CHAPTER 9: PURE COMPETITION

Introduction
In Chapters 9–11, we reach the heart of microeconomics, the concepts which comprise more than a quarter of the AP microeconomics exam. With a fuller understanding of revenues and costs, we bring them together to see how the firm makes profit-maximizing decisions about output and product prices. The firm’s ability to control product price highlights the differences among four market models examined over the next three chapters. Chapter 9 describes pure (perfect) competition, explaining how firms make profit-maximizing, loss-minimizing, and shutdown decisions, and how the industry adjusts in the long run. The principles developed in this chapter carry through to decision making by firms in other market structures as well. Material from Chapter 9 appears on the AP microeconomics exam in a large number of multiple-choice questions, and a free-response question about decision making in at least one of the market structures is part of nearly every exam.

Market Structures
Industries are classified by their market structures. Perfect competition involves a large number of firms who produce identical products and can easily enter or exit the industry. The other three market structures are considered imperfect competition. Monopolistic competition is similar to perfect competition in that a large number of firms compete and can easily enter or exit the industry, but the products are slightly different and firms heavily advertise those non-price differences. Only a few firms compete in oligopolies, which experience significant barriers to entry by new firms. Oligopolies are unique in that each firm is affected by its rivals’ decisions. In a pure monopoly, one firm is the only producer of a good, and barriers to entry by competitors are complete.

Perfect Competition
Perfectly competitive markets are rare but provide a foundation for understanding profit maximization and efficiency. Remember the smiley (©)? Four characteristics define a perfectly competitive market. First, a large number of independent sellers produce the product, so decisions of one firm have no effect on competitors. Second, goods produced by all of the firms are identical, so consumers do not care which firm’s product they buy. Third, perfectly competitive firms are price takers, meaning they have no control over the product price; they must accept the price set in the market. Fourth, firms can freely enter and exit the industry without significant barriers to entry. Products like corn, wheat, milk, beef, stocks, bonds, and currencies are sold in perfectly competitive markets.

Demand
In a perfectly competitive market, the industry demand curve is downward-sloping. But once the price is set by supply and demand, the firm is a price taker. The demand curve for the individual firm is horizontal, perfectly elastic at that market equilibrium price.

Bear in Mind
Multiple-choice questions asking the difference between the downward-sloping industry demand and the firm’s perfectly elastic demand curve are frequently part of the exam.

Revenue
The firm’s total revenue is price times quantity sold. Because the firm is a price taker, it sells each product for the same price, so average revenue equals price. Marginal revenue is the change
in total revenue from selling one more unit of the product. Because the perfectly competitive firm sells every product for the same price, marginal revenue, price, and the average revenue are all equal, graphed on the horizontal demand curve.

**Taking the EEK! Out of Economics**

Although the types of revenue are calculated differently, marginal revenue, price, average revenue, and demand are equal for perfectly competitive firms. This is key, because for imperfectly competitive firms, the marginal revenue will separate from the others.

**Short-Run Profit Maximization Using Total Revenue and Total Cost**

Because the perfectly competitive firm cannot control its price, it must maximize profit based on output. Because the plant and equipment are fixed in the short run, the firm can only change its variable costs and then determine the most profitable output. Firms can determine profit-maximizing output by studying total revenue and total cost or marginal revenue and marginal cost. First, we will look at the total cost and total revenue method.

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**Total-revenue-total-cost approach to profit maximization for a purely competitive firm**

Total revenue for the perfectly competitive firm slopes upward at a constant rate because it increases by the product price with each unit sold. In this example, for the first two units of output, total cost exceeds total revenue, so the firm would make a loss by producing at those output levels. After the second unit of output is the break-even point, where total cost equals total revenue and the firm achieves a normal profit, but not economic profit. After the thirteenth unit of output is a second break-even point, and output beyond that point also brings the firm a loss. Between those break-even points, total revenue is greater than the total cost at each output, and the firm earns economic profit. To maximize profit, the firm produces output at the point where total revenue is the greatest vertical distance above the total cost—in this case, at nine units. The distance between the curves is the economic profit per unit. The total economic profit is the profit per unit times the output.
Short-Run Profit Maximization Using Marginal Revenue and Marginal Cost
Firms also find profit-maximizing output by comparing marginal revenue to marginal cost. If marginal revenue is greater than or equal to marginal cost, a firm should produce the unit; if marginal cost is greater than marginal revenue, the firm should not produce it.

The correct perfectly competitive market graph is actually two side-by-side graphs. On the left is the market for the industry, with supply and demand determining the price and quantity. Because the individual firm is a price taker, the price is then connected via a horizontal line to the individual firm graph on the right. The Price = Marginal Revenue = Average Revenue = Demand on that horizontal line for the individual firm. Marginal cost crosses the ATc at its minimum point. In long-run equilibrium, marginal revenue, marginal cost, and ATc all meet at the same point. To maximize profit or minimize loss, the firm should produce where the marginal revenue equals the marginal cost.

**MR = MC Rule:** Firms ALWAYS maximize profit by producing where MR = MC.

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Many students look at the graph of the individual firm and wonder why the firm wouldn't maximize profit by producing where MC is at its minimum, as the difference between MR and MC is greatest at that output. But consider what happens when you increase output by one unit. The additional revenue the firm earns from producing that next unit is greater than the cost of producing that unit. It is a smaller difference but still a gain for the firm, and that additional profit is added to the profit earned from earlier units. Remember, the firm is trying to maximize its total profit, not the profit per unit, so if the firm can bring in even a little more profit by producing one more product, it will do so.

**The Profit-Maximizing Case**
In the long run, the industry and individual firm achieve equilibrium where the firm produces output at the point where MC = MR, and P = ATc, so there is no economic profit. However, in the short run, the firm can earn an economic profit.
Short-run profit maximization for a purely competitive firm

Remember, the MR = P = AR = D curve for the individual firm is set by supply and demand in the industry. The firm should produce at MC = MR, as always. But notice that this time, the ATC is lower than P. This shows the firm is making an economic profit. The amount of economic profit can be found in two ways:

1. Total Revenue - Total Cost.
   \[ \text{Total Revenue} = \text{Price} \times \text{Output} \]
   \[ \text{Total Cost} = \text{ATC} \times \text{Output} \]
2. Profit per Unit x Output.
   \[ \text{Profit per Unit} = \text{Price} - \text{Average Total Cost} \]

The Loss-Minimizing Case

Short-run loss minimization for a purely competitive firm

Again, the MR = P = AR = D curve for the firm results from the price set by industry supply and demand. The firm, as always, should produce where MC = MR. But notice this time, ATC is higher than P, showing the firm is suffering an economic loss. Loss is calculated the same way profit is calculated (P - ATC); it will produce a negative number for a loss. So if the firm is losing money, should it shut down? Not necessarily. Remember, the firm still has fixed costs it must pay in the short run, even if the firm closes. So we need to determine whether the firm will lose more money by shutting down or staying open in the short run. Assume these are the firm’s short-run costs at a particular level of output:

- Fixed Cost = $100
- Variable Cost = $150
- Total Cost = $250
- Total Revenue = $200
In this case, the firm has a loss of $50, because the total cost is greater than total revenue. However, if the firm shuts down, it would incur a loss of $100 because it has to cover its fixed costs. Therefore, this firm should remain in business in the short run, because its losses are less if it remains open than if it shuts down. If the firm’s marginal revenue is greater than or equal to the average variable cost, the firm should remain in business in the short run, because any additional revenue earned beyond the variable cost can be put toward the fixed cost. You can see this in the loss-minimizing graph. The MR = P curve is above the AVC curve, so the firm should remain in business in the short run.

The Shutdown Case

![Graph showing the shutdown case for a purely competitive firm]

**The short-run shutdown case for a purely competitive firm**

This market looks very similar to the loss-minimizing case, except that both the ATC and AVC curves are above the MR = P curve. Even if the firm produces where MC = MR, it cannot recover its variable costs. Therefore, the firm should shut down. Let’s look at numbers, using the same costs as the loss-minimizing case but lower total revenue:

- **Fixed Cost = $100**
- **Variable Cost = $150**
- **Total Cost = $250**
- **Total Revenue = $100**

In this case, the firm is incurring a loss of $150. Should the firm remain in business in the short run? If it stays in business, it loses $150, but if it shuts down, it loses $100. The firm is better off shutting down. The firm cannot even cover the variable costs of the labor and raw materials to create the output it is selling, so it should shut down.

So we have a series of points to determine production. At the output where MC = MR,

- If the ATC is lower than the MR = P curve, the firm should produce and is earning an economic profit in the short run.
- If the ATC is equal to the MR = P curve, the firm should produce, is earning zero economic profit, and is in long-run equilibrium.
- If the ATC is higher than the MR = P curve, the firm is incurring a loss.
  - If the AVC is lower than or equal to the MR = P curve, the firm should continue to produce to minimize its loss in the short run.
  - If the AVC is higher than the MR = P curve, the firm should shut down.
Bear in Mind
Some questions on the AP microeconomics exam may give you a scenario about a firm's costs and revenues at a particular output. For better success, sketch the individual firm's cost and revenue curves as explained in the question, so you can visualize the relationship between the curves. Actually seeing the curves tends to make the answer more obvious.

Marginal Cost and Short-Run Supply
The upward-sloping portion of the marginal cost curve that is above the AVC curve is the firm's short-run supply curve. The firm will not produce where marginal revenue does not cover the average variable cost, but from the point where they are equal onward, the firm will produce where MR = MC to maximize profit (or minimize loss) in the short run.

**Short-Run Profit**

![Graph showing marginal cost and revenue curves](image)

In the short run, if consumer demand for the product increases, the market price increases. The increase in market price carries over to the individual firm, a price taker that must accept the market price. Therefore, the marginal revenue curve shifts up from M1 to M2 at the higher price. At the higher price, the firm has an incentive to increase production to the output where MR = MC to maximize profit. At this output, the price is higher than the average total cost, so the firm is earning an economic profit.

**Long-Run Equilibrium**

![Graph showing long-run equilibrium](image)

Temporary profits and the reestablishment of long-run equilibrium in (a) a representative firm and (b) the industry

Chapter 9: Pure Competition
In the short run, perfectly competitive firms may experience economic profit or loss. In this figure, the industry increase in demand raised the market price (marginal revenue to the firm), so the firm increased its production to the output where MC = MR. However, in the long run, the market adjusts as the profit motive entices firms to enter the industry. New firms increase industry supply, lowering the price. The lower price transfers to individual firms in lower marginal revenue, causing the firm to reduce production until once again MC = MR. At that output, MC = ATC, so the firm again returns to zero economic profit, and there is no incentive for other firms to enter the industry.

Short-Run Losses and Long-Run Equilibrium

Consider the case of a decrease in consumer demand for the product. Lower demand causes the price to fall, lowering marginal revenue for the individual firm. Because the marginal revenue is lower than ATC, the individual firm suffers a loss. In the short run, firms reduce production to the output where MC = MR to minimize their losses. However, in the long run, some firms that cannot cover their variable costs or are attracted to other profit-making opportunities will exit the industry, reducing industry supply. As the price rises, marginal revenue rises as well, until the firm reaches equilibrium, producing where MC = MR = ATC, and there is no incentive for other firms to exit the industry.

Changes in Per-Unit Production Costs and Subsidies

Changes in production cost can also change the firm’s output and cause short-run profits or losses. If the firm’s labor cost (a variable cost) increases, the average variable cost, marginal cost, and average total cost all shift upward. Marginal cost crosses marginal revenue to the left of the firm’s original output, so the firm reduces its output to where MC = MR. Because ATC is higher than the price at that output, the firm incurs a loss in the short run but will continue producing as long as the price is higher than ATC. In the long run, industry supply decreases as a result of lower output by firms and some firms exiting the industry. As marginal revenue for each firm rises, the market returns to long-run equilibrium, with firms producing where MC = MR = ATC at the higher price, and the new industry equilibrium shows a higher price and lower quantity.

If the government provides a per-unit subsidy to firms, the process works in reverse. The lower AVC also reduces the ATC and MC for the firm. As a result, the new MC crosses MR further to the right, increasing output. Because the ATC is now lower than the price, the firm experiences a short-run economic profit. In the long run, that profit draws new firms into the industry and supply increases, lowering the product price. The lower price transfers to a lower marginal
revenue for the firm, and the firm returns to long-run equilibrium, with the firm producing where 
MC = MR = ATC with no economic profit.

Changes in Lump-Sum Production Costs and Subsidies
Changes in lump-sum costs, such as property taxes, operating licenses, or rent, affect only 
average fixed cost and ATC. Because these costs do not affect marginal cost, the marginal cost 
curve does not shift, and output does not change in the short run. However, the increase in cost 
causes ATC to shift upward, so the firm incurs a short-run loss. In the long run, industry supply 
will decrease as firms exit the industry. The market price and thus marginal revenue to the firm 
will increase, and the firm will again return to long-run equilibrium to produce at the output 
where MC = MR = ATC.

If the government offers a lump-sum subsidy to firms, AFC and ATC both fall. Because 
marginal revenue does not move, the firm’s output does not change in the short run. Now that the 
firm is earning economic profit, more firms enter the industry, increasing supply and lowering the 
price. The lower marginal revenue causes the firm to decrease output, to produce where MC = 
MR = ATC, and the firm no longer earns an economic profit.

Taking the EEK! Out of Economics
Although firms may make economic profits or suffer losses in the short run, the long-run entry or 
exit of firms in the industry eventually returns the market to equilibrium, where firms earn zero 
economic profit. At this point, it is important to remember the difference between normal and 
economic profit. The firm’s accountant is still showing a normal profit, which is paid to the 
entrepreneur. But beyond that normal profit, there is no economic or excess profit, which would 
draw other firms into the industry.

Bear in Mind
It is very important to be able to distinguish the effects of changes in per-unit and lump-sum 
production costs. Changes in per-unit costs affect the variable cost (and therefore average total 
cost). Changes in these costs also shift the marginal cost curve, so the firm’s output will change 
as the firm produces at MC = MR. Changes in lump-sum costs affect the fixed cost (and 
therefore average total cost). However, changes in these costs do not affect the firm’s marginal 
cost curve, so the firm’s output does not change and the firm continues to produce at the same 
output in the short run. Questions, particularly those in the free-response portion of the AP 
macroeconomics exam, have asked students to be able to make this distinction to correctly explain 
the effects of changes in production costs.

Increasing, Constant, and Decreasing Cost Industries
When new firms enter an industry, the additional demand for resources to make products can 
affect the price of those resources. In increasing-cost industries, the firms’ increased demand for 
resources pushes up the resource cost, causing the firms’ ATC curves to shift up. As a result, the 
industry’s long-run supply curve is upward-sloping. In a constant-cost industry, the firms’ 
increased demand for resources has no effect on the cost of those resources. The firms’ ATC 
curves remain in place and the industry’s long-run supply curve is horizontal. In decreasing-cost 
industries, increased demand for resources can lower the cost of resources, so the supply curve 
would actually be downward-sloping.
Bear in Mind
Questions on the AP microeconomics exam consistently assume a constant-cost industry, so students can focus on the relationships between costs and revenues in the short run without the costs of resources changing at the same time.

Efficiency

Long-run equilibrium: a competitive firm and market

A perfectly competitive industry in long-run equilibrium achieves both productive and allocative efficiency. Productive efficiency occurs when the firm produces at the lowest cost per product. This occurs at the minimum ATC, where MC = ATC. Consumers benefit because the product price is low, and society benefits because scarce resources are used in the most efficient way. The graph on the left illustrates productive efficiency.

Allocative efficiency occurs when resources are divided among goods and services such that society receives the mix of goods and services it wants. Productive efficiency is necessary for an industry to be able to achieve allocative efficiency. Once the firms are producing at lowest cost, allocative efficiency focuses on whether firms are producing the products consumers actually want. This occurs at the output where P = MC. At that point, the value society receives from the last product is equal to the marginal cost of producing it. The graph on the right illustrates allocative efficiency. Notice that these side-by-side graphs are the illustration of long-run equilibrium for the perfectly competitive industry. Consumer and producer surplus are also maximized in a perfectly competitive market.

Economists consider perfect competition to be the perfect model of the “invisible hand” at work. Individual firms are free to enter and exit the industry and produce and set output in ways that maximize profit. Both productive and allocative efficiency are achieved, which help to keep prices down for consumers and ensure that scarce resources are used in the most efficient way to produce the mix of goods society desires. And when changes occur in the market, firms respond to profits and losses in the short run by changing output and the industry changes in the long run as firms enter or exit, until long-run equilibrium and productive and allocative efficiency are once again achieved.
Multiple-Choice Questions

1. Which of the following best describes a perfectly competitive market?
   I. A large number of firms exist in the industry.
   II. Products are differentiated.
   III. Firms can easily enter or exit the industry.
   (A) I only
   (B) II only
   (C) I and III only
   (D) II and III only
   (E) I, II, and III

2. Because the perfectly competitive firm is a price-taker, its demand curve is
   (A) upward sloping.
   (B) downward sloping.
   (C) horizontal.
   (D) vertical.
   (E) dependent on the marginal cost.

3. In order to maximize profit, the firm should produce where
   (A) Marginal Revenue = Price.
   (B) Marginal Cost = Marginal Revenue.
   (C) Marginal Cost = Average Variable Cost.
   (D) Price = Average Variable Cost.
   (E) Average Revenue = Price.

4. At long-run equilibrium for the perfectly competitive firm, the marginal cost is equal to all of the following EXCEPT
   (A) average total cost.
   (B) marginal cost.
   (C) price.
   (D) marginal revenue.
   (E) average variable cost.

5. At a particular output, a perfectly competitive firm’s price is $10, marginal cost is $11, average total cost is $12, and average variable cost is $8. The firm should
   (A) increase output to maximize profit.
   (B) continue production at its current level of output to maximize output.
   (C) decrease output to minimize loss, but keep producing in the short run.
   (D) raise the product price to $11 to maximize profit.
   (E) shut down.

6. If a firm incurs losses, it should continue to produce as long as the price covers the
   (A) average variable cost.
   (B) average fixed cost.
   (C) average total cost.
   (D) marginal cost.
   (E) marginal revenue.
7. If a firm is producing 10 products for a price of $5 per unit, and the marginal cost of producing the 11th product is $3, which of the following statements is true?
   (A) The total cost of producing 11 units is $5 greater than producing 10 units.
   (B) The total revenue of selling 11 units equals the total revenue of selling 10 units.
   (C) The total profit from selling 11 units is $2 more than the total profit from selling 10 units.
   (D) The marginal revenue from selling the 11th unit is $3.
   (E) The marginal cost of producing the 11th unit is greater than the marginal revenue from producing it.

8. If consumer demand for the product in a perfectly competitive industry increases, which effects will occur for the individual firm in the short run?
   I. The product price will increase.
   II. The firm will incur a loss at its current output.
   III. The firm will increase output.
   (A) I only
   (B) II only
   (C) II and III only
   (D) I and III only
   (E) I, II, and III

9. If a perfectly competitive firm is initially in long-run equilibrium, and the firm’s variable cost increases, all of the following occur in the short run EXCEPT
   (A) the firm’s average total cost will increase.
   (B) the firm’s marginal cost will increase.
   (C) the firm’s average fixed cost will increase.
   (D) the firm’s output will decrease.
   (E) the firm will experience a short-run loss.

10. In a perfectly competitive industry in which firms are achieving short-run economic profit,
    (A) firms will enter the industry.
    (B) firms will increase the product price.
    (C) industry output will decrease.
    (D) firms will exit the industry.
    (E) the government will increase taxes.

11. Assume a perfectly competitive firm is in long-run equilibrium. If the firm’s property tax (a lump-sum cost) increases, in the short run, the firm will
    (A) not change its output.
    (B) increase output to where marginal cost equals the new average total cost.
    (C) reduce output to where marginal cost equals the new average total cost.
    (D) increase output to where the new marginal cost equals marginal revenue.
    (E) reduce output to where the new marginal cost equals marginal revenue.

12. Assume profit-maximizing firms in a perfectly competitive industry are in long-run equilibrium. In that condition, all of the following are achieved EXCEPT
    (A) firms earn normal profit.
    (B) firms have no incentive to enter or exit the industry.
    (C) both productive and allocative efficiency are achieved.
(D) consumer and producer surplus are maximized.
(E) firms earn economic profit.

Free-Response Questions
1. Assume Joslyn Farm is a profit-maximizing firm in the perfectly competitive corn industry, which is in long-run equilibrium.
(a) Draw correctly labeled, side-by-side graphs for the corn industry and Joslyn Farm. Show and label each of the following:
(i) industry price and output
(ii) Joslyn Farm’s price and output
(b) Suppose the government offers a per-unit subsidy to corn farmers. On your graphs from part (a), show the effects of the subsidy on each of the following in the short run:
(i) Joslyn Farm’s output. Explain the effect.
(ii) the area of profit or loss for Joslyn Farm. Explain the effect.
(c) Explain how the industry will return to long-run equilibrium and why this effect occurs in perfectly competitive markets.

2. Assume SamKat, Inc., sells lemonade at a county fair, surrounded by dozens of other food stands selling the very same lemonade.
(a) In what type of market structure is SamKat operating?
(b) If SamKat increases its product price above the industry equilibrium price, what will happen to its total revenue? Explain.
(c) Assume the cost of lemons increases for all lemonade stands in the industry.
(i) Explain the effect of the cost increase on SamKat’s output.
(ii) Explain the effect on SamKat’s short-run profit or loss.
(iii) Under what conditions will SamKat continue to produce in the short run?

3. The table below indicates the short-run costs for Cherryl’s Cupcakes, a profit-maximizing firm in a perfectly competitive industry in long-run equilibrium.

<table>
<thead>
<tr>
<th>Output Produced</th>
<th>Total Cost</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>1 box</td>
<td>30</td>
</tr>
<tr>
<td>2 boxes</td>
<td>35</td>
</tr>
<tr>
<td>3 boxes</td>
<td>38</td>
</tr>
<tr>
<td>4 boxes</td>
<td>44</td>
</tr>
<tr>
<td>5 boxes</td>
<td>51</td>
</tr>
<tr>
<td>6 boxes</td>
<td>60</td>
</tr>
<tr>
<td>7 boxes</td>
<td>70</td>
</tr>
<tr>
<td>8 boxes</td>
<td>90</td>
</tr>
</tbody>
</table>

(a) Calculate the marginal cost of producing the second box of cupcakes.
(b) Calculate the average total cost of producing 4 boxes of cupcakes.
(c) Cherryl’s Cupcakes receives a price of $10 per box of cupcakes. Indicate how many boxes of cupcakes the firm should sell to maximize its profit. Explain how you reached that conclusion.
If cupcakes are a normal good and consumer incomes decrease, explain
(i) the effect on the cupcake industry.
(ii) the effect on the price Cherryl's Cupcakes will receive for its product.
(iii) the effect on the quantity of cupcakes produced by Cherryl's Cupcakes.
(iv) the short-run economic profit or loss incurred by Cherryl's Cupcakes.
(v) the industry's long-run adjustment.

Multiple-Choice Explanations
1. (C) Products produced in a perfectly competitive industry are identical.
2. (C) The industry demand curve is downward-sloping, and the market equilibrium
price set in the industry becomes the perfectly elastic demand for the firm. Because the
firm has no power to change price in the market, it can sell all of the products it makes at
the same price.
3. (B) The MC = MR rule is the same for firms in all market structures. The firm
should continue to produce as long as the marginal revenue from selling a unit is greater
than or equal to the marginal cost of producing that unit.
4. (E) For the perfectly competitive firm, marginal revenue and price are equal on the
demand curve. The firm maximizes profit where MC = MR, and it reaches productive
efficiency by producing where MC = ATC at that same point. The average variable cost
curve will be below the ATC, so it is the only curve not equal to all of the others at the
profit-maximizing output.
5. (C) At that output, marginal cost is greater than marginal revenue, so the firm should
decrease output. The firm is incurring a loss because price is lower than the average total
cost, but the price is higher than the average variable cost, so the firm should continue to
produce in the short run.
6. (A) If the firm can recover all of its variable costs, it should continue to produce
because it can use any additional revenues toward its fixed costs.
7. (C) The marginal revenue of producing the next unit is $5, and the marginal cost of
producing the next unit is $3, so the total profit increases by $2.
8. (D) Increased industry demand pushes up the price, which causes the firm's marginal
revenue curve to shift up. In the short run, the firm increases output to the point where
MC = MR again. Because the price is now higher than the ATC, the firm experiences an
economic profit in the short run.
9. (C) An increase in variable cost increases the firm's average total cost and marginal
cost, but it has no effect on average fixed cost. The firm decreases its output to minimize
its loss where MC = MR, and the loss is illustrated with the new ATC positioned above
the price.
10. (A) Economic profit draws firms into the industry. Firms that cannot affect product
price are price-takers, and the short-run economic profit would lead firms to increase
output rather than reducing it.
11. (A) A lump-sum cost only affects average fixed cost and average total cost. Because
marginal cost is not affected, the firm's output does not change.
12. (E) In long-run equilibrium, firms earn only a normal profit to cover the opportunity
cost of the entrepreneur and resources involved in the firm, but there is no economic
profit, because the existence of economic profit draws new firms into the industry. While
the firm will see an accounting profit, there is no economic profit.

Free-Response Explanations
1. 10 points (4 + 4 + 2)
(a) 4 points:
1 point is earned for correctly identifying equilibrium price and quantity for the industry.
1 point is earned for drawing a horizontal line linking the industry price to Joslyn Farm's marginal revenue curve.
1 point is earned for labeling the firm's demand curve as price and showing output where MC = MR.
1 point is earned for correctly placing the average total cost curve with its minimum at the output where MC = MR.

(b) 4 points:
• 1 point is earned for showing Joslyn Farm's output will increase.
• 1 point is earned for explaining that the firm produces where MC = MR; because MC shifted downward, they now cross at a greater output.
• 1 point is earned for showing Joslyn Farm's area of profit.
• 1 point is earned for explaining that because the new ATC is below the price (or marginal revenue or average revenue), the firm is earning an economic profit.

(c) 2 points:
• 1 point is earned for explaining that firms enter the industry.
• 1 point is earned for explaining that profits draw the firms into the industry.

2. 6 points (1 + 2 + 3)
(a) 1 point:
• 1 point is earned for identifying the market structure as perfect competition.
(b) 2 points:
• 1 point is earned for stating that SamKat's total revenue will fall to zero.
• 1 point is earned for explaining that customers will purchase the substitute product from another firm.
(c) 3 points:
• 1 point is earned for stating that SamKat's output will decrease.
• 1 point is earned for stating that SamKat will incur a short-run loss.
• 1 point is earned for explaining that SamKat will continue to produce in the short run as long as marginal revenue is greater than or equal to average variable cost.

3. 9 points (1 + 1 + 2 + 5)
(a) 1 point:
• 1 point is earned for stating that the marginal cost is $5.
(b) 1 point:
• 1 point is earned for stating that the average total cost is $11.
(c) 2 points:
• 1 point is earned for stating that Cherryl's Cupcakes maximizes profit at 7 boxes.
• 1 point is earned for explaining that the marginal revenue equals the marginal cost at that output.
(d) 5 points:
• 1 point is earned for stating that the industry demand decreases.
• 1 point is earned for stating that the price of the product decreases.
• 1 point is earned for stating that the firm's output decreases.
• 1 point is earned for stating that the firm will incur a short-run loss.
• 1 point is earned for explaining that in the long-run, firms will exit the industry.