Chief Reader Report on Student Responses:

2023 AP® Microeconomics Set 1

Free-Response Questions

- Number of Students Scored 94,772
- Number of Readers 135
- Score Distribution

Exam Score	N	%At
5	20,225	21.34
4	24,625	25.98
3	19,566	20.65
2	18,860	19.90
1	11,496	12.13

- Global Mean 3.25

The following comments on the 2023 free-response questions for AP® Microeconomics were written by the Chief Reader Aaron Lowen, Professor of Economics, Grand Valley State University; Assistant Chief Reader Peter Duffer, Buffalo Grove High School; Exam Leader Gerald Simons, Professor of Economics, Grand Valley State University; 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, Explain, and Calculate
Topic: Monopoly, Efficiency, Factor Markets
Max Score: 10
Mean Score: 5.93

What were the responses to this question expected to demonstrate?

The question assessed students' understanding of how a monopoly would maximize profit in the short run, the appropriate policy to improve allocative efficiency, and the effect of a change in market demand on marginal revenue and the profit-maximizing quantity of output. The question also assessed students' understanding of a perfectly competitive labor market, the effects of labor supply changes on the market equilibrium, and how to solve for the wage rate using the cost minimization formula.

The question stated that "RKB is a profit-maximizing monopoly that produces a new patented device. RKB is earning positive economic profit." In part (a) students were asked to draw a correctly labeled graph for a monopoly earning positive economic profit. Part (a)(i) and (a)(ii) asked students to show the profit-maximizing quantity and price, respectively. The question tested students' knowledge of market conditions for a monopoly and their ability to illustrate these concepts using a graph. This task required demonstrating knowledge of revenue and cost conditions by drawing a downward-sloping demand curve (D), a downward-sloping marginal revenue curve (MR) that lies below the demand curve, and by drawing the marginal cost (MC) curve. Students were required to show that the profit-maximizing quantity (Q_M) occurs where MR equals MC and that the profit-maximizing price (P_M) is determined by identifying the price that corresponds to this quantity on the demand curve. These tasks required students to demonstrate marginal analysis in a graphical format. Part (a)(iii) asked students to draw the average total cost (ATC) curve consistent with the given positive economic profit condition by having the ATC curve below P_M at Q_M and with the rising MC curve passing through the minimum point of the ATC curve. Part (a)(iv) asked students to completely shade the area of deadweight loss. This task required students to demonstrate their understanding that deadweight loss exists as the area from Q_M, between MC and D, to where MC = D.

Part (b) of this question introduced students to various ways of regulating the monopolist. Students were asked to state whether a binding price ceiling, a binding price floor, a per-unit tax, or a lump-sum tax could be used to produce the allocatively efficient quantity. This task required students to demonstrate knowledge that a binding price ceiling, at the price where D = MC, would incentivize the monopolist to produce the allocatively efficient quantity.

Part (c) of this question redirected students to consider that if, instead of government regulations, consumers realize that the device harms the users' vision. Students were asked to determine what would happen to the profit-maximizing quantity of the monopolist. This task required students to state the profit-maximizing quantity would decrease and explain that the D and MR curves would decrease, causing the MR curve to intersect MC at a lower quantity.

Part (d) of the question stated, "Assume that RKB hires workers in a perfectly competitive labor market." In part (d)(i) students were asked to draw a correctly labeled perfectly competitive labor market, requiring them to draw a downward-sloping demand for labor (D_L) curve, an upward-sloping supply of labor (S_L) curve, and the equilibrium wage and quantity labeled W_E and Q_E, respectively. This part of the question tested students' knowledge of the factor market and their ability to illustrate this concept with a graph.

In part (d)(ii) students were told that immigration increased the number of workers and were asked to graph the change. This task required students to illustrate that the S_L curve will increase (shift right) and cause the new equilibrium wage, labeled as W_2, to lie below W_E, and the new equilibrium quantity, labeled as Q_2, to be to the right of Q_E. In part (d)(iii) students were provided with the marginal product of the last unit of capital (MP_K) and the marginal product of the last unit of labor (MP_L). Students were also provided with the rental rate of capital. Students were directed to consider that the firm uses the optimal combination of capital and labor and were then directed to calculate the wage rate and show their work. This task required students to set up the cost minimization equation correctly and to calculate the wage rate as $200.

How well did the responses address the course content related to this question? How well did the responses integrate the skills required on this question?

In part (a) 67% of students earned the point for drawing a correctly labeled graph of a monopoly showing downward-sloping demand and marginal revenue curves with the MR curve below the D curve. In part (a)(i) 70% of students earned the point for identifying the profit-maximizing quantity, Q_M, where MR equals MC. In part (a)(ii) 68% of students earned the point for showing the profit-maximizing price, P_M, from the D curve at the quantity Q_M. In part (a)(iii) 50% of students earned the point for correctly drawing the ATC below P_M at Q_M with the MC curve intersecting the ATC curve at its minimum. In part (a)(iv) 53% of students earned the point for completely shading the correct area of deadweight loss.

In part (b) 51% of students correctly stated that a binding price ceiling would change the firm's output to the allocatively efficient quantity.

In part (c) 59% of students earned the point for correctly stating that the profit-maximizing quantity would decrease because the D and MR curves would decrease, causing the MR curve to intersect the MC curve at a lower quantity.

In part (d)(i) 60% of students earned the point for drawing a correctly labeled graph of the perfectly competitive labor market with a downward-sloping D_L curve, an upward-sloping S_L curve, the equilibrium wage labeled W_E, and the equilibrium quantity labeled Q_E. In part (d)(ii) 62% of students earned the point for showing an increase (rightward shift) in S_L resulting in a lower equilibrium wage, labeled as W_2, and a higher equilibrium quantity, labeled Q_2. In part (d)(iii) 53% of students earned the point for correctly calculating the new wage rate as $200 and showing their work.

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) • Missing labels or showing incorrect labels on the axes. • Drawing a horizontal demand curve. • Identifying the MR curve as the same as the D curve. • Omitting the MR curve.	• Correctly labeling all axes. • Drawing a downward-sloping D and a downward-sloping MR below D.
Part (a)(i) • Identifying Q_M directly below the intersection of D and MC. • Identifying Q_M directly below the intersection of ATC and D.	• Drawing an upward sloping MC and labeling the profit-maximizing quantity as Q_M where MR = MC.
Part (a)(ii) • Identifying P_M directly from the intersection of MR and MC. • Identifying P_M directly from the intersection of MC and ATC. • Identifying P_M directly from the intersection of ATC and D.	• Identifying P_M from D at Q_M.
Part (a)(iii) • Drawing ATC on or above P_M at Q_M. • Drawing ATC without MC passing through the minimum point of ATC.	• Drawing ATC below P_M at Q_M with MC passing through the minimum point of ATC.
Part (a)(iv) • Shading the deadweight loss area from Q_M to where ATC = D. • Shading of the deadweight loss stops at the ATC curve.	• Shading the deadweight loss area from Q_M, between MC and D, until MC = D.
Part (b) • Identifying binding price floor, per-unit subsidy, or lump-sum tax.	• Stating the government would impose a binding price ceiling.

Part (c) • Stating the profit-maximizing quantity would increase. • Explaining the quantity demanded will decrease, causing profit-maximizing quantity to decrease. • Stating profit-maximizing quantity will decrease without an explanation.	• Stating the profit-maximizing quantity will decrease and explaining that D will decrease, causing MR to decrease and intersect MC at a lower quantity.
Part (d)(i) • Missing/incorrect labels. • Drawing a perfectly competitive firm graph instead of the market graph.	• Correctly labelling all axes. • Drawing a correctly labeled perfectly competitive market with a downward-sloping D_L and upward-sloping S_L. • Correctly labeling the equilibrium wage and quantity as W_E and Q_E, respectively.
Part (d)(ii) • Drawing an increase in D_L and labeling the new equilibrium wage and quantity above W_E and to the left of Q_E, respectively. • Labeling the new equilibrium wage and quantity without shifting S_L.	• Drawing SL_2 to the right of S_L and correctly labeling the new equilibrium wage and quantity as W_2 below W_E and Q_2 to the right of Q_E.
Part (d)(iii) • Stating the formula for utility maximization instead of the formula for cost minimization. • Setting up the formula correctly but making numerical errors.	• Setting up the calculation as (2,500/$500) = (1,000/wage rate) and solving for the wage rate = $200.

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?

Market graphs are important for understanding how price and output are related in different market structures. For students to have success on the AP exam, students should know how to correctly illustrate and analyze graphs of firms in different market structures. The monopoly model and its accompanying graph is an important market structure model for students to understand since nearly all firms have some degree of market power.

In parts (a)(i) through (a)(iv) students were relatively successful at constructing the basic model, correctly drawing demand, marginal revenue, marginal cost, and average total cost curves, and then using these curves to identify the profit-maximizing quantity and price. Students generally understood the basic mechanics of the quantity and price determination for a firm with market power. However, particularly in part (a)(iii), students struggled with correctly drawing the average total cost curve. While many students correctly drew the average total cost curve showing positive economic profit, there needs to be an emphasis on the rising marginal cost curve passing through the minimum point of the average total cost curve. It may

be helpful to provide students with additional practice in recreating and interpreting the monopoly graph when earning positive, negative, or zero profits. Additionally, this will be useful for later units that share similar graphical characteristics.

In part (b) students were relatively successful at determining that a price ceiling would allow for the allocatively efficient quantity to be produced. It would be beneficial to have students practice identifying possible market outcomes and articulate which policy options would achieve those outcomes.

In part (c) students were required to state that the profit-maximizing quantity would decrease and explain that the decrease in demand would cause the marginal revenue to decrease. Many students stated either a decrease in demand or a decrease in marginal revenue for the decrease in the profit-maximizing quantity, but not both. It would be beneficial for students to practice giving more complete explanations in terms of the connection between demand, marginal revenue, and the intersection with marginal cost.

In parts (d)(i) and(d)(ii) students were relatively successful in drawing a perfectly competitive labor market and graphing the change in supply. However, many students incorrectly drew a perfectly competitive labor firm graph. It is important that students are aware of the difference between the market graph and the firm graph and when to use each.

In part (d)(iii) students were relatively successful in calculating the wage rate and correctly showing their work using the cost-minimization rule. However, many students cited the formula for a different concept. It is important to differentiate between the use of marginal utility per dollar for utility maximization and the cost minimization rule for the factor market. Students should also be provided with opportunities to practice calculating wage or rental rates.

A general recommendation is to encourage students to consider all the information that is provided in the stem of the problem. It is important 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 that are available for use.

Finally, students can benefit from practicing using economic reasoning and terminology consistently. Educators should encourage students to use proper phrasing by providing more opportunities to use content-related vocabulary.

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

We recommend that teachers take advantage of the resources available in AP Classroom for the topics and skills covered in this question. AP Daily videos on Topics 4.2 Monopoly and 6.4 The Effects of Government Intervention in Different Market Structures can be assigned to students as warm-ups, lectures, or reviews, and topic questions can be assigned to assess student understanding.

Question 2

Task: Explain, Identify, Assert
Topic: Comparative Advantage and Externalities
Max Score: 5
Mean Score: 1.76

What were the responses to this question expected to demonstrate?

The question assessed student understanding of comparative advantage and the implications of, and policy to correct for, a negative externality.

The question shows the production possibilities curves for Northland and Southland, producing wheat in bushels and cloth in yards.

In part (a) students were asked to state which country has a comparative advantage in producing wheat and to explain using numbers. This part of the question required students to demonstrate their ability to calculate the opportunity cost of producing wheat and explain, using their knowledge of comparative advantage, that Southland has a lower opportunity cost of producing wheat and, therefore, has the comparative advantage in producing wheat.

Part (b) of this question asked students to identify a specific term of trade that would be beneficial to both countries for 10 bushels of wheat. This part required knowledge of terms of trade when comparing opportunity costs between countries.

Part (c) of this question required students to state whether a change in opportunity cost changed comparative advantage and explain using numbers. Students had to calculate the opportunity cost of producing cloth and apply numbers in their explanation that Southland has a higher opportunity cost of producing cloth and, therefore, does not have a comparative advantage in producing cloth.

In part (d) students were introduced to a third country, Alderia, which produces turnips in a perfectly competitive market, is not engaged in international trade, and has pollution runoff from the turnip fields that is harming residents.

In part (d)(i) students were asked to indicate the effect of a negative externality on efficiency and explain their reasoning using marginal analysis. Students were required to demonstrate knowledge of marginal social benefit and marginal social cost, as well as understanding the difference between marginal social cost and marginal private cost due to a negative externality.

In part (d)(ii) students were asked to demonstrate their understanding of tax policy effects by stating the impact of a lump-sum tax on the equilibrium price and quantity in the short run.

How well did the responses address the course content related to this question? How well did the responses integrate the skills required on this question?

In part (a) 65% of students earned the point for stating that Southland has the comparative advantage in wheat and explaining that the opportunity cost of producing one bushel of wheat in Southland is ½ a yard of cloth, which is less than the opportunity cost of 3 yards of cloth for producing one bushel of wheat in Northland.

In part (b) 62% of students earned the point for identifying a specific number between 5 and 30 yards of cloth that would be beneficial in trade for both countries.

In part (c) 41% of students earned the point for stating that Southland does not have a comparative advantage in cloth and for explaining that Southland's opportunity cost of producing one yard of cloth is 1.5 bushels of wheat, which is greater than Northland's opportunity cost of producing one yard of cloth, which is 1/3 of a bushel of wheat.

In part (d)(i) 18% of students earned the point for stating that no, the market equilibrium does not efficiently allocate resources, and explaining through marginal analysis the effect of the negative externality, by either stating that the negative externality causes the marginal social cost to be greater than the marginal social benefit (MSC>MSB) at the market equilibrium, or that the negative externality in production causes the marginal social cost to be greater than the marginal private cost (MSC>MPC) at the market equilibrium.

In part (d)(ii) 24% of students earned the point for stating that a lump-sum tax will not change the market equilibrium price and quantity in the short run.

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) • Calculating opportunity cost of producing cloth instead of opportunity cost of producing wheat. • Comparing an opportunity cost of producing cloth to an opportunity cost of producing wheat. • Describing absolute advantage instead of comparative advantage.	• Calculating and comparing each country's opportunity cost of producing wheat and stating that Southland has a comparative advantage in producing wheat because its opportunity cost of producing wheat is lower than that of Northland.
Part (b) • Specifying the endpoints of the trading range as mutually beneficial. • Giving an exchange rate rather than a quantity of cloth to trade.	• Identifying a specific number of yards of cloth larger than 5 and smaller than 30.
Part (c) • Calculating the opportunity cost of producing wheat instead of the opportunity cost of producing cloth. • Comparing an opportunity cost of producing cloth to an opportunity cost of producing wheat. • Describing absolute advantage instead of comparative advantage.	• Calculating and comparing each country's opportunity cost of producing cloth and stating that Southland has a higher opportunity cost of producing cloth and therefore does not have a comparative advantage in producing cloth.
Part (d)(i) • Assuming a perfectly competitive market equilibrium is always socially optimal (even in the presence of an externality). • Not referencing MSB, MSC, MPC, or MPB when analyzing externalities.	• Stating that the market results in an inefficient allocation of resources because pollution is a negative externality and stating that MSC>MSB or MSC>MPC at the market equilibrium.

Part (d)(ii) • Not knowing the difference between the effects of lump-sum and per-unit taxes. • Not knowing which costs are affected by a lump-sum tax.	• Stating that lump-sum taxes have no effect on marginal cost and therefore have no effect on equilibrium price and quantity in the short run.

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?

Comparative advantage is a core concept for trade and specialization. In parts (a) and (c) many students calculated and compared opportunity costs correctly. However, some students did not use the appropriate opportunity costs or did not indicate if their calculations were for the opportunity cost of producing wheat or of producing cloth. Additionally, some students discussed absolute advantage rather than comparative advantage. It would be beneficial for students to practice giving more complete explanations for what opportunity cost indicates and how to use it to determine comparative advantage.

Part (b) required recognizing that there is a range of possible trades that are beneficial for both countries, in this case between 5 and 30 yards of cloth. Many students identified a specific number within that range, but some gave the endpoint values of 5 or 30, not realizing that such a trade would not benefit one of the countries. A few students gave an exchange rate for trade, rather than a specific quantity of trade as stated in the prompt. Students should be provided with opportunities to practice calculating mutually beneficial trading quantities.

In part (d) some students assumed that perfectly competitive markets are always socially optimal, even in the presence of an externality. Others understood the externality's effect on allocative efficiency but were unable to explain using marginal analysis. In particular, many of those students gave explanations using only demand and supply instead of MSC, MPC, MSB, and MPB. This was the case even though the question explicitly instructed them to explain using marginal analysis. Teachers should help students recognize the different sources of externalities and provide opportunities for them to practice how to use MSC, MPC, MSB, and MPB to explain the difference between the market equilibrium quantity and the socially optimal quantity.

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

We recommend that teachers take advantage of the resources available in AP Classroom for the topics and skills covered in this question. AP Daily videos on Topics 1.4 Comparative Advantage and Trade and 6.4 The Effects of Government Intervention in Different Market Structures can be assigned to students as warm-ups, lectures, or reviews, and topic questions can be assigned to assess student understanding.

Question 3

Task: Calculate, Identify, Assert, and Explain
Topic: Cost, Perfect Competition, and Cross-Price Elasticity
Max Score: 5
Mean Score: 2.04

What were the responses to this question expected to demonstrate?

The question assessed students' understanding of how Hansel Hangout, a typical profit-maximizing firm in a perfectly competitive market, would maximize profit in the short run and be affected by changes in the long run, and how the quantity demanded of a related good would be impacted.

The question provided a graph showing a perfectly competitive firm with a horizontal demand and marginal revenue (D = MR) curve, a marginal cost (MC) curve, an average total cost (ATC) curve that is above the demand curve, and an average variable cost (AVC) curve that is below the demand curve in the relevant range. The question required students to use their knowledge of profit maximization and cost curves to determine the firm's economic profit, how firm profitability affects the entrance or exit of firms in the market, and how the market price moves toward long-run equilibrium. The question also required students to use their knowledge of the relationship between a change in price and quantity demanded of two goods when analyzing the coefficient value for the cross-price elasticity of demand.

In part (a) students were asked to calculate Hansel Hangout's total fixed cost (TFC) and to show their work. This required students to use their knowledge to assert values from the graph. Students were required to calculate average fixed cost (AFC) by subtracting AVC from ATC at either a quantity of 4, 6, or 8 and to multiply this value by the quantity selected, resulting in TFC = $72.

Part (b) asked students to identify the price and profit-maximizing quantity for Hansel Hangout's Good X. Students were required to identify a price of $14 and a quantity of 6 units from the intersection of the MC and MR curves.

Part (c) asked students to calculate Hansel Hangout's economic profit and show their work with the quantity they identified in part (b). Students needed to identify, from the graph, the ATC at the quantity they provided in part (b) and to calculate the firm's profit as −$42.

Part (d) asked students to assert and explain what will happen to the price of Good X as the market adjusts to the long-run equilibrium. This required students to state that the market price will increase and explain that the negative economic profit as calculated in part (c) will lead to the exit of some firms from the market, thereby decreasing the market supply and increasing the market equilibrium price.

Part (e) asked students to assert and explain what will happen to the quantity demanded of Good C that has a positive cross-price elasticity of demand with Good X, based on the price change of Good X in part (d). This required students to assert that a positive cross-price elasticity of demand shows that the two goods are substitutes in consumption. Students were also required to explain that an increase in the price of Good X will increase the demand for Good C, causing an increase in the quantity demanded of Good C.

How well did the responses address the course content related to this question? How well did the responses integrate the skills required on this question?

In part (a) 46% of students earned the point by correctly calculating TFC as $72 and showing the correct calculation.

In part (b) 60% of students earned the point by identifying the profit-maximizing price of $14 and quantity of 6 units.

In part (c) 45% of students earned the point by calculating the economic profit as −$42 and showing the correct calculation.

In part (d) 28% of students earned the point by asserting that price increases and explaining that some firms would exit the market causing market supply to decrease (or the market supply curve will shift to the left), increasing the price.

In part (e) 35% of students earned the point by asserting that a positive cross-price elasticity of demand shows that the two goods are substitutes in consumption and that the increase in price of Good X would cause an increase in quantity demanded for Good C.

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) • Multiplying the TFC calculation by the quantity selected (e.g., $\$72 \times 6 = \$432$). • Only calculating AFC. • Calculating AFC and dividing by the quantity selected (i.e., $(\$21 - \$9)/6 = \$2$).	• Calculating TFC as the area between ATC and AVC at a specific quantity, such as $(\$26 - \$8) \times 4 = \$72$, $(\$21 - \$9) \times 6 = \$72$, or $(\$20 - \$11) \times 8 = \$72$.
Part (b) • Identifying price = ATC ($21) at the profit-maximizing quantity of 6. • Identifying the profit-maximizing quantity as 8 units, which is where MC = ATC ($20). • Identifying the correct price or the correct quantity, but not both.	• Identifying that the profit-maximizing price and quantity occurs where MC = MR, which is at $14 and 6 units, respectively.
Part (c) • Calculating economic profit using a different quantity than what was identified in part (b).	• Calculating economic profit at the profit-maximizing quantity, $(\$14 - \$21) \times 6 = -\$42$ or $(\$14 \times 6) - (\$21 \times 6) = -\$42$.
Part (d) • Providing an incomplete explanation by not connecting firms exiting the market to a decrease in supply. • Providing an incorrect explanation of an increase in market price by connecting firms exiting the market to an increase in demand.	• Stating that the market price will increase because of the economic loss from part (c) and explaining that some firms will exit the market and connecting that to a decrease in the market supply.
Part (e) • Stating that a positive cross-price elasticity of demand indicates that the two goods are complements. • Explaining that an increase in the price of Good X will decrease the quantity demanded for Good C. • Stating that a positive cross-price elasticity of demand indicates that the two goods are substitutes but not explaining that a change in price of Good X causes a change in demand for Good C.	• Identifying that a positive cross-price elasticity of demand indicates that the two goods are substitutes in consumption and explaining that an increase in the price of Good X from part (d) will increase the demand for Good C, causing an increase in the quantity demanded of Good C.

• Providing the formula for calculating the cross-price elasticity of demand without explaining the effect of the increase in the price of Good X on the demand for Good C.	

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 important for students to understand as many firms operate in highly competitive markets. Students were relatively successful at using the curves of the graph to calculate costs and economic profit. Students were somewhat successful at asserting that price increases in the long run when there is an economic loss. Relatively few students fully explained what would happen to the market price in the long run. Most commonly, students explained that short-run negative economic profits (economic losses) would lead to some firms exiting the market. However, students frequently failed to connect firms exiting the market to a decrease in the market supply.

Teachers should provide opportunities for students to practice showing work for calculations from the setup to the solution—(i) write out the formula, (ii) input the numerical values, (iii) calculate the answer. Teachers should also provide opportunities for students to practice explaining all of the steps in the movement from the short run to the long run—explaining (i) how a change in the market equilibrium price affects the firm's economic profits, (ii) how a change in economic profits causes firms to either enter or exit the market, (iii) how the resulting change in the number of firms affects the market supply, and (iv) how the change in market supply affects the equilibrium price and quantity.

Cross-price elasticity of demand is important for understanding the relationship between two goods as substitutes, complements, or as unrelated. Students were relatively successful in asserting that a positive cross-price elasticity of demand indicates that the two goods are substitutes. However, students frequently did not make the connection in their explanation that a change in the price of one good causes a change in the demand for the other good. One suggestion is to ask students throughout the semester to explain the relationship of a nondescript good (i.e., Good X) with the product being analyzed.

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

We recommend that teachers take advantage of the resources available in AP Classroom for the topics and skills covered in this question. The elements of cost and perfect competition reflected in this question are covered in Topics 3.2 and 3.4–3.7 from Unit 3 Production, Cost, and the Perfect Competition Model. Cross-price elasticity of demand is covered in Topic 2.5 Other Elasticities. AP Daily videos can be assigned to students as warm-ups, lectures, or reviews, and Topic Questions and past AP Exam questions from the Question Bank can be assigned to assess student understanding.