirely on buyers.
14. A country imposes a tariff on imported steel. Compared with free trade, which of the following is true?
- (A) The domestic price falls, and domestic production falls.
 (B) Domestic consumer surplus rises.
 (C) The domestic price rises, and domestic consumption rises.
 (D) The domestic price rises, domestic production rises, and imports fall.
 (E) Imports rise because the domestic price is higher.

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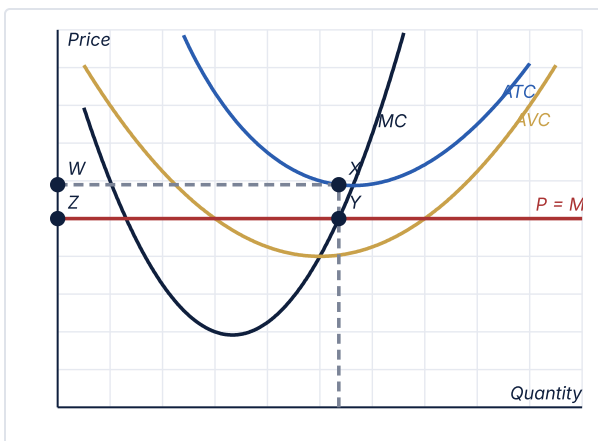
15. The market in the graph has demand $P = 16 - 2Q$ and supply $P = 4 + Q$. A subsidy of \$3 per unit is paid to producers (supply shifts down by \$3). The government's cost is



- (A) \$3 (B) \$5 (C) \$9 (D) \$15 (E) \$30
16. The income elasticity of demand for foreign vacations is 2.5. If household income rises 4 percent, the quantity of foreign vacations demanded will
- (A) rise by 1.6 percent (B) rise by 2.5 percent (C) rise by 4 percent
(D) rise by 6.5 percent (E) rise by 10 percent
17. A firm's total output as it adds workers is 8, 20, 30, 36, and 40 for 1 through 5 workers. The average product of labor with 4 workers is

Workers	1	2	3	4	5
Total output	8	20	30	36	40

- (A) 6 (B) 8 (C) 9 (D) 10 (E) 36
18. The table shows a firm's total cost. Average total cost is minimized (among these quantities) at an output of
- | Output | 0 | 1 | 2 | 3 | 4 | 5 |
|------------|------|-------|-------|-------|-------|-------|
| Total cost | \$60 | \$100 | \$130 | \$150 | \$180 | \$230 |
- (A) 1 unit (B) 2 units (C) 3 units (D) 4 units (E) 5 units
19. The graph shows a perfectly competitive firm in the short run. The market price is P . Which statement is correct?



- (A) The firm should produce more than Q^* because P exceeds AVC .
(B) The firm should shut down because it earns negative accounting profit.
(C) The firm should produce Q^* and earn zero economic profit.
(D) The firm should shut down because P is below ATC .
(E) The firm should produce Q^* and earn an economic loss equal to rectangle $WXYZ$.

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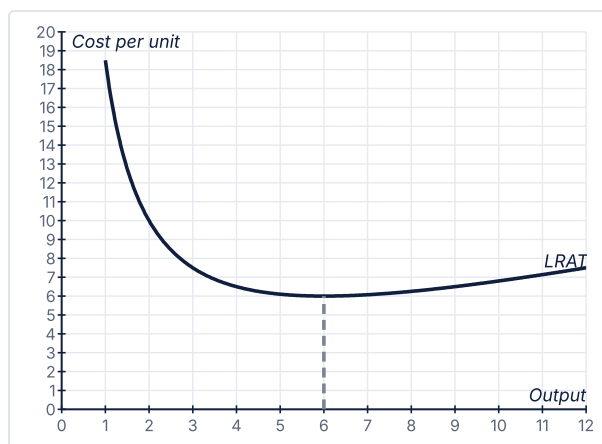
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20. Demand for the product of an increasing-cost perfectly competitive industry rises, and the industry returns to long-run equilibrium. Compared with the original equilibrium, the long-run price is
- (A) higher, and industry output is lower. (B) lower, and industry output is higher.
 (C) the same, and industry output is higher. (D) higher, and industry output is higher.
 (E) the same, and industry output is the same.

SECTION I, PART B Multiple Choice: Questions 21-40

Choose the best answer. Questions that refer to a table or graph use the data shown.

21. Each firm in a perfectly competitive market faces a horizontal demand curve because
- (A) firms collude to set the price.
 (B) entry into the market is blocked.
 (C) the market demand curve is perfectly elastic.
 (D) each firm sells a unique product with no substitutes.
 (E) each firm is so small relative to the market and sells an identical product, so it cannot affect the market price.
22. A perfectly competitive firm sells 30 units at \$20. Its average variable cost is \$14 and its total fixed cost is \$150. The firm's economic profit is
- (A) \$30 (B) \$150 (C) \$180 (D) \$420 (E) \$600
23. The graph shows a firm's long-run average total cost curve ($LRATC = 0.5q + 18/q$). For output levels above 6 units, the firm experiences



- (A) diseconomies of scale. (B) increasing marginal returns.
 (C) constant returns to scale. (D) economies of scale.
 (E) economic profit.
24. A firm's economic profit is zero. Which of the following must be true?
- (A) The firm is earning a loss and should exit.
 (B) The firm's revenue equals its explicit costs.
 (C) The firm earns a normal profit: revenue just covers all explicit and implicit costs.
 (D) The firm earns zero accounting profit.
 (E) The firm should shut down.
25. A firm has total revenue of \$400, total variable cost of \$450, and total fixed cost of \$100 in the short run. The firm should
- (A) produce, earning a profit of \$50. (B) produce, losing \$150.
 (C) shut down, losing \$450. (D) produce, because it covers fixed cost.
 (E) shut down, losing \$100.

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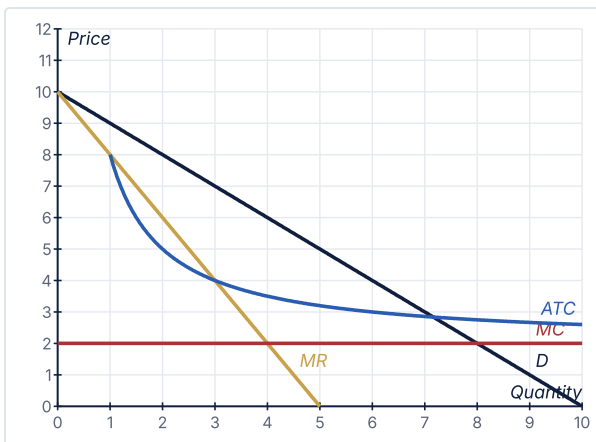
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26. Which of the following correctly defines the two kinds of efficiency?
- (A) Both mean that marginal revenue equals marginal cost.
 (B) Productive efficiency means maximum profit; allocative efficiency means maximum output.
 (C) Productive efficiency is producing at the minimum average total cost; allocative efficiency is producing where price equals marginal cost.
 (D) Productive efficiency is price equal to marginal cost; allocative efficiency is minimum average total cost.
 (E) Both mean that economic profit is positive.
27. A perfectly competitive, constant-cost industry is in long-run equilibrium when demand falls. After full adjustment, the price is
- (A) lower, and firms earn economic losses.
 (B) unchanged, industry output is lower, and the number of firms is unchanged.
 (C) higher, and there are fewer firms.
 (D) unchanged, industry output is lower, and there are fewer firms.
 (E) lower, industry output is lower, and the number of firms is unchanged.
28. In the short run, only labor is a variable input. Each worker is paid \$20 per hour, and the marginal product of the last worker is 5 units per hour. The firm's marginal cost is
- (A) \$0.25 per unit
 (B) \$4 per unit
 (C) \$5 per unit
 (D) \$15 per unit
 (E) \$100 per unit
29. A monopolist faces the demand schedule shown and has a constant marginal cost of \$5 per unit and no fixed cost. The profit-maximizing output and price are

Quantity	1	2	3	4	5
Price	\$12	\$10	\$8	\$6	\$4

- (A) 2 units at \$10
 (B) 4 units at \$6
 (C) 3 units at \$8
 (D) 1 unit at \$12
 (E) 5 units at \$4
30. The graph shows an unregulated natural monopoly. Its economic profit is



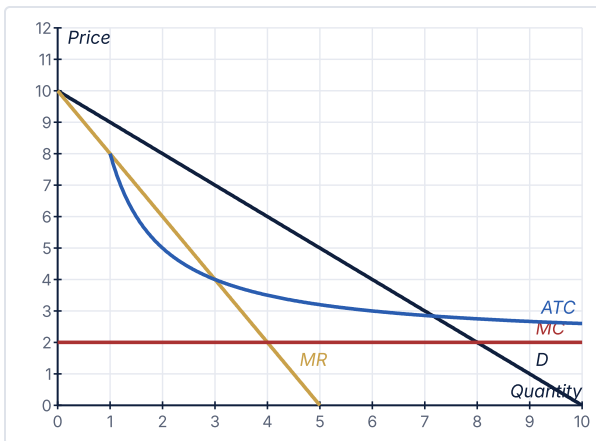
- (A) \$6
 (B) \$10
 (C) \$16
 (D) \$24
 (E) \$32

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31. The regulator of the natural monopoly in the graph requires price equal to marginal cost. At that price the firm sells 8 units. Its economic loss is



- (A) \$ 0.75 (B) \$ 6 (C) \$ 8 (D) \$ 16 (E) \$ 22
32. Which condition is necessary for a firm to practice price discrimination profitably?
- (A) The firm can prevent resale between the groups it charges different prices.
 (B) The firm faces a horizontal demand curve.
 (C) All consumers have the same elasticity of demand.
 (D) The firm's marginal cost is zero.
 (E) The firm sells its product in a perfectly competitive market.
33. Compared with a perfectly competitive industry with the same costs, a single-price monopoly will
- (A) charge a higher price and produce a lower quantity, creating a deadweight loss.
 (B) produce where price equals marginal cost.
 (C) produce the same quantity at a higher price.
 (D) charge the same price but produce less.
 (E) charge a lower price and produce a higher quantity.
34. Two firms choose whether to advertise. Payoffs (Firm X, Firm Y) in millions of dollars are shown. The Nash equilibrium is
- | | Y advertises | Y does not |
|--------------|--------------|------------|
| X advertises | 6, 2 | 9, 4 |
| X does not | 3, 7 | 5, 5 |
- (A) both firms advertise. (B) there is no Nash equilibrium.
 (C) X does not advertise and Y advertises. (D) X advertises and Y does not advertise.
 (E) neither firm advertises.
35. In a cartel, each member could earn more by secretly producing more than its quota. This is an example of
- (A) an increase in barriers to entry.
 (B) each firm having an incentive to cheat, which makes cartels unstable.
 (C) perfectly elastic demand for the cartel.
 (D) firms being price takers.
 (E) a Nash equilibrium that is also collectively optimal.
36. The market shares of nine firms are 22, 18, 14, 11, 9, 8, 7, 6, and 5 percent. The four-firm concentration ratio is
- (A) 22 percent (B) 40 percent (C) 65 percent
 (D) 74 percent (E) 100 percent

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37. A monopolistically competitive firm earns positive economic profit in the short run. What happens next?
- (A) Exit occurs, shifting each firm's demand curve right.
 - (B) Entry occurs, shifting each existing firm's demand curve left and making it more elastic until profit is zero.
 - (C) The firm's marginal cost shifts down.
 - (D) The firm's profit persists because of barriers to entry.
 - (E) The firm's demand becomes perfectly elastic and price equals marginal cost.
38. A monopolistically competitive firm has a downward-sloping demand curve yet earns zero economic profit in the long run because
- (A) barriers to entry prevent exit.
 - (B) product differentiation gives limited market power, but free entry competes the profit away.
 - (C) marginal revenue equals price.
 - (D) it chooses output where average cost is minimized.
 - (E) it is a price taker.
39. Oligopolies are characterized by
- (A) one firm with no close substitutes.
 - (B) free entry and exit with identical products.
 - (C) perfectly elastic demand for each firm.
 - (D) many firms each with no influence on the price.
 - (E) interdependence: each firm's best strategy depends on the actions of its rivals.
40. The graph shows a monopolist with demand $P = 10 - Q$ and constant marginal cost of \$2 that is able to practice perfect price discrimination. Its producer surplus (economic profit before fixed cost) is



- (A) 8 (B) 16 (C) 24 (D) 32 (E) 64

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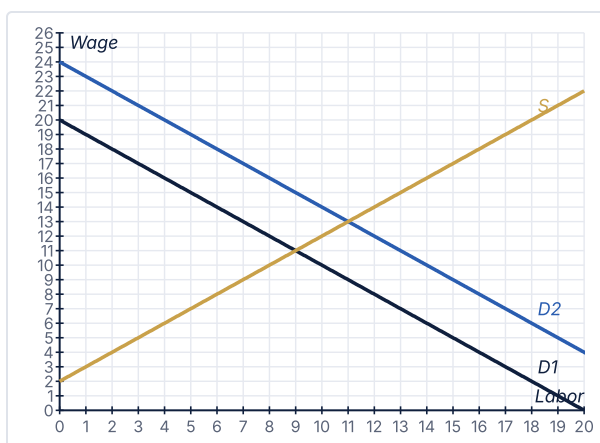
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SECTION I, PART C Multiple Choice: Questions 41-60

Choose the best answer. Questions that refer to a table or graph use the data shown.

41. Which of the following is a barrier to entry?
- (A) Product differentiation among sellers (B) A large number of buyers
(C) Large profits earned by existing firms (D) High consumer demand
(E) A government-granted patent on a medicine
42. A theater charges \$6 to senior citizens and \$10 to other adults. To maximize profit, the theater must believe that senior citizens have
- (A) higher marginal cost to the theater.
(B) the same elasticity of demand as other adults.
(C) perfectly inelastic demand.
(D) more elastic demand than other adults.
(E) less elastic demand than other adults.
43. A perfectly competitive firm sells its output at \$6 per unit and pays a wage of \$20. The marginal product of the 1st through 5th workers is 10, 8, 6, 4, and 2 units. The profit-maximizing number of workers is
- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
44. The graph shows labor demand shifting from D1 to D2 in a competitive labor market. Which event could explain this?



- (A) The government imposes a minimum wage.
(B) The price of the product the workers make rises.
(C) Workers decide to retire earlier.
(D) The number of qualified workers rises.
(E) The wage in other occupations rises.
45. Which of the following would decrease the supply of labor to the market for nurses?
- (A) An increase in hospital revenue
(B) A reduction in nursing education costs
(C) An increase in wages in other occupations that require similar skills
(D) A rise in the wage paid to nurses
(E) An increase in the demand for nurses

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46. The graph shows a monopsony labor market. Compared with a competitive labor market, the monopsonist will hire



- (A) fewer workers at a higher wage.
 (B) the same number of workers at a lower wage.
 (C) more workers at a higher wage.
 (D) fewer workers (6) at a wage of \$16.
 (E) fewer workers (6) at a lower wage (\$10).
47. In the monopsony market shown, a minimum wage of \$12 is imposed. Employment will be



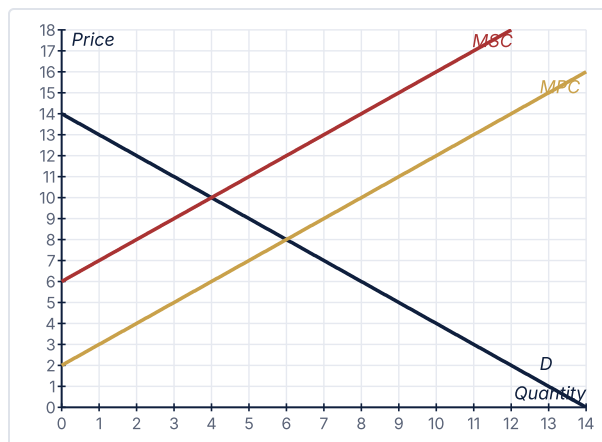
- (A) 4 (B) 6 (C) 8 (D) 10 (E) 12
48. A firm's marginal product of labor is 20 and the wage is \$5. Its marginal product of capital is 30 and the price of capital is \$10. To minimize the cost of its output, the firm should
- (A) use less of both inputs.
 (B) use more of both inputs.
 (C) keep the current mix.
 (D) use more capital and less labor.
 (E) use more labor and less capital.
49. A decrease in consumer demand for automobiles will most likely
- (A) decrease the demand for autoworkers, because labor demand is derived from product demand.
 (B) decrease the marginal product of capital to zero.
 (C) have no effect on the labor market.
 (D) increase the wage of autoworkers.
 (E) increase the supply of autoworkers.
50. The demand for labor in an industry will be more elastic when
- (A) the demand for the final product is inelastic.
 (B) there are many close substitutes for labor, such as machines.
 (C) workers have unique skills.
 (D) the time period is very short.
 (E) labor is a very small part of production cost.

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51. For a monopsonist, the marginal factor cost of labor exceeds the wage because
- (A) the firm sells in a monopoly market.
 - (B) to hire an additional worker the firm must raise the wage for all of its workers.
 - (C) the firm's marginal revenue product is higher.
 - (D) the firm must pay overtime.
 - (E) workers' marginal product rises.
52. The free-rider problem arises with public goods because
- (A) the goods are rival, so using one unit prevents others from using it.
 - (B) firms charge consumers too high a price.
 - (C) the goods are nonexcludable, so people can benefit without paying, and private firms under-provide them.
 - (D) the goods are over-consumed because they have no cost.
 - (E) public goods produce negative externalities.
53. The graph shows a market with a negative externality. The deadweight loss created by the unregulated market is



- (A) 1 (B) 2 (C) 4 (D) 6 (E) 8
54. Which of the following is a market-based policy for reducing pollution?
- (A) Requiring every firm to install the same scrubber
 - (B) Allowing firms to buy and sell pollution permits
 - (C) Setting a maximum allowable emission rate for each firm
 - (D) Banning production of the good
 - (E) Government operating the plants
55. Education provides external benefits to society. To achieve the efficient level of education, the government could
- (A) set a price ceiling on tuition.
 - (B) do nothing, because markets always produce the efficient quantity.
 - (C) ban private schools.
 - (D) pay a per-unit subsidy equal to the marginal external benefit.
 - (E) tax education by the marginal external benefit.
56. According to the Coase theorem, an externality can be resolved without government action if
- (A) the externality is negative.
 - (B) the number of parties affected is large.
 - (C) the good is a public good.
 - (D) the government sets a tax.
 - (E) property rights are well defined and the transaction costs of bargaining are low.

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57. The table shows the shares of total income received by each fifth of households. The bottom 60 percent of households receive

Quintile	Lowest	Second	Third	Fourth	Highest
Share of income	5%	10%	15%	25%	45%

- (A) 15 percent of income (B) 30 percent of income (C) 40 percent of income
(D) 55 percent of income (E) 70 percent of income
58. A tax system takes \$2,000 from a person earning \$20,000, \$7,500 from a person earning \$50,000, and \$20,000 from a person earning \$100,000. This tax is
- (A) progressive, because the average tax rate rises with income.
(B) regressive, because lower-income people pay a lower amount.
(C) proportional, because everyone pays a tax.
(D) regressive, because the amount of tax rises with income.
(E) proportional, because higher-income people pay more.
59. The table shows the marginal benefit and marginal cost of each additional unit of pollution abatement. The efficient amount of abatement is

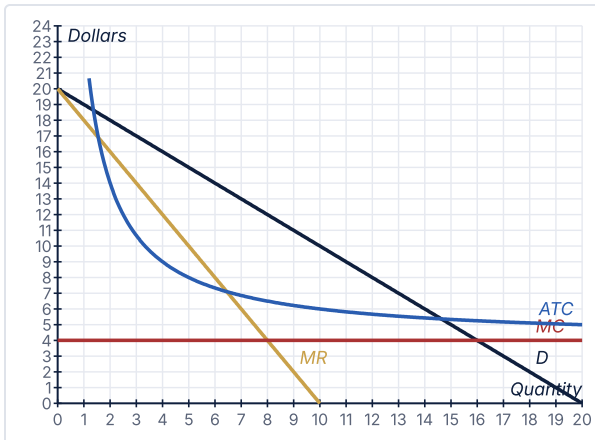
Unit abated	1	2	3	4	5
Marginal benefit	\$20	\$16	\$12	\$8	\$4
Marginal cost	\$5	\$7	\$9	\$11	\$13

- (A) 1 unit (B) 2 units (C) 3 units (D) 4 units (E) 5 units
60. In the used-car market, sellers know more about car quality than buyers. Buyers offer only an average price, so owners of high-quality cars withdraw them, and the average quality of cars for sale falls. This is an example of
- (A) adverse selection arising from asymmetric information.
(B) moral hazard.
(C) a price ceiling.
(D) a public good.
(E) a positive externality.

QUESTION 1 Monopoly and Regulation (10 points)

A monopolist faces the market demand curve $P = 20 - Q$, so its marginal revenue is $MR = 20 - 2Q$. Its total cost is $TC = 20 + 4Q$, so its marginal cost is a constant \$4 and its average total cost is $ATC = 4 + 20/Q$. The graph shows these curves.

61. (a) Determine the profit-maximizing quantity and price for the unregulated monopolist.



62. (b) Calculate the monopolist's economic profit.
63. (c) Determine the allocatively efficient quantity and calculate the deadweight loss of the unregulated monopoly.
64. (d) The government sets a price ceiling of \$8. Determine the quantity the monopolist now sells, and explain why the monopolist's output increases.
65. (e) With the \$8 price ceiling in place, calculate the monopolist's economic profit and the remaining deadweight loss.

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QUESTION 2 Hiring Labor in a Competitive Market (4 points)

A perfectly competitive firm sells its output for \$5 per unit and hires labor in a perfectly competitive labor market at a wage of \$25 per worker. The table shows its total output.

66. (a) Calculate the marginal revenue product of the 3rd worker.

Workers	1	2	3	4	5
Total output	12	22	30	36	40

67. (b) How many workers should the firm hire at a wage of \$25? Explain.
68. (c) If the wage rises to \$35, how many workers should the firm hire?
69. (d) The price of the output rises to \$7 with the wage back at \$25. How many workers should the firm hire, and what happens to the firm's demand for labor?

QUESTION 3 Oligopoly and Game Theory (4 points)

Two airlines, Air A and Air B, serve the same route and each simultaneously chooses a high fare or a low fare. The payoff matrix shows annual profits in millions of dollars (Air A, Air B).

70. (a) Does Air A have a dominant strategy? If so, identify it and explain.

	Air B high fare	Air B low fare
Air A high fare	50, 50	20, 70
Air A low fare	70, 20	35, 35

71. (b) Identify the Nash equilibrium and the profit each airline earns in it.
72. (c) Both airlines would earn more at (high, high). Explain why they are unlikely to reach that outcome in a one-time game without an enforceable agreement.
73. (d) Explain how repeating the game many times could make the high-fare outcome more likely.

Key Practice Exam 2: Answers and Explanations

Complete solutions. Free-response keys show the scoring breakdown.

E2 Practice Exam 2**SECTION I, PART A · MULTIPLE CHOICE: QUESTIONS 1-20**

- C. The slope of the line is $80/40 = 2$, so every bicycle costs 2 scooters, no matter where on the line the economy is. The other values are the intercepts or mistaken ratios.
- A. As more of one good is produced, resources less suited to it must be moved over, so each additional unit costs more of the other good. A straight line would show constant costs.
- A. A cake costs Maria 2 loaves and Jon 1.5 loaves, so Jon has the lower opportunity cost in cakes and Maria in bread (0.5 cake versus 0.67 per loaf). Gains come from comparative advantage, not from who is faster overall.
- E. The PPC shifts when the quantity or quality of resources or technology changes. Reducing unemployment moves the economy to the curve, not the curve itself, and tastes and prices do not change what is physically possible.
- A. The tickets are a sunk cost that is the same whether or not they attend, so only the marginal benefit (\$35) and marginal cost (\$20) matter. Counting the \$60 is the sunk-cost fallacy.
- D. A positive statement can be tested with evidence, even if it is wrong. The others contain value judgments such as 'should', 'unfair', 'ought', and 'deserve'.
- C. Higher income increases demand for a normal good at every price, shifting the curve right. A fall in the good's own price would be a movement along D1, and lower production costs shift supply.
- E. Falling supply and rising demand both push the price up, but supply pushes quantity down while demand pushes it up, so quantity depends on the relative sizes of the shifts.
- A. Revenue falls from $5 \times 100 = \$500$ to $4 \times 110 = \$440$, a decrease of \$60. Demand is inelastic here (the midpoint elasticity is about 0.43), and for inelastic demand a price cut reduces revenue.
- E. A specific brand has many close substitutes, so a small price rise sends buyers elsewhere. Necessities, goods with few substitutes, and low-priced items have inelastic demand.
- D. At \$14, quantity demanded is 1 and quantity supplied is 10, so the surplus is 9 units. The government pays $9 \times \$14 = \$126$. Using the quantity supplied ($10 \times \$14 = \$140$) forgets that consumers still buy 1 unit.
- C. At \$6 only 2 units are traded (quantity supplied). At $Q = 2$, the buyers' value is $16 - 4 = \$12$ and the seller's cost is \$6, so the gap is \$6. The lost units run from 2 to the efficient quantity of 4, so $DWL = 1/2 \times 6 \times 2 = 6$. The shortage of 3 is not an area.

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13. B. If sellers cannot reduce quantity supplied at all, they cannot pass any of the tax to buyers; the price buyers pay stays the same and sellers receive less.
14. D. A tariff raises the price domestic consumers pay, so quantity demanded falls and domestic producers expand, which reduces imports. Consumers lose surplus and the government gains revenue.
15. D. The new supply is $P = 1 + Q$. Setting $16 - 2Q = 1 + Q$ gives $Q = 5$, so the cost is $\$3 \times 5 = \$15$. Using the old quantity of 4 (\$12) is the usual error.
16. E. Percent change in quantity = income elasticity $\times$ percent change in income = $2.5 \times 4 = 10$ percent. Because the elasticity exceeds 1, vacations are a luxury good.
17. C. Average product = total output / workers = $36 / 4 = 9$. The value 6 is the marginal product of the 4th worker, and 36 is total product.
18. D. ATC equals total cost / output: \$100, \$65, \$50, \$45, and \$46 for 1 through 5 units. The lowest is \$45 at 4 units; the marginal cost of the 5th unit (\$50) is above ATC, so the average rises after 4.
19. E. Q^* is where $P = MC$. Price lies above AVC but below ATC, so the firm covers its variable costs and part of fixed cost; by producing it loses less than the fixed cost it would lose by shutting down. The loss is the rectangle between ATC and price at Q^* .
20. D. As more firms enter, input prices rise and cost curves shift up, so the new minimum ATC is higher. The long-run supply curve slopes upward: price is higher than before but lower than the short-run peak, and output is higher.

SECTION I, PART B · MULTIPLE CHOICE: QUESTIONS 21-40

21. E. A price taker sells any quantity at the market price, and would sell nothing at a higher price because buyers can buy the identical product elsewhere. The market demand curve itself slopes downward.
22. A. Average fixed cost = $150 / 30 = \$5$, so $ATC = \$19$ and profit per unit = \$1; profit = \$30. The value \$180 is revenue minus variable cost (contribution to fixed cost), not profit.
23. A. LRATC is at its minimum of 6 at $q = 6$. Beyond that, average cost rises with output, which defines diseconomies of scale; below 6, LRATC falls (economies of scale).
24. C. Zero economic profit means the owners earn exactly what their resources could earn elsewhere. Accounting profit equals the implicit costs and is positive, so the firm stays in the market.
25. E. Revenue (\$400) does not cover variable cost (\$450). Producing loses \$150 ($400 - 550$), while shutting down loses only the \$100 of fixed cost.
26. C. Productive efficiency means the good is made at the lowest possible cost per unit; allocative efficiency means the last unit's value to buyers (price) equals its marginal cost.
27. D. Lower demand creates losses; firms exit until price returns to minimum ATC. Each remaining firm is again at its efficient scale, so only the number of firms and total output change.
28. B. Marginal cost = wage / marginal product = $20 / 5 = \$4$ per unit. As marginal product falls, marginal cost rises.
29. A. Total revenue is \$12, \$20, \$24, \$24, and \$20, so marginal revenue is 12, 8, 4, 0, and -4. MR exceeds MC of \$5 for the 2nd unit (\$8) but not the 3rd (\$4), so produce 2 units and charge \$10.
30. B. $MR = MC$ at $Q = 4$, price \$6. ATC at 4 units is $2 + 6/4 = \$3.50$, so profit = $(6 - 3.5) \times 4 = \$10$. The value \$16 ignores fixed cost, and \$24 is total revenue.
31. B. At $Q = 8$, $ATC = 2 + 6/8 = \$2.75$ while $P = MC = \$2$, so the loss per unit is \$0.75 and the total loss is $0.75 \times 8 = \$6$.
32. A. The firm needs market power, separable groups with different elasticities, and a way to stop low-price buyers from reselling to high-price buyers.
33. A. The monopolist restricts output to where $MR = MC$ and charges the higher price on the demand curve, so units valued above their cost are not produced.
34. D. Advertising is a dominant strategy for X ($6 > 3$ and $9 > 5$). Given that X advertises, Y does better by not advertising ($4 > 2$). Neither wants to deviate from (9, 4); Y has no dominant strategy, since it prefers to advertise if X does not.
35. B. When the cartel price is above marginal cost, each member gains from selling an extra unit, but if all cheat, output rises and the price falls toward the competitive level.
36. C. The four largest firms hold $22 + 18 + 14 + 11 = 65$ percent. The value 74 percent is the five-firm ratio.
37. B. New firms offer close substitutes, taking customers away, until demand is tangent to ATC with zero profit. Demand does not become perfectly elastic, so price stays above marginal cost.
38. B. Differentiation gives each firm a downward-sloping demand curve, but free entry shifts the demand until price just equals average total cost.
39. E. With only a few firms, one firm's price or output decisions change its rivals' profits, so firms must anticipate each other's responses, which is why game theory is used.
40. D. A perfect discriminator sells each unit at the buyer's maximum price until $D = MC$ at $Q = 8$. The profit is the triangle between demand and MC: $\frac{1}{2} \times 8 \times (10 - 2) = 32$. The value 16 is the profit of a single-price monopolist.

SECTION I, PART C · MULTIPLE CHOICE: QUESTIONS 41-60

41. E. A patent legally excludes other firms from selling the product. Profits and demand attract entry; they do not block it.
42. D. The profit-maximizing markup is lower for the more price-sensitive group, which is charged the lower price.
43. D. Marginal revenue product is \$60, \$48, \$36, \$24, and \$12. The 4th worker adds \$24, which exceeds the \$20 wage; the 5th adds only \$12, so the firm hires 4.
44. B. A higher product price raises each worker's marginal revenue product, increasing labor demand. The other options affect labor supply or cause movements along the curves.
45. C. Better alternatives elsewhere lead workers to move to other occupations, shifting nurse supply left. A rise in the nurse wage causes a movement along the supply curve, and more education would shift supply right.

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46. E. The monopsonist hires where $MRP = MFC$ ($28 - 2L = 4 + 2L$, so $L = 6$) and pays the wage on the supply curve, \$10. A competitive market would hire 8 workers at \$12 where $MRP = \text{supply}$. The \$16 is the MRP at 6 workers, not the wage.
47. C. At a \$12 wage the supply curve is $4 + L = 12$, so $L = 8$, and the wage is now the marginal factor cost for all workers up to 8. MRP at 8 is $28 - 16 = \$12$, so the firm hires 8, the efficient number. Employment rises from 6 to 8.
48. E. MPL per dollar is $20 / 5 = 4$ and MPK per dollar is $30 / 10 = 3$. Labor is the better buy, so substitute labor for capital until the ratios are equal.
49. A. Firms hire labor because of the revenue its output brings, so lower product demand lowers price and MRP and shifts labor demand left.
50. B. If firms can easily replace labor with other inputs, a wage increase causes a large reduction in the quantity of labor demanded.
51. B. The upward-sloping supply curve means a higher wage is needed to attract another worker, and that higher wage applies to everyone hired, so the extra cost of the last worker is more than her wage.
52. C. When nobody can be excluded, nobody has an incentive to pay, so the market supplies too little. Governments solve this by funding provision through taxes.
53. C. The market quantity is 6 ($D = MPC: 14 - Q = 2 + Q$) and the efficient quantity is 4 ($14 - Q = 6 + Q$). At $Q = 6$ the MSC is 12 and D is 8, a gap of 4; the triangle has base $6 - 4 = 2$, so $DWL = 1/2 \times 2 \times 4 = 4$.
54. B. Tradable permits and corrective taxes use prices to guide abatement to the firms where it is cheapest. Uniform technology rules, bans, and standards are command-and-control.
55. D. With a positive externality, the market quantity is too low. A subsidy equal to the external benefit per unit raises private marginal benefit to the social marginal benefit.
56. E. When rights are clear and bargaining is cheap, the affected parties can negotiate to the efficient outcome regardless of who initially holds the right. Many parties raise transaction costs.
57. B. Add the shares of the bottom three quintiles: $5 + 10 + 15 = 30$ percent. That point (60, 30) lies on the Lorenz curve, well below the line of equality (60, 60).
58. A. Average rates are 10 percent, 15 percent, and 20 percent, which rise with income, so the tax is progressive. Paying a larger amount does not make a tax progressive; the rate must rise.
59. C. Abate while marginal benefit is at least marginal cost. The 3rd unit has $MB \$12 > MC \$9$, but the 4th unit has $MB \$8 < MC \$11$, so the efficient amount is 3.
60. A. Adverse selection occurs before a transaction when one side has hidden information, driving the best sellers out. Moral hazard is risky behavior after a contract is signed.

QUESTION 1 · MONOPOLY AND REGULATION (10 POINTS)

61. 2 points. 1 point: sets $MR = MC$, $20 - 2Q = 4$, so $Q = 8$. 1 point: reads the price from the demand curve, $P = 20 - 8 = \$12$ (not \$4, which is MC).
62. 2 points. 1 point: ATC at 8 units $= 4 + 20/8 = \$6.50$ (or $TC = 20 + 32 = \$52$). 1 point: profit $= (12 - 6.50)(8) = \$44$ (or $TR 96 - TC 52 = \$44$). Model graph: the rectangle between price \$12 and ATC \$6.50 out to $Q = 8$.
63. 2 points. 1 point: the efficient quantity is where $P = MC$: $20 - Q = 4$, so $Q = 16$. 1 point: $DWL = 1/2 \times (16 - 8) \times (12 - 4) = \$32$. Model graph: the triangle bounded by demand, MC , and the quantity 8.
64. 2 points. 1 point: at \$8 the quantity demanded is 12, and the firm sells 12 units. 1 point: the ceiling makes MR equal to \$8 for every unit up to 12 (the firm can no longer lower price to sell more and cannot charge more), and \$8 exceeds MC of \$4, so each unit up to 12 adds profit; MR returns to the demand-based MR only after 12, where it is below MC .
65. 2 points. 1 point: profit $= TR - TC = 8(12) - (20 + 4 \times 12) = 96 - 68 = \$28$, down from \$44. 1 point: $DWL = 1/2 \times (16 - 12) \times (8 - 4) = \$8$, down from \$32, because output is closer to the efficient quantity.

QUESTION 2 · HIRING LABOR IN A COMPETITIVE MARKET (4 POINTS)

66. 1 point: the marginal product of the 3rd worker is $30 - 22 = 8$ units, so $MRP = 8 \times \$5 = \$40$.
67. 1 point: MRP of the 1st through 5th workers is \$60, \$50, \$40, \$30, and \$20. The firm hires while MRP is at least the wage, so it hires 4 workers ($MRP \$30 \geq \$25$) and not the 5th ($\$20 < \$25$). Equivalently, it hires until $MRP = \text{wage}$.
68. 1 point: with a \$35 wage the 3rd worker's MRP of \$40 still exceeds the wage but the 4th worker's \$30 does not, so the firm hires 3 workers.
69. 1 point: MRP becomes \$84, \$70, \$56, \$42, and \$28, all above \$25, so the firm hires 5 workers. The higher output price increases MRP at every quantity of labor, so the firm's labor demand curve shifts to the right (an increase in demand).

QUESTION 3 · OLIGOPOLY AND GAME THEORY (4 POINTS)

70. 1 point: yes, the low fare is dominant for Air A, because it earns $70 > 50$ if B charges high and $35 > 20$ if B charges low.
71. 1 point: both airlines choose the low fare, a Nash equilibrium in which each earns \$35 million; neither can gain by changing its fare alone (A would fall to 20 and B would fall to 20).
72. 1 point: if one airline expects the other to charge a high fare, it can earn more (70 instead of 50) by cutting its fare, and each airline fears being undercut and earning only 20. Because each has an incentive to cheat, the high-fare outcome is not stable (prisoner's dilemma).
73. 1 point: in a repeated game a firm that cheats can be punished in later rounds by a price war (for example tit-for-tat), and the loss from retaliation can outweigh the one-period gain from undercutting, so cooperation can be sustained.

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