

**Sample Proficiency Exam
Firms and Markets (B01.1303)**

This sample exam has the same format and content as the waiver exam for Firms and Markets. If you need help beyond the answer provided below, you might consult a microeconomics textbook (there are many good ones covering more or less the same material). One of the best is the textbook we'll use for the course this fall: Michael Baye, *Managerial Economics & Business Strategy (Fourth Edition)*, McGraw Hill.

Please answer each question in the book provided. I understand that the honor code applies: *I will not lie, cheat, or steal to gain an academic advantage, or tolerate those who do.*

1. Vitamin C is a generic vitamin produced by many companies: entry is easy, brand names are not important. A good friend – a world-renowned orthopedic surgeon from New Jersey – tells you that he is about to publish in *The New England Journal of Medicine* (a highly respected and widely quoted medical journal) a study indicating that daily doses of 500 mg of vitamin C tend to improve muscle tone and increase physical stamina in adults, with no adverse side effects. Though a very good doctor, he is woefully ignorant about the basic workings of markets. He would like to know what is likely to happen, *and why*, to the price of vitamin C, to the quantity sold, to the profits of the producers, and to the number of firms that produce it. Consider these issues both in the short run and long run. Summarize what you would tell him.

Answer.

One would expect demand to increase as a result of the article. In the short run, supply is fixed. We would therefore observe a move along the supply curve, with both price and output going up. Current producers would see profits go up. The extent of the price hike would depend on the steepness of the supply curve: the steeper the short-run supply curve is, the greater the price increase.

In the long run, one would expect the supply function to shift right, as new producers enter the market and existing producers expand their capacity. If demand stays high, this would correspond to a movement along the demand curve, with output going up and price going down. Since there is easy entry, you wouldn't expect a high return on investments in new capacity.

To summarize: We would expect price to go up in the short-run, then back down in the long run, possibly to almost the same level as the initial level. As to output, we would expect it to go up, with a greater increase in the long run than in the short run.

Except for a short-term impact on current producers, we would not expect much if any increase in profit.

2. The Village Globe Theatre (off-off-off-Broadway) sold 175 tickets at \$10 per seat at its last show. In an experiment, they raised the price to \$11, and subsequently sold 150 tickets.
 - (a) Estimate the price elasticity of demand in the vicinity of \$10/seat; show your work.
 - (b) If the demand curve is linear and the theater wants to increase its revenue, should it increase or decrease its price (from \$10) or leave it unchanged? Explain.

Answer.

- (a) Price elasticity: $-10/7 = -1.43$.
 - (b) Decrease. There are three ways to see this. One is that revenue falls when you raise price, so you might guess that reducing price raises revenue. Another is the elasticity: since it's less than one (in absolute value), revenue increases when you decrease price. Finally, you can extrapolate demand to other prices since you're told that demand is linear: each one-dollar reduction in price is associated with an additional 25 tickets. You can work out the revenue directly (multiply price times quantity).
3. You have a monopoly over the production and sale of zooghorns, a patented new instrument that has become popular with grunge bands. Your marketing experts have estimated that the annual worldwide demand for zooghorns will be:

<u>Price</u>	<u>Quantity</u>
\$1000	0
900	100,000
800	200,000
700	300,000
600	400,000
500	500,000
400	600,000
300	700,000

Your production engineers estimate that production of zooghorns requires an initial set-up cost of \$30 million and a marginal cost of \$400 per horn.

- (a) Based on this information, what price should you charge and what quantity should you produce and sell? Explain how you arrived at your answer.
 - (b) What is the elasticity of demand at this price and quantity?
 - (c) The City of New York, always desperate for tax revenue and realizing that the Bronx is the only place that zooghorns can be manufactured, decides to place a special annual tax of \$30 million on your operations. How will this affect your price and quantity decisions? Explain.

Answer.

- (a) Sell $q=300,000$ at a price $p=\$700$.

-
- (b) The elasticity of demand is $-7/3 = -2.33$. Why? The elasticity is $(dq/q)/(dp/p)$ at the values $q=300,000$ and $p=700$.
- (c) There should be no change in quantity or price. The tax is a fixed cost; it affects nothing at the margin.

4. You are the marketing manager of Apple and must consider the introduction of a new, stripped down version of the iMac, nicknamed the “Baby iMac.” The challenge is to target a new market segment. Last year, you sold 1 million iMacs for \$1,500 each to a market segment we’ll refer to as “high-end users.” Market research tells you, however, that there is a second market segment (“low-end users”) of 2 million people who might be interested in the Baby iMac. would be willing to pay up to \$500 for a Baby iMac. Your market researchers tell you that (i) the first segment (current buyers of the iMac) would be willing to pay up to \$800 for the Baby iMac and no more than \$1500 for the iMac itself; (ii) the second segment would be willing to pay up to \$500 for a Baby iMac but no more than \$600 even for iMac. Finally, your production people tell you that it costs \$300 to produce either version.

What prices should you set for the two models?

Answer.

Let’s approach the problem by considering a range of possible pricing strategies, and choosing the one that generates the highest profit. One possible strategy (call it the “benchmark”) is to only sell the full version and charge \$1,500. You would sell 1m units (the price is beyond what segment 2 will pay) for a total profit of $(1500 - 300) \times 1m = \$1.2b$. A second possible strategy would be to target the two models at the two segments, charging (say) \$500 for the Baby and \$1500 for the full iMac. Would this work? No! Segment 1 gets no value from buying the full iMac (it’s priced at exactly their value), but $300 = 800 - 500$ from the Baby version. Thus they would buy the stripped-down version. An alternative strategy is to charge \$1,200 for the full iMac (think of this as slightly less) and \$500 for the Baby. This will lead high-end users to pay \$1,200 and low-end users to pay \$500. Total profit is now $(500 - 300) \times 2m + (1200 - 300) \times 1m = \$1.3b$, an improvement over the current solution. It’s an illustration of how “versioning” allows companies to target multiple customer segments.

5. Define, explain briefly, and give an example of:
- (a) Network effect.
- (b) Signal.

Answer.

- (a) A network effect arises when the value to an individual of using a product or service depends on the number of other users of the same product or service. Benefits can occur because of the opportunity for more interactions; costs can arise because of congestion. Examples: telephone system (value depends on how many other people have phones), fax machines, and the internet (ditto) are examples.

(b) Again, suppose there is hidden information about buyers or sellers. A signal is a mechanism that helps the person with the information to convey it to others. An example is a warranty. Suppose that the quality of a product is unknown. A warranty is presumably more expensive to sellers of low quality products. As a result, you might expect it to be offered only by producers of high-quality products. The offer of a warranty would therefore serve as a "signal" to buyers that the product is of high quality.

6. From the perspective of the seller, a sealed-bid auction is generally to be preferred to an open-outcry (ascending-price) auction. Do you agree?

Answer.

No, generally not. A sealed-bid (highest-price bidder gets the item at the price that he/she bid) introduces potential elements of strategy, because each bidder wonders whether he/she is bidding higher than is necessary in order to win. So bidders may shade their bids downward, yielding less for the seller. (A second-price auction avoids that problem.) An open-outcry auction introduces no such strategic issues, since the bidder should simply keep bidding until he/she is the only one left or until the price has exceeded his/her expected value from the item. The only potential advantage to a sealed-bid auction is that it is less susceptible to collusion among bidders than is an open-outcry auction.

7. Two airlines, Flibinite Airways (FA) and Dayrdevl Inc. (DI), offer competing services on the Cleveland/Newark route. No other airlines fly this route. The companies are now considering possible advertising/promotion campaigns for next year, for which they will make commitments in December. Each is considering both a "modest" and a "heavy" campaign. Since they compete with each other, the campaign of each would have consequences for the other's sales and profits. Also, since FA has a somewhat better safety record and a stronger brand name, its profits are higher. The estimated annual profits (in \$ millions) that each company could expect are known to each other (they have been reported in the trade press) and are as follows:

		FA	
		M	H
DI	M	80	20
	H	50	40

- (a) If each airline chooses its campaign without knowledge of the other's choice, what campaigns are they likely to choose? Explain.
- (b) A consultant to FA has suggested that FA could commit to a choice of campaign in November and publicly announce its choice. Do you think that this is a good idea? Explain.

Answer.

- (a) FA chooses heavy; DI chooses heavy. Why? Heavy is a dominant strategy for FA: it produces higher payoffs whether DI choose modest or heavy. DI knows this, and therefore chooses heavy as well. Put another way, this is the Nash equilibrium.
- (b) Yes. If FA commits to moderate, then DI will also choose moderate, and FA's profits will be higher.

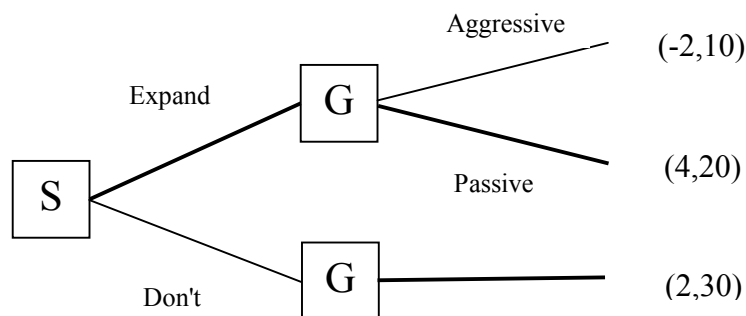
8. You are a small firm in a business dominated by a giant who has 75% of the market. Your current challenge: to decide whether to expand your capacity. If you don't, you expect to earn \$2m, as you did last year. The giant will earn \$30m. If you do expand, your profits depend on whether the giant responds aggressively by cutting its price or passively by maintaining price at its current level. The giant's motivation is to use the threat of a price war to discourage you from expanding. The estimated possible payoffs if you expand are:

- If the giant responds aggressively, you will lose \$2m and the giant earns \$10m.
- If the giant responds passively, your profits increase to \$4m and the giant earns \$20m.

Use a game tree to study the strategic interactions between you and the giant. Should you expand capacity?

Answer.

Yes. The giant should realize that a price war is a poor strategic choice: once you've expanded, it makes more being passive (20) than being aggressive (10). Realizing this, you should expand. The game tree looks like this (S for small, G for Giant):



The payoffs at the end list yours first (the convention is to list payoffs in the same order as moves), then your competitors' payoff. The best choice at each branch is noted in bold. The equilibrium is (Expand,Passive).