

Microeconomics, Module 7: "Competition: Short Run"

Illustrative Test Questions

(The attached PDF file has better formatting.)

Question 7.1: Sales Quantity

A competitive firm can sell any quantity of output it chooses as long as it charges

- A. More than its average total cost.
- B. The established market price.
- C. Its break-even price.
- D. Less than its average total cost.
- E. Less than the price a monopolist would charge.

Answer 7.1: B

Question: Module 8 says that the competitive firm charges a price equal to its average total cost. Since it faces a horizontal (flat, perfectly elastic) demand curve, if it charges less than this amount, it should be able to sell as much as it wants. If it charges its average total cost, it breaks even. What aren't C and D true?

Answer: The long-term equilibrium price for a competitive firm is its average total cost, which is its break-even price. This is a *long-run equilibrium*; at any moment, the market price may be more or less.

- If the market price is below its break-even price, it can't sell anything if it charges its break-even price.
- If the market price is above its break-even price, it would be a fool to charge its break-even price, since it can sell the same quantity at the market price.

Question: Is it common for the market price to differ from the break-even price in competitive industries?

Answer: Auto insurance is a competitive industry whose products are relatively easy to price. But auto insurance has recurring underwriting cycles; some years the market price is above break-even, some years it is below break-even. It is common for the market price to differ from the break-even price in many competitive industries.

Question 7.2: Increased Sales

A competitive firm sells 10,000 units at \$10 per unit in an industry with a market demand of $Q = 500,000 - 10,000P$. To sell 20,000 units, the firm must lower its price by

- A. \$0.50
- B. \$1.00
- C. \$1.50
- D. \$2.00
- E. The firm need not lower its price at all.

Answer 7.2: E

In a competitive market, a firm can sell all it wishes at the market price.

Question: If this is true, why don't all firms raise their output in a competitive industry? Why wouldn't a firm prefer to sell more?

Answer: Wheat is a competitive industry. If the market price is \$10 a bushel of wheat, a farmer can sell all the wheat produced for \$10 a bushel. Each farmer operates at a supply that is the long-run minimum average total cost, which is the minimum cost output. If the farmer produces more, the average total cost rises, and the farmer loses money on each bushel sold. In a perfectly competitive industry, all firms operate at maximum efficiency and minimum average cost.

Question 7.3: Auto Insurance Industry

Which of the following suggests that the personal auto insurance industry is competitive?

- A. Little product differentiation among auto insurance policies
- B. Low profits in the auto insurance industry
- C. High diversity of prices among auto insurers
- D. Recurrent underwriting cycles in auto insurance
- E. High consumer loyalty to their auto insurance carriers

Answer 7.3: A

Statement B: Low profits may be caused by a variety of factors. Low risk industries have low expected profits, and the low average profits of auto insurers is sometimes taken as a sign of low risk. Monopolized industries often have high profits, but low profits is not necessarily a sign of competition.

Statement C: If an industry is perfectly competitive, all suppliers adopt the market price, with little diversity. If a supplier charges more than the market price, it should not be able to sell its output. The diversity of prices among auto insurers indicates that the market is not perfectly competitive. Commodity markets may be perfectly competitive: farm products, minerals, and some basic food products. Few other industries are perfectly competitive. Auto insurance is highly competitive, but it is not perfectly competitive.

Statement D: Underwriting cycles might suggest co-ordination of prices among suppliers; this is characteristic of oligopoly, not competition. But industry pricing (by rating bureaus or co-ordinated activities) is rare in personal auto insurance. Underwriting cycles suggest neither competition nor lack of competition; they are hard to interpret.

Statement E: In a perfectly competitive industry, consumers quickly shift their purchases to the supplier with the lowest prices. Consumer loyalty to a particular supplier is not a sign of competition.

Question: So is the auto insurance industry competitive, or is it not competitive?

Answer: The auto insurance industry is more competitive than most industries in the United States. But few industries are perfectly competitive. Even capital markets, like those for common stocks, have had cartels enforcing broker commissions and other instances of monopolistic behavior. No CEO in a perfectly competitive industry has a take home pay of \$160 million and a secretary earning \$240,000; the New York stock exchange is a monopoly.

Some agricultural products are sold in competitive markets, but the size of farm subsidies, the money spent on lobbying for farm subsidies, and the agricultural subsidies in the European Common Market show how uncompetitive some of these markets are. Farm products are the best example of competitive markets, but distortions evident in global farm products competition show how easily competition can be destroyed.

Auto insurance is highly competitive, but it is not perfect. Life insurance, health insurance, and other lines of business are similarly competitive. But the public is skeptical of our industry, and insurers are continually criticized for non-competitive activity; usually the criticism is not correct. It is essential for actuaries to understand why insurers are seen as competitive or non-competitive.

Question 7.4: Supply Curve

A competitive firm's supply curve coincides with its

- A. marginal cost curve.
- B. marginal revenue curve.
- C. average cost curve.
- D. average variable cost curve
- E. A competitive firm does not have a supply curve.

Answer 7.4: A

A *monopolist* does not have a supply curve; we cover this in a later module. For a competitive firm, the supply curve is the marginal cost curve above the *shut-down price* (the minimum average *variable costs* in the short run).

Question 7.5: Shut Down Price

A competitive firm will shut down if the market price drops below the firm's

- A. Break-even price
- B. Average total cost
- C. Average variable cost
- D. Average fixed cost
- E. Marginal cost

Answer 7.5: C

Question: Why would the market price drop below the firm's average variable costs?

Answer: Two common reasons are a change in demand and entry of other firms.

- *Demand:* After September 11, 2001, demand for air travel decreased greatly. Several industries that depend on air travel saw their market prices drop below their variable costs: airlines, hotels catering to business travelers, cab companies.
- *Entry:* Globalization is bring lower-cost competitors into various markets. As China and India enter markets for basic goods and services, higher-cost firms in other countries find their market prices below their average variable costs.

Question 7.6: Short Run Strategy

A competitive firm has short-run total costs of \$5,000, of which \$1,500 are fixed costs. The firm's total revenue is \$4,000. If the firm's marginal cost equals the market price, what action should the firm take in the short-run?

- A. The firm has losses and should exit the industry in the short run.
- B. The firm should shut down in the short run to avoid a \$1,000 loss.
- C. The firm should raise its price in the short run to increase its revenues.
- D. The firm should continue production in the short run and accept the \$1,000 loss.
- E. The firm should reduce production in the short run to reduce its marginal cost.

Answer 7.6: D

The variable costs are the total costs minus the fixed costs: $\$5,000 - \$1,500 = \$3,500$. In the short run, the firm shuts down only if the market price drops below its minimum average variable costs; otherwise, it charges the market price and makes a profit or loss.

Question 7.7: Pricing in a Competitive Industry

All but which of the following are true in a perfectly competitive industry?

- A. A firm can sell any quantity at the going market price.
- B. A firm that raises its price above the equilibrium level loses all its market share.
- C. Each firm faces a downward sloping demand curve.
- D. The industry demand curve is downward sloping.
- E. All of A, B, C, and D are true.

Answer 7.7: C

The demand curve facing the individual firm is horizontal (flat, perfectly elastic). If it were not flat, it could not sell any quantity at the market price.

The industry demand curve is never perfectly flat. A perfectly flat industry demand curve means that consumer will buy any amount offered at the market price. This contradicts the law of decreasing marginal utility.

Question: How can the industry demand curve slope down if the demand curve facing each firm is flat? Isn't the industry demand curve the sum of the firms' demand curves?

Answer: The demand curve facing the individual firm is flat over the range of reasonable output for the firm; it is not perfectly flat for all outputs. Suppose the market for wheat is perfectly competitive. Each farmer can sell as much wheat as desired at the going market price, since many farmers compete with low barriers to entry, no product differentiation, and similar costs. Suppose 800 million bushels of wheat are sold in 20X7, of which Farmer Isaac produces 2 million. Even if Farmer Isaac produces 2.5 million bushels in 20X8, he can still sell the entire quantity at the going market price.

Question: What if Farmer Jacob has 10% percent of the U.S. wheat production? Is he still a competitive producer?

Answer: The answer depends on whether the market share confers market power. For commodities like wheat, supply does not differ by farmer.

Question 7.8: Demand Curves in a Competitive Industry

Which of the following is true in a perfectly competitive industry?

- A. The market demand curve is horizontal.
- B. The market demand curve has an elasticity of zero.
- C. The demand curve facing an individual firm is horizontal.
- D. The demand curve facing an individual firm has an elasticity of zero.
- E. None of A, B, C, or D is true.

Answer 7.8: C

A horizontal demand curve has an elasticity of negative infinity. The market demand curve is downward sloping and has a negative (but not infinite) elasticity.

Question: A horizontal supply curve has an elasticity of positive infinity. What is the graphic difference between elasticities of positive vs negative infinity?

Answer: Neither the supply nor the demand curve can be perfectly horizontal, since a truly flat curve is economically impossible. Rather:

- A flat demand curve is the limit of a downward sloping demand curve as the slope become infinitesimally small.
- A flat supply curve is the limit of a downward sloping supply curve as the slope become infinitesimally small.

For the illustrative test question above:

- The market demand curve is downward sloping; the elasticity is negative, but not zero or infinity. A flat demand curve has an elasticity of negative infinity; a vertical demand curve has an elasticity of zero.
- The demand curve facing a competitive firm is flat in the region relevant to the firm's short term pricing decisions. For simplicity, we simply say it is flat.

Question 7.9: Competitive Equilibrium

All but which of the following are true in a competitive equilibrium?

- Marginal revenue equals marginal cost.
- Quantity demanded equals quantity supplied.
- Price equals marginal revenue.
- Price equals marginal cost.
- All of A, B, C, and D are true.

Answer 7.9: E

Statements A and B are true in any industry where profits are maximized.

Statement C is true of a competitive industry. Algebraically, the price curve is the demand curve expressed as $P = f(Q)$. The marginal revenue curve is the $\partial(PQ)/\partial Q$.

$\partial(PQ)/\partial Q = P \Rightarrow \partial(PQ) = P \times \partial Q \Rightarrow P \times \partial Q + Q \times \partial P = P \times \partial Q \Rightarrow Q \times \partial P = 0 \Rightarrow \partial P = 0 \Rightarrow P$ is a constant. This is the definition of a flat demand curve, so the industry is competitive.

Statement D is a combination of statements A and C.

Question 7.10: Competitive Industry

All but which of the following are *characteristic* of a competitive industry?

- Each firm is a small part of a large industry.
- The products of different firms are interchangeable.
- Buyers can easily switch suppliers if the current supplier raises prices.
- Economies of scale are small or zero.
- All of A, B, C, and D are characteristic of a competitive industry.

Answer 7.10: E

None of these is required, but each is characteristic of a competitive industry.

In a competitive industry, no firm has market power, meaning that consumers switch to another supplier if the firm raises its prices (Statement C). This occurs only if the products are interchangeable (Statement B); sophisticated products are less interchangeable.

Illustration: Data base systems are hard to integrate from one vender to another. EDP hardware may be generic, but the software (especially systems software) is specific to the product. Vendors must price the

generic products competitively; the non-interchangeable software and maintenance can be priced monopolistically. In the year before it sold its PC business, IBM had a margin of about 1% on its PC's, but margins of 20% or 30% on its maintenance and systems support businesses.

Statement D: If economies of scale are large, small firms face large barriers to entry.

Question 7.11: Competitive Industry

In a competitive industry, which of the following is most likely to be true?

- A. The firms are the same size.
- B. The firms have the same marginal cost curves.
- C. The firms have the same fixed costs.
- D. The firms sell identical products.
- E. Entry into the industry is relatively easy.

Answer 7.11: E

Statement A: To simplify the mathematics, the textbook often assumes that competitive firms are the same size. In practice, this is not the case. Farm produce is a competitive industry, but farms vary greatly in size.

Statement B: Firms have the same marginal cost for the last unit produced, since

- Competitive firms all charge the same market price.
- In a competitive market, the marginal revenue is the market price.
- A firm prices where marginal cost equals marginal revenue.

But the marginal cost curves of two competitive firms may differ.

Statement C: Fixed costs are not relevant for short term pricing.

Statement D: The products are generally inter-changeable, not identical. This means that a consumer can switch between suppliers without having to change other things; it does not mean that suppliers sell identical products.

Statement E: Ease of entry is the *sine quo non* of a competitive industry.

Question 7.12: Competitive Equilibrium

At a competitive equilibrium, which of the following is true?

- A. Price *equals* marginal cost and the marginal cost curve is *upward* sloping.
- B. Price *equals* marginal cost and the marginal cost curve is *downward* sloping.
- C. Price *equals* marginal cost and the marginal cost curve is at its *minimum*.
- D. Price is *more than* marginal cost and the marginal cost curve is *upward* sloping.
- E. Price is *more than* marginal cost and the marginal cost curve is at its *minimum*.

Answer 7.12: A

Question 7.13: Competitive Industry

In a competitive industry, which of the following is true?

- A. All firms charge the same price.
- B. All firms have the same marginal cost curve.

- C. All firms have the same total profit.
- D. All firms have the same shut-down price.
- E. None of A, B, C, or D is true.

Answer 7.13: A

In a competitive industry, firms are *price-takers*; they all charge the market price. If any firm charged more than the market price, it would lose all its business.

Question: Why doesn't a firm charge less than the market price to gain market share?

Answer: In a competitive industry, a firm can sell all it produces at the market price; it has no need to charge less than the market price.

For statements B, C, and D, we use a numerical illustration. Suppose the market price is 20, and a small firm and a large firm have the following costs:

- Small firm: marginal cost = $10 + 0.1Q$; fixed cost = 100
- Large firm: marginal cost = $5 + 0.05Q$; fixed cost = 1,000

We equate marginal cost and price:

- Small firm: $10 + 0.1Q = 20 \Rightarrow Q = 100$
- Large firm: $5 + 0.05Q = 20 \Rightarrow Q = 300$

We compute for each firm: average variable cost, total cost, profit, and shut-down price. Both firms have linear marginal cost curves, so the average variable cost is the marginal cost at the midpoint of the line segment from zero to the quantity supplied.

- Small firm: $10 + \frac{1}{2} \times (0 + 10) = 15$
- Large firm: $5 + \frac{1}{2} \times (0 + 15) = 12.5$

The total cost is the average variable cost times the quantity supplied plus fixed costs:

- Small firm: $15 \times 100 + 100 = \$1,600$
- Large firm: $12.5 \times 300 + 1,000 = \$4,750$

Total revenue is price times quantity supplied:

- Small firm: $20 \times 100 = \$2,000$
- Large firm: $20 \times 300 = \$6,000$

Profit is total revenue minus total cost:

- Small firm: $\$2,000 - \$1,600 = \$400$
- Large firm: $\$6,000 - \$4,750 = \$1,250$

The shut-down price is the minimum average variable cost, which is \$10 for the small firm and \$5 for the large firm.

Question 7.14: Pricing in a Competitive Industry

All but which of the following are true of a competitive industry in the short run?

- A. The short run marginal cost curve for a firm is typically U-shaped.
- B. Only the *upward*-sloping part of the marginal cost curve is relevant to the firm's supply decisions.
- C. If the market price is less than average total cost, firms raise their prices so that price equals average total cost.
- D. A perfectly competitive firm shuts down in the short run if, at the profit-maximizing quantity, the price is less than the average variable cost of production.
- E. All of A, B, C, and D are true.

Answer 7.14: C

Statement B: Suppose price equals marginal cost and the marginal cost curve is downward sloping. By selling one more unit, the firm makes a greater profit or incurs a smaller loss, so the current quantity cannot be optimal.

Statement C: In the *long-run*, if the market price is less than average total cost, some firms (the least efficient firms, or the firms that have other investment opportunities) exit the market. The lower supply moves the supply curve left and raises it, so the intersection of the supply and demand curves is at a higher price and lower quantity.

Statement D: If the firm shuts down when price is less than average *variable* cost, it loses less money.

Question: Were statement D true, many firms would shut down whenever sales are poor. In fact, firms shut down only rarely; most firms continue operating at a loss until they decide to exit the market.

Answer: For many firms, most of these costs are fixed.

- If the firm pays workers by salary (not by hourly wage), it must fire workers to reduce payroll expense; it can't just lay them off temporarily. The cost of hiring, training, and firing workers out-weighs the short run benefits of lower payroll costs.
- For many (most) firms, a temporary shut-down causes consumers to switch to other suppliers; the loss is greater than the short run cost of continuing to operate. These firms are not in competitive markets, which assume that all consumers continually switch to the lowest cost supplier.
- For many small firms, the largest expense is the opportunity cost of the owner; this is a fixed expense, not a variable expense.
- Most entrepreneurs are optimists, presuming that hard work will get them past periods of low earnings. They presume that business will improve tomorrow (or next week or next month), and they stay in business after a rational firm would leave.

Illustration: An actuary has a private consulting business. The past year, the business earned \$300,000, and its expenses were \$500,000, including the actuary's salary.

- Start up costs are high: If the actuary shuts down the business for a few months, employees may find other work. The cost of searching for new employees (and perhaps a new location) are so great that they exceed the benefits of shutting down.
- Consumers switch to other consultants if one shuts down; it takes years to rebuild the business.
- The actuary's own salary (perhaps \$200,000) is a fixed cost.
- Actuarial consultants are optimists: they believe their work is excellent, and profits will improve as soon as the word gets around.

Question 7.15: Shut down Prices

All but which of the following are true regarding shutdown prices?

- A. The shutdown price is the minimum price that covers average variable costs.
- B. The shutdown price is where the marginal cost curve intersects the average cost curve.
- C. The shutdown price is where the marginal cost curve intersects the average variable cost curve.
- D. Supply curves slope upwards because of diminishing marginal returns.
- E. All of A, B, C, and D are true.

Answer 7.15: B

Only one of B and C can be correct. Fixed expenses do not affect short run supply decisions, such as the shut-down price.

Statement D can be rephrased various ways. In the short-run, some inputs are fixed and some can be varied. Suppose capital is fixed and labor is variable. Hiring more labor means that each worker uses less capital, so productivity declines.

Question 7.16: Price Elasticity of Supply

Which of the following is a possible price elasticity of supply for firms in a competitive industry?

- A. $-\infty$
- B. -1
- C. $-\frac{1}{2}$
- D. 0
- E. $+1$

Answer 7.16: E

The price elasticity of supply is positive, since the supply curve slopes upward.

A zero elasticity means the curve is vertical. This can occur only if the production costs are zero or if the firm is obligated to produce a certain quantity by the government. Neither of these occur in competitive markets.

Question 7.17: Price Elasticity of Demand

Which of the following is a possible price elasticity of demand for firms in a perfectly competitive industry?

- A. $-\infty$
- B. -1
- C. $-\frac{1}{2}$
- D. 0
- E. $+1$

Answer 7.17: A

The demand curve facing the firm is horizontal, or perfectly elastic; this means elasticity of negative infinity.

Question: If the market is not perfectly competitive, would B and C be possible?

Answer: All firms, whether or not they are competitive, produce at the elastic part of the demand curve. On the inelastic part, a reduction in quantity supplied causes an increase in revenue. Since the reduction in quantity supplied reduces costs, the net profit increases; the firm can reduce quantity and raise profits.

Exercise 7.18: Minimum Total Cost

Question: Landsburg says that in a competitive equilibrium, the industry produces at the lowest possible total cost. But competition provides incentives to innovate, and a competitive firm may find a lower cost production method. What does Landsburg mean that the industry produces at the lowest possible cost?

Answer: Competition stimulates innovation, and we expect costs to keep reducing in competitive industries. Landsburg means that we cannot re-arrange production in a competitive industry to reduce costs.

Suppose a competitive industry produces 100,000 identical cellular phones at a total cost of \$10 million. The industry has four firms:

- Firm A produces 40,000 phones.
- Firm B produces 30,000 phones.
- Firm C produces 20,000 phones.
- Firm D produces 10,000 phones.

If we re-arranged production in the industry, so that Firm A produces 10,000 phones and Firm D produces 40,000 phones, the total cost would be more than \$10 million.

Question: If the industry is perfectly competitive and the product produced by all firms is identical, aren't the firms the same?

Answer: The firms are not identical. In some illustrations, Landsburg assumes the firms are identical to show the effects of competition on the number of firms competing in the industry. But the following relations hold in a competitive industry:

- The same price prevails throughout the market (if the product is identical).
- Each firm faces a horizontal demand curve (perfectly elastic), which implies that
- Marginal revenue for each firm equals the market price.
- Each firm has an upward sloping short run marginal cost curve.
- To maximize profits, each firm produces at the quantity where marginal cost equals marginal revenue, which equals the market price.
- Since the market price is the same for all firms, the marginal cost is the same.

Question: Does this imply that the marginal cost for each firm in this exercise is \$100, which is \$10 million divided by 100,000 phones?

Answer: We don't know the price in the exercise. In the long-run, the marginal cost equals the average total cost equals the price. But this exercise deals with the short run, not the long-run. In the short run, the marginal cost equals the price, but this does not necessarily equal the average total cost. The price may be \$120, and the industry is earning short run profits of \$2 million, or the price may be \$80, and the industry incurs short run losses of \$2 million.

Suppose the price is \$120. Firm A's marginal cost for phone #40,000 is \$120. Since its marginal cost curve is upward sloping, its marginal cost for the next thousand phones is \$121 apiece, and its marginal cost for the previous thousand phones is \$119 apiece.

Similarly, Firm D's marginal cost for phone #10,000 is \$120. Since its marginal cost curve is upward sloping, its marginal cost for the next thousand phones may be \$122 apiece, and its marginal cost for the previous thousand phones may be \$118 apiece. The two firms have the same marginal cost at the point of equilibrium, but they do not have the same marginal cost curve.

Suppose Firm A produces 41,000 phones and Firm D produces 9,000 phones.

- The increase in cost for Firm A is $1,000 \times \$121 = \$121,000$.
- The decrease in cost for Firm D is $1,000 \times \$118 = \$118,000$.

The net change in cost for the industry is +\$3,000.

If Firm A produces 39,000 phones and Firm D produces 11,000 phones.

- The increase in cost for Firm D is $1,000 \times \$122 = \$122,000$.
- The decrease in cost for Firm A is $1,000 \times \$119 = \$119,000$.

The net change in cost for the industry is +\$3,000.

Question: What about the long-run? Are the industry's cost minimized for the long-run?

Answer: If price equals average total cost, which is true in a long-run equilibrium, the long-run costs are also minimized. In this exercise, price exceeds average total cost, so the industry is not in long-run equilibrium. The firms will increase production, perhaps by building larger and more efficient production plants. If the industry is not in long-run equilibrium, it can often improve efficiency by moving to a long-run equilibrium.

Exercise 7.19: Shift of Industry Supply Curve

A rise in marginal costs makes a competitive industry's supply curve move leftward for two reasons.

- What are these two reasons?
- Will the output of individual firms rise or fall?

Solution 7.19:

Part A: The two reasons given by Landsburg are

- The marginal cost curve of each firm rises.
- The less efficient firms may shut down.

Part B: The output of an individual firm may either rise or fall, depending on the shapes of the curves and the marginal cost curves of new entrants.