Chief Reader Report on Student Responses:

2025 AP® Microeconomics Free-Response Questions

- Number of Students Scored 118,022
- Number of Readers 209
- Score Distribution

Exam Score	N	%At
5	25,405	21.5%
4	28,292	24.0%
3	26,693	22.6%
2	23,975	20.3%
1	13,657	11.6%

- Global Mean 3.24

The following comments on the 2025 free-response questions for AP® Microeconomics were written by the Chief Reader James Leady, Teaching Professor, University of Notre Dame; Assistant Chief Reader Peter Duffer, Buffalo Grove High School; Exam Leader Lindsey Nagy, Associate Professor, Muhlenberg College; and Question Leaders Jaymily Solano, Seminole High School; James Brumbaugh, Professor of Economics, Laurel Ridge Community College; and Tamra Carl, York Community High School. They give an overview of each free-response question and of how students performed on the question, including typical student errors. General comments regarding the skills and content that students frequently have the most problems with are included. Some suggestions for improving student preparation in these areas are also provided. Teachers are encouraged to attend a College Board workshop to learn strategies for improving student performance in specific areas.

Question 1

Task: Graph, Assert, Calculate, Explain
Topic: Perfect Competition, The Effects of Government Intervention in Markets, Long-Run Production Costs

	Max Points:	Mean Score:
Point 1	1	0.73
Point 2	1	0.48
Point 3	1	0.57
Point 4	1	0.61
Point 5	1	0.31
Point 6	1	0.63
Point 7	1	0.08
Point 8	1	0.36
Point 9	1	0.74
Point 10	1	0.48

Overall Mean Score: 5.0

What were the responses to this question expected to demonstrate?

The question assessed understanding of how a firm in a perfectly competitive market would maximize profit in the long run, how the firm adjusts the profit-maximizing quantity given an increase in fixed costs, and how an increase in production would affect the firm's long-run average total cost. The question also assessed understanding of how the government affects the market when it grants a per-unit subsidy to producers and when it imposes a binding price floor.

The question stated that Deskward is a typical profit-maximizing firm that produces and sells wooden desks in a constant-cost, perfectly competitive market that is in long-run equilibrium.

Part A asked to draw correctly labeled side-by-side graphs for the wooden desk market and for Deskward. The first point in the graph for part A required showing the equilibrium price labeled P_M and equilibrium quantity labeled Q_M on the market graph. The second and third points in the graph for part A required showing the firm's profit-maximizing price and quantity labeled P_F and Q_F, respectively. These parts of the question assessed knowledge of market conditions for perfect competition and the ability to illustrate these concepts using a graph. The fourth point in the graph for part A asked to draw an average total cost curve, labeled ATC, consistent with long-run equilibrium.

Part B asked to explain what would happen to Deskward's profit-maximizing quantity in the short run given an increase in monthly rent—a fixed cost. This task required demonstrating knowledge that a change in a fixed cost does not affect the firm's marginal cost nor marginal revenue and therefore has no effect on the firm's profit-maximizing quantity or price.

Part C stated that the government was considering granting a per-unit subsidy to wooden desk producers. Part C (i) asked to show the effect of the per-unit subsidy on the market graph from part A. This part assessed the knowledge that a per-unit subsidy to producers increases the supply, thus shifting the supply curve to the right, resulting in a lower price and a greater quantity. Part C (ii) asked to shade the area representing the total cost of the subsidy to the government. This task assessed knowledge of evaluating the effect of the subsidy on the price producers will receive and the price consumers will pay.

Part D stated that the government imposes a binding price floor in the market for wooden desks instead of the per-unit subsidy. Part D asked to determine and explain if the price floor would result in a shortage of wooden desks, a surplus of wooden desks, or neither. This task required demonstrating knowledge of the effect of a binding price floor on a market.

Part E stated that Deskward also produces chairs and that when Deskward increased production from 500 to 600 chairs, long-run total costs increased from $80,000 to $108,000. Part E (i) asked to calculate Deskward's long-run average total cost (LRATC) of producing 500 chairs and to show the work. Part E (ii) asked to explain using numbers whether Deskward was experiencing economies of scale, diseconomies of scale, or the efficient scale. This part assessed knowledge of how changes in costs relate to the firm's scale of production in the long run.

How well did the responses address the course content related to this question? How well did the responses integrate the skill(s) required on this question?

In part A 73% of responses earned point 1 for drawing a correctly labeled market graph with a downward-sloping demand curve, an upward-sloping supply curve; the market equilibrium price, labeled P_M, and the market equilibrium quantity, labeled Q_M. For point 2 in the graph for part A, 48% of responses showed a horizontal demand curve, labeled d = MR, extended from the market price, P_M, and labeled the firm's price P_F. For point 3 in the graph for part A, 58% of responses showed a rising MC curve and Deskward's profit-maximizing quantity, labeled Q_F, where MR = MC. For point 4 in the graph for part A, 61% of responses showed the ATC curve tangent to Deskward's d = MR curve at Q_F and showed the MC curve passing through the minimum point of the ATC curve.

In part B 31% of responses earned point 5 for stating that Deskward's profit-maximizing quantity would not change in the short run and explaining that a change in a fixed cost would not affect the firm's marginal cost or marginal revenue.

In part C (i) 63% of responses earned point 6 showing a rightward shift of the market supply curve and showed the new market equilibrium price, labeled P* and the new market equilibrium quantity, labeled Q*. In part C (ii) 8% of responses earned point 7 for shading the area representing the total cost of the subsidy to the government.

In part D 36% of responses earned point 8 for stating there will be a surplus of wooden desks and explaining that the binding price floor is set above the market equilibrium price, which causes the quantity supplied of wooden desks to be greater than the quantity demanded of wooden desks.

In part E (i) 75% of responses earned point 9 for calculating Deskward's long-run average total cost as $160 per chair and showing the work. In part E (ii) 48% of responses earned the point for stating Deskward experiences diseconomies of scale and explaining that when output increases from 500 to 600 chairs, the LRATC increases from $160 to $180 per chair.

What common student misconceptions or gaps in knowledge were seen in the responses to this question?

Common Misconceptions/Knowledge Gaps	*Responses that Demonstrate Understanding*
Part A Point 1 • Using hash marks on the axis instead of dotted lines extending to the axes to indicate equilibrium price and quantity • Labeling the firm's information on the market graph • Missing a supply or demand curve label, or both labels • Switching supply and demand curve labels	• Drawing a market graph with downward-sloping demand curve labeled as D and an upward-sloping supply curve labeled as S, and indicating the equilibrium price and quantity along their respective axes, labeled as P_M and Q_M
Part A Point 2 • Missing the firm's horizontal d = MR curve label • Labeling the firm's horizontal d = MR curve as MRDARP (without commas or equal signs) • Missing the extension between the market price P_M on the market graph and the firm's price P_F on the firm graph • Drawing a firm with market power (downward-sloping D and MR curves) • Missing the MR label	• Drawing and labeling a horizontal d = MR curve extended from the market graph price P_M and labeling P_F on the vertical axis
Part A Point 3 • Missing the MC label	• Drawing an upward-sloping MC curve • Identifying the profit-maximizing quantity labeled as Q_F where MR = MC

Part A Point 4 • Drawing the ATC curve below or above the d = MR curve • Drawing the ATC curve without the MC curve passing through the minimum point of ATC • Missing the ATC label	• Drawing the ATC curve tangent to the d = MR curve at Q_F with MC passing through the minimum point of ATC
Part B Point 5 • Asserting that the profit-maximizing quantity will increase or decrease • Explaining only that MR does not change	• Stating that the profit-maximizing quantity will not change and explaining that a change in a fixed cost does not affect a firm's MC nor MR
Part C (i) Point 6 • Drawing a rightward demand curve shift • Drawing a leftward supply curve shift • Missing new equilibrium labels of P*, Q*, or both labels • Shifting the firm's MC curve without shifting the market supply curve • Missing the new supply curve label and/or a directional arrow showing the shift	• Drawing a rightward market supply curve shift with the new equilibrium price and quantity, labeled P* and Q* respectively • Showing P* below P_M to demonstrate that a per-unit subsidy received by producers would lower the market price for consumers
Part C (ii) Point 7 • Shading only the area between P* to P_M and over to Q* • Shading only the area above P_M and over to Q*	• Shading the area representing the cost of the subsidy to the government, which is the area between the original price (P_M) and the new price (P* = P_M + subsidy), extending horizontally to the equilibrium quantity (Q*)

Part D Point 8 • Asserting a shortage or neither • Explaining supply will increase and demand will decrease (which indicates a shift in the curves) • Identifying the effect of the binding price floor on either quantity supplied or quantity demanded independently, without drawing a comparison between the two quantities	• Stating a surplus and explaining that a binding price floor results in a higher price leading to quantity supplied exceeding quantity demanded
Part E (i) Point 9 • Calculating the change in total cost	• Calculating the LRATC as $160 and showing the work: LRATC = $80,000 / 500 = $160
Part E (ii) Point 10 • Asserting economies of scale or the efficient scale • Incorrectly calculating the increase in LRATC as $280 from finding the change in total cost • Missing the explanation that the LRATC increases from $160 to $180 per chair	• Stating Deskward experiences diseconomies of scale and explaining that when their output increases from 500 to 600 chairs, the LRATC increases from $160 to $180 per chair

Based on your experience at the AP® Reading with student responses, what advice would you offer teachers to help them improve the student performance on the exam?

The perfect competition model and its accompanying graphs are an important market structure model for students to understand. Students should know how to draw correctly labeled side-by-side graphs of the market and the firm showing the cost and revenue curves corresponding to whether the firm is in long-run equilibrium earning zero economic profit or in short-run equilibrium earning positive or negative economic profit.

Teachers are encouraged to not only model but require students to practice drawing the perfect competition model. Students should illustrate that a perfectly competitive firm is a price taker by showing on the side-by-side graphs the firm's horizontal demand curve reflecting the firm's price, P_F, extended from the market price established in the market graph. Responses that missed point 2 in the graph for part A frequently did not correctly label the firm's demand curve as d = MR or did not make a connection between the d = MR curve and the market price. It is easier to make the connection when the market graph is on the left side of the page and the firm graph is on the right side of the page. Students also need to make a clear distinction when labeling the firm's curves. "MRDARP" is not an acceptable label. "MR = d = AR = P_F" is acceptable, yet to earn the point, P_F should be labeled on the vertical axis. Responses that missed point 4 in the graph for part A typically showed the incorrect relationship between MC and the ATC minimum by having multiple minimum points tangents to d = MR. There needs to be an emphasis on graphing a rising marginal cost curve passing through one clear minimum point of the average total cost curve.

Teachers are encouraged to emphasize that a change in a firm's profit-maximizing quantity requires a change in MC or MR. It would be beneficial to review the connection of total fixed costs and total variable costs to the different types of average costs and the marginal cost. Responses that missed point 5 in part B did not correctly explain the reason behind why the profit-maximizing quantity remained the same when a fixed cost changed. Students generally understood the effect of the increase in the fixed cost on the average total cost. However, many students were unable to explain that a change in a fixed cost does not affect the marginal cost nor marginal revenue.

Teachers often provide students with ample opportunities to practice showing the effect of a per-unit tax. However, it is equally important to review and model how a per-unit subsidy affects the market and identify the total cost to the government of granting the subsidy. Responses that missed point 6 in part C (i) incorrectly shifted the supply curve leftward and shaded in the area representing the tax revenue the government would collect. Those responses that showed the correct rightward shift of the market supply curve as a result of the per-unit subsidy but missed point 7 in part C (ii) had difficulty in shading the correct area representing the total cost of the subsidy to the government, typically shading only the top portion or the bottom portion of the total cost of the subsidy to the government.

Teachers are encouraged to frequently remind students of the differences in terminology between demand (supply) and quantity demanded (quantity supplied). Responses that missed point 8 in part D had difficulty with the economic terminology when describing the surplus. Many responses incorrectly stated the supply would be greater than the demand or that the higher price causes the demand to decrease and the supply to increase.

It would also be beneficial for teachers to revisit the topics of long-run production and long-run costs when working with perfect and monopolistic competition models. Additionally, teachers should be modeling and providing students with practice on how to calculate average costs. Most of the responses that missed point 9 in part E (i) calculated the change in total cost or did not show the work for the correct final answer. For point 10 in part E (ii), most responses asserted that the firm was experiencing diseconomies of scale when the firm's average total cost increased as it increased the production of chairs but missed the point for not providing the correct explanation using numbers. Students often confuse economies of scale with returns to scale; providing a clear distinction between the two concepts will be beneficial for students.

A general recommendation to teachers is to encourage students to consider all the information that is provided in the stem of the question and to provide students with the opportunity to review each piece of information and determine what is relevant. It would be helpful to allow students to practice reviewing previous free-response questions available for use.

What resources would you recommend to teachers to better prepare their students for the content and skill(s) required on this question?

Teachers are encouraged to sign in to AP Classroom to access AP Daily videos and find questions on the topics and skills addressed in this question. AP teachers can also use the AP Question Bank in AP Classroom to enable students to practice and receive feedback on formative topic questions and past AP Exam questions.

Knowledge of the following topics is essential to correctly answer the question:

- Topic 2.1: Demand
- Topic 2.2: Supply
- Topic 2.6: Market Equilibrium and Consumer and Producer Surplus
- Topic 2.7: Market Disequilibrium and Changes in Equilibrium
- Topic 2.8: The Effects of Government Intervention in Markets
- Topic 3.2: Short-Run Production Costs
- Topic 3.3: Long-Run Production Costs
- Topic 3.5: Profit Maximization
- Topic 3.7: Perfect Competition

Question 2

Task: Assert, Explain, Calculate
Topic: Monopsonistic Markets, Changes in Factor Demand and Factor Supply, The Effects of Government Intervention in Different Market Structures

	Max Points:	Mean Score:
Point 1	1	0.81
Point 2	1	0.51
Point 3	1	0.41
Point 4	1	0.35
Point 5	1	0.61

Overall Mean Score: 2.69

What were the responses to this question expected to demonstrate?

The question assessed understanding of monopsony in the labor market by providing a monopsony graph for Quartz Excavations, the only employer of miners in a small town. The question assessed understanding of how the imposition of a minimum wage and a change in the demand for a product would affect the firm's hiring decisions.

Part A asked to identify the profit-maximizing number of miners to hire. This part required demonstrating knowledge of a monopsony's profit-maximization rule for hiring miners from a labor market, where marginal revenue product (MRP) equals marginal factor cost (MFC).

Part B asked to state whether the wage rate for the profit-maximizing number of miners was equal to $15, greater than $15, or less than $15, and to explain the answer using numbers. This part assessed knowledge that the wage rate is determined by the supply of labor curve.

Part C asked to calculate the total wage bill for Quartz Excavations when the government sets a $25 minimum wage and to show the work. This task required demonstrating knowledge of how this binding price floor affects the number of miners hired by using the MRP curve on the graph to identify the number of hired miners and knowledge of calculating the total wage bill.

Part D stated that instead of the minimum wage, there is now an increase in the demand for quartz. Part D (i) asked to state and explain whether the marginal revenue product of miners will increase, decrease, or remain the same. This task required understanding that MRP is the product of marginal revenue (MR) and marginal product (MP), MRP = MR × MP, and explaining the effect of the increase in the price of the product on MR and MRP. Part D (ii) asked if the marginal factor cost of the last miner hired after the demand for quartz increased is greater than, less than, or equal to the marginal factor cost before the demand for quartz increased. This part required recognizing that a rightward shift of the MRP curve would result in an increase in the quantity of miners hired at the new intersection of MRP and MFC curves and that at the higher quantity of miners, the MFC of the last miner hired would be greater.

How well did the responses address the course content related to this question? How well did the responses integrate the skill(s) required on this question?

In Part A 81% of responses earned point 1 for stating the profit-maximizing number of miners to hire is 4 miners.

In part B 51% of responses earned point 2 for stating that the wage rate at the profit-maximizing quantity of workers was less than $15 and explaining that the wage rate was $10 on the supply of labor curve at that quantity.

In part C 41% of responses earned point 3 for calculating the total wage bill as $50 and showing the work.

In part D (i) 35% of responses earned point 4 for stating MRP increased and explaining that the increase in demand for quartz increases the price and the marginal revenue for quartz. In part D (ii) 61% of responses earned point 5 for stating that after the increase in demand for quartz, the MFC of the last miner hired is greater than the MFC of the last miner hired before the increase in demand for quartz.

What common student misconceptions or gaps in knowledge were seen in the responses to this question?

Common Misconceptions/Knowledge Gaps	*Responses that Demonstrate Understanding*
Part A Point 1 • Using the incorrect equilibrium (S = MRP) for finding the profit-maximizing quantity of miners	• Stating that the profit-maximizing number of miners is 4 (where MRP=MFC)
Part B Point 2 • Not using the supply of labor curve to find the wage rate	• Stating that Quartz Excavations will pay a wage rate that is less than $15 and explaining that the wage rate paid by a monopsonist is determined by the supply of labor at the quantity of labor hired
Part C Point 3 • Not understanding that a minimum wage will affect the number of miners hired • Not understanding that a minimum wage set above the current wage rate will change the wage rate	• Using the correct number of miners (2) and the correct wage rate ($25) in the calculation of the total wage bill

Part D (i) Point 4 • Explaining with marginal revenue instead of marginal revenue product when making the assertion • Explaining with the profit-maximization rule in the product market (MR = MC) • Stating that the marginal product of labor increased • Incorrectly stating that MRP = MR × P	• Demonstrating economic causation. For example, "The demand for quartz increased, causing the product price to increase and MR to increase. The increase in MR increased MRP which caused demand for labor to increase."
Part D (ii) Point 5 • Stating that MFC increased and production cost "stays the same" • Using MR and MC in the assertion	• Stating that the MFC of the last worker hired is now greater than the last minor hired before the demand for quartz increased

Based on your experience at the AP® Reading with student responses, what advice would you offer teachers to help them improve student performance on the exam?

Teachers should emphasize how firms make decisions using marginal analysis and include examples of factor markets. Students should be able to calculate, identify, and explain their assertions using economic concepts. Additional practice using economic terminology may help students better articulate their reasoning.

Students made two common errors that reflected a misunderstanding of monopsony markets. The first was not recognizing that the hiring firm had market power due to the presence of an MFC curve above the supply of labor curve, and the second was incorrectly determining the wage rate based on the MRP curve. Teachers are encouraged to review monopsony, practice monopsony graphs, highlight the differences between monopsonistic and perfectly competitive labor markets, and explain to students that the wage rate is determined by the supply of labor curve.

Teachers should use examples with tables and graphs to show students how to calculate the wage bill with and without a minimum wage. Teachers should emphasize the effect of government policies (e.g., minimum wages) on the firm's hiring decisions.

Teachers should reinforce the chain of reasoning using precise economic terminology. It is important to review the connections between the labor market and the product market, emphasizing the effects of changes in product demand on labor demand through changes in price, MR, and MRP.

Additionally, teachers should emphasize that MFC is a production cost, and it is a proper term to describe marginal terminology in factor markets. Having students explain this verbally in class will increase their comfort with these relatively new terms when first being introduced to factor markets.

What resources would you recommend to teachers to better prepare their students for the content and skill(s) required on this question?

Teachers are encouraged to sign in to AP Classroom to access AP Daily videos and find questions on the topics and skills addressed in this question. AP teachers can also use the AP Question Bank in AP Classroom to enable students to practice and receive feedback on formative topic questions and past AP Exam questions.

Knowledge of the following topics is essential to correctly answer the question:

- Topic 5.2: Changes in Factor Demand and Factor Supply
- Topic 5.3: Profit-Maximizing Behavior in Perfectly Competitive Factor Markets
- Topic 5.4: Monopsonistic Markets
- Topic 6.4: The Effects of Government Intervention in Different Market Structures

Question 3

Task: Assert, Calculate, Explain
Topic: Marginal Analysis and Consumer Choice, Other Elasticities

	Max Points:	Mean Score:
Point 1	1	0.65
Point 2	1	0.63
Point 3	1	0.91
Point 4	1	0.29
Point 5	1	0.36

Overall Mean Score: 2.85

What were the responses to this question expected to demonstrate?

This question assessed understanding and analyzing consumer behavior in identifying the optimal consumption bundle of Lucy using a provided table with the marginal utility gained from consuming additional units of either Good X or Good Y. The question assessed knowledge of calculating total utility and how consumption choices are affected by prices given a limited budget. The question also assessed understanding of the relationship between two goods based on their cross-price elasticity.

Part A asked how many units of each good will maximize Lucy's utility when the two goods are free. This task required knowledge that a rational consumer would only consume quantities of each good that had a positive marginal utility.

Part B asked to calculate Lucy's total utility when she consumes 2 units of Good X and 2 units of Good Y and to show the work. This task assessed knowledge that total utility is the sum of marginal utilities of the units consumed.

Part C introduced the price of Good X as $2, the price of Good Y as $4, and Lucy's budget as $20. Part C (i) asked to assert how many units of Good Y Lucy could purchase if 2 units of Good X are purchased with her limited budget of $20. This task assessed understanding a budget constraint. Part C (ii) asked to assert and explain the optimal quantities of Good X and Good Y at the prices of $2 and $4, respectively, using marginal analysis and numbers. This task required the understanding of marginal analysis.

Part D stated the price elasticity of demand for Good X was −2.0, the price elasticity of demand for Good Y was −0.8, and the cross-price elasticity of demand between Good X and Good Y was +1.6. Part D asked to assert and explain if Goods X and Y are complementary goods, substitute goods, normal goods, or inferior goods. This task required understanding the type of good using the price elasticity of demand, cross-price elasticity, and income-elasticity of demand.

How well did the responses address the course content related to this question? How well did the responses integrate the skill(s) required on this question?

In part A 65% of responses earned point 1 for stating that Lucy will maximize her total utility by consuming 5 units of Good X and 4 units of Good Y.

In part B 63% of responses earned point 2 for calculating total utility as 88 utils and showing the work.

In part C (i) 91% of responses earned point 3 for calculating the quantity of Good Y that would be purchased as 4 units and showing the work. In part C (ii) 29% of responses earned point 4 for stating 4 units of Good X and 3 Units of Good Y and explaining that the MU/P spent on the last unit of Good X is 4 utils/$ (=8 utils/$2) and the MU/P spent on the last unit of Good Y is 4 utils/$ (=16/$4) when Lucy spends her entire budget.

In part D 36% of responses earned point 5 for stating that Good X and Good Y are substitutes and explaining that the cross-price elasticity of demand is positive because an increase (a decrease) in the price of Good X will increase (decrease) the demand and therefore the quantity demanded of a substitute good, Good Y.

What common student misconceptions or gaps in knowledge were seen in the responses to this question?

Common Misconceptions/Knowledge Gaps	*Responses that Demonstrate Understanding*
Part A Point 1 • Stating 1 unit of Good X because it is the unit with the highest marginal utility for Good X and 1 unit of Good Y because it is the unit with the highest marginal utility for Good Y	• Stating 5 units of Good X, 4 units of Good Y
Part B Point 2 • Adding 16 + 24 to calculate the total utility of the second unit of Good X and the second unit of Good Y • Showing 2 × (16 + 24) to calculate the total utility of the second unit of Good X and the second unit of Good Y	• Stating that the total utility from consuming 2 units of Good X and 2 units of Good Y = 36 utils + 52 utils = 88 utils
Part C (i) Point 3 • Using the price of $4 for Good X and the price of $2 for Good Y when Lucy spends her entire budget	• Stating 4 units of Good Y and showing 2($2) + Y($4) = $20

Part C (ii) Point 4 • Calculating the combination that spends Lucy's entire budget without using marginal analysis; 4($2) + 3($4) = $20 • Not clearly labeling calculated values that represent the MU/P for each good • Comparing the MU for each unit of each good and describing the sequence that each additional unit is purchased based on which good would generate the greater MU for the next unit until the budget is exhausted	• Stating 4 units of Good X and 3 Units of Good Y and explaining that the MU/P spent on the last unit of Good X is 4 utils/$ (=8 utils/$2) and the MU/P spent on the last unit of Good Y is 4 utils/$ (=16/$4) when Lucy spends her entire budget
Part D Point 5 • Stating that Good X and Good Y are complementary goods because the cross-price elasticity of demand is positive • Explaining that Good X and Good Y are normal and inferior goods because the price elasticity of demand for each is negative	• Stating that Good X and Good Y are substitute goods and explaining that the cross-price elasticity of demand is positive because an increase (a decrease) in the price of Good X will increase (decrease) the demand and therefore the quantity demanded of a substitute good, Good Y

Based on your experience at the AP® Reading with student responses, what advice would you offer teachers to help them improve student performance on the exam?

When teaching marginal analysis and consumer choice, teachers are encouraged to emphasize the distinction between marginal utility and total utility. Total utility is the cumulative sum of marginal utilities across units consumed. When discussing consumption of a free good, teachers should guide students to look beyond the high marginal utility of the first unit and understand that a rational consumer will continue to consume additional units only as long as the marginal utility remains positive. Once marginal utility becomes negative, consumption will decrease total utility, and a rational consumer would not consume at that point.

Teachers are encouraged to not only model but also have students practice calculating total utility by having a table with a marginal utility column and have students add a total utility column. Teachers should continue to have students exhaust the budget when explaining the optimal combination of goods.

Teachers should emphasize with students using marginal analysis and numbers to explain the optimal combination of goods which involves comparing the marginal utility per dollar (MU/P) across goods and allocating spending to maximize total utility within a budget constraint. When calculating the MU/P of each good, teachers should model and have students practice creating an additional MU/P column for each good on the table because this marginal analysis is needed to explain the consumer's optimal quantities. It would be beneficial to explain how additional units are purchased in the order that generates the higher MU/P and to model circling the MU/P that are equal for the final unit of each good purchased. In addition, when students find MU/P that are equal for each good, students should use the budget constraint to confirm that the budget is fully spent.

Teachers are encouraged to review the different types of price elasticities and the interpretation of each. Teachers could model and have students practice by creating a table with one of the two goods labeled "Good A" so there is no obvious connection between the two goods. Reinforcing the relationship between a change in the price of one good causing a change in demand for the other good is helpful in seeing that these changes are either both increasing or decreasing, which entails a positive cross-price elasticity of demand for substitute goods. It is also helpful to remind students that there needs to be a change in income for students to determine if a good is normal or inferior.

What resources would you recommend to teachers to better prepare their students for the content and skill(s) required on this question?

Teachers are encouraged to sign in to AP Classroom to access AP Daily videos and find questions on the topics and skills addressed in this question. AP teachers can also use the AP Question Bank in AP Classroom to enable students to practice and receive feedback on formative topic questions and past AP Exam questions.

Knowledge of the following topics is essential to correctly answer the question:

- Topic 1.5: Cost-Benefit Analysis
- Topic 1.6: Marginal Analysis and Consumer Choice
- Topic 2.3: Price Elasticity of Demand
- Topic 2.5: Other Elasticities