1. Suppose Tub-A-Lub is a plastic swimming pool manufacturer and the plastic swimming pool industry is perfectly competitive. Tub-A-Lub can sell each swimming pool for $110 and has marginal costs indicated in the table below.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>TVC</th>
<th>Marginal Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>1</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>160</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>220</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>300</td>
<td>95</td>
</tr>
<tr>
<td>5</td>
<td>395</td>
<td>105</td>
</tr>
<tr>
<td>6</td>
<td>500</td>
<td>115</td>
</tr>
<tr>
<td>7</td>
<td>615</td>
<td>125</td>
</tr>
<tr>
<td>8</td>
<td>740</td>
<td></td>
</tr>
</tbody>
</table>


The marginal revenue of a pool is $110. In the short run, Tub-A-Lub will produce 6 pools (they will produce the sixth because MC<MR and not produce the seventh because MC>MR).

\[
\text{TR}=110 \times 6 = 660, \quad \text{TVC}=90+70+60+95+105=500, \quad \text{TFC}=150
\]

Profits=660-500-150=+10

In the long run, Tub-A-Lub stays in business and continues to produce 6 because profits are positive (assuming price and costs do not change).


The marginal revenue of a pool is still $110 and the change in fixed costs from $150 to $200 does not change marginal costs. Therefore, Tub-A-Lub will still produce 6 pools in the short run.

\[
\text{TR}=110 \times 6 = 660, \quad \text{TVC}=90+70+60+95+105=500, \quad \text{TFC}=200
\]

Profits=660-500-200=-40

In the long run, Tub-A-Lub exits the industry because profits are negative (assuming price and costs do not change).
2. The graph below depicts the cost curve of a firm in a perfectly competitive industry. Suppose the market price is $24.

\[d=MR\]

a) What is the total fixed cost (TFC) for this firm? Show calculations.
At an output of 3, the ATC is 18 and the AVC is 8. Therefore, the AFC=ATC-AVC=18-8=10 and the TFC=AFC*Q=10*3=30. You can do this same calculation at any output level.

b) What are the profits if the firm maximizes profits? Show graphically.
At a price of $24, the firm’s demand curve and MR curve are depicted above. Profits are maximized where MR=MC which is at an output of 6. At an output of 6, TR=24*6=144 and TC=ATC*Q=18*6=108. Therefore, profits are TR-TC=144-108=36.

c) How much would the firm’s profits increase if the firm increases output from 4 to 7? Show calculations.
Increasing output from 4 to 5 increases profits by 6 because the MC of the 5th unit is 18 and the MR is 24. Calculated in the same manner, increasing output from 5 to 6 increases profits by 24-22=2 and increasing output from 6 to 7 decreases profits by 24-26=-2. Therefore, profits increase by 6+2-2=6 if the firm increases output from 4 to 7.
3. The graph below depicts the demand curve and cost curves of a monopolist.

![Graph showing demand curve (D), marginal revenue (MR), marginal cost (MC), average total cost (ATC), average variable cost (AVC), and profit line (Profits)].

a) What are the profits of this firm? Show all your calculations. Show profits on the graph.

\[ MR = MC \text{ at } Q = 5. \] Therefore, \[ P = 11, TR = 11(5) = 55, TC = ATC(Q) = 4.75(5) = 23.75 \text{ and } \]
\[ \text{Profits} = 55 - 23.75 = $31.25. \] Area denoted as profits above.

b) How much do the firm’s profits increase or decrease if the firm produces an output of 7 units compared to an output of 6 units? Explain.

The MR associated with producing the 7th unit (i.e. going from an output of 6 units to an output of 7 units) is $3 and the MC is $9. Therefore, profits decrease $6 when output is increased from 6 to 7 units.

c) Does the profit maximizing firm produce the efficient level of output? Explain why or why not.

No because there are consumers who do not buy the good even though their valuation for a unit of the good is greater than the MC incurred by the firm from producing that unit. The consumers valuations are reflected by the demand curve. Consider the 6th unit. There is a consumer whose valuation (benefit) of that unit is $10.50 and the MC associated with the 6th unit is $7. You can use the same argument to argue that the efficient level of output is 6.6 units.
d) Now suppose the government imposes a $4 per unit tax on consumers that purchase from the monopolist.

Using the graph above, determine the monopolist’s profits after the $4 per unit tax is imposed. Show your calculations and depict graphically.

A $4 per unit sales tax shifts the demand curve downward by $4 to D’. Based on demand D’, MR=MC at Q=4. Therefore, P=8, TR=8(4)=32, TC=ATC(q)=4.25(4)=17 and Profits=$15.
Ares-Serono SA of Switzerland has conceived a fertility drug that is easier to make, more convenient for women to inject and higher in purity and consistency. Similar drugs have been derived from the urine of postmenopausal women, involving complex collection procedures and purification: when orders surged, companies couldn’t always produce enough.

Serono’s new bioengineered drug, Gonal-F, eliminates the use of human urine and ensures an adequate supply. But the price is high … and a woman may use two dozen or more per (month). Serono attributes the price to the need to recoup the costs of research and new production facilities. Nonetheless, “People will pay whatever it takes to have a baby. It’s an emotional issue,” says drug-industry analyst Hemant Shah.

The graph below depicts the daily demand for Gonal-F. Suppose Serono’s total fixed cost is $20,000 and their marginal cost of producing an ampule of Gonal-F is constant at $40. (Based on the article, an ampule is the unit of quantity.)

a) If Serono is profit maximizing, does their statement attributing the high price for Gonal-F to their need to recoup the costs of research make sense? EXPLAIN.

No because research is a fixed cost so it should not affect price.

b) What are Serono’s daily profits from Gonal-F?

70*3000-40*3000-20000=70000
5. Read the article below entitled “The Tricky Business of Rolling Out New Toilet Paper”.

Suppose the graph below depicts the yearly demand (D) and cost curves for Kleenex Cottenelle’s new toilet paper if they do not spend anything in promoting the brand. If they do promote the brand, the demand for the new toilet paper increases demand from D to D’.

(a) If promoting costs Kleenex Cottenelle $50,000, should they pay the $50,000 for promotion? Show calculations.

Profits if don’t promote: 200*500-140*500=30,000. Profits if promote: 260*700-130*700-50000=41000. Promote because profits are greater.
The Tricky Business of Rolling Out a New Toilet Paper
By Tara Parker-Pope

The Wall Street Journal
Page B1

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Marketers of bathroom tissue have used everything from puffy clouds to cuddly babies to advertise their products. Now Kimberly-Clark wants to talk about the real reason people use toilet paper.

Testing the limits of how much consumers want to hear about what goes on in the bathroom, the maker of Kleenex Cottonelle is spending $100 million to promote the brand as the toilet paper that wipes better than regular tissue, thanks to a new "rippled texture." New ads begin today and ten million free samples will be hung on doorknobs in the eastern U.S., where the product will first appear.

The new texture is "designed to leave you feeling clean and fresh," promise the ads from WPP Group's Ogilvy & Mather in Chicago. Another ad claims that "discriminating toilet paper users" prefer the tissue because it "left them feeling cleaner than the leading brand." The name, Kleenex Cottonelle, will remain the same, as will the price. The tagline: "Your fresh approach to toilet paper."

Talking about the way a toilet paper performs is a major departure for a category that for years has focused on squealzable softness, quilted softness and cottony softness. Are consumers who remember seeing Mr. Whipple squeeze the Charmin ready to hear even a hint of what he did with the product?

Kimberly-Clark is convinced that they are. And the ads call it by the name most consumers use: toilet paper. This is, after all, familiar territory for the maker of the Kotex, the first feminine-care product ever advertised. The company also pushed the boundaries of personal-care advertising when in 1981 its Depends brand launched the first national-television advertising for an adult-incontinence product.

More recently, the company has tacitly acknowledged the unpleasant task of cleaning baby bottoms as it boasts that its Huggies baby wipes "clean like a washcloth."

"If we have news that's important for a consumer, then we can find a way to tastefully communicate it," says Tom Falk, group president of Kimberly-Clark's North American tissue, pulp and paper business. "It's graphic, but [the textured tissue] really feels very different."

This is Kimberly-Clark's biggest push ever in the $3.5 billion-a-year U.S. toiletpaper business, where it is a relative newcomer. Its original Kleenex toilet-tissue brand struggled after its introduction in 1990.

The company merged with Scott Paper, maker of the Scott and Cottonelle brands, in 1995 and created Kleenex Cottonelle, which helped Kimberly-Clark gain a 23% share of the market. But it trails rival Procter & Gamble's Charmin, which has 30%. Among premium tissues, Kleenex Cottonelle still ranks a distant fourth behind Charmin, Fort James's Northern and Georgia-Pacific's Angel Soft.

Overall, bath-tissue sales are flat and premium brands are losing share to economy-priced tissue. Many toilet-paper consumers treat the brands as interchangeable and simply shop for the best deal. Even the industry's most recent innovation -- the triple-sized roll from Charmin -- is about value, rather than improved performance.

Kimberly-Clark hosted focus groups to talk to consumers about toilet paper, and asked them to compare leading brands with the new Kleenex Cottonelle textured tissue. They discovered that even though tissue advertising doesn't talk about how well a toilet paper wipes, that is what customers are thinking about.

Nonetheless, Kimberly-Clark marketing executives quickly discovered there were limits to what they could say. In advertising focus groups, it became clear that words such as "hygiene" and "cleansing" conjured up unpleasant images about the "process" of using toilet paper, rather than the final benefit.

"You can quickly cross a line where consumers say, 'Yeah, that's what the category is all about, but please don't go there,'" says Kent Willetts, marketing director for Kleenex rolled products. "Our big challenge was how do you talk to people about it."

The advertising solution is an anthropomorphic roll of toilet paper with a heavy British accent (the voice of London actress Louise Mercer from the old NBC sitcom "Dear John"). "I'm new Kleenex-Cottonelle toilet paper, and I understand you have a cleaning position available," the tissue says. "I have a unique, rippled texture designed to leave you feeling clean and fresh. I'd love to show you what I can do."

In another ad, the tissue brags that consumers prefer it to the leading brand. "Looks like all my bottom-line thinking is paying off," the tissue says. For now, the ads will claim only that consumers say the new tissue leaves them feeling cleaner than other brands, but Kimberly-Clark is "working on a way to objectively measure cleaning better," says Mr. Willetts. "There's no method right now."

The rippled texture is the result of a patented technology that dries the tissue during manufacturing without crushing it flat and later embossing it, the older approach. This method also allows the tissue to hold its rippled shape when wet, allowing it to clean better, the company says.

Thanks to a $170 million investment in a Beacht Island, S.C., manufacturing site, the process uses less fiber while improving the bulk and strength of the tissue. As a result, the company's manufacturing costs per roll are 20% less than those for other premium tissues.

With the price to consumers remaining the same, the extra margin will help Kleenex Cottonelle better withstand the price wars plaguing the tissue category and let the company spend more on marketing and advertising to grab market share.

"It's a very delicate thing, but it has the potential, if it's done right, of taking a major share of the toilet paper market," says George Rosenbaum, chief executive of Chicago market researcher Leo J. Shapiro & Associates. "When you revisit cleaning, you're opening up a number of issues that years of product promotion have been silent about."

The $100 million launch budget is more double what Kimberly-Clark spent on the brand last year. About $20 million to $30 million will go toward national television advertising, including 18 weeks of prime-time TV. In addition to the door-to-door sampling, another million single rolls will be available in stores for 50 cents each in the Eastern U.S.

As is typical in the paper-products industry, it probably will be at least 18 months before the product is available elsewhere, because Kimberly-Clark will have to build a new tissue-making plant to supply the remaining two-thirds of the country.

In the meantime, the company will launch a new, softer version of Kleenex Cottonelle in the rest of the U.S. Those more-traditional ads show a bubble drifting onto folds of toilet tissue. But the product package includes the "clean, fresh feeling" promise, in an effort to prime consumers for the eventual appearance of the textured tissue nationwide.

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6. The graph below depicts the demand curve and cost curves for a particular medical procedure from the East Lansing Medical Clinic.

Calculate profits if the medical clinic can perfectly price discriminate. Show your calculations.

When a firm can perfectly price discriminate, the demand curve equals the MR curve so to maximize profits (at MR=MC), the medical center would see 60 people (Q=60). The total revenue (TR) would be TR=.5(60)(30)+20(60)=2100. Total cost (TC) of producing 60 is 1500 because TC=ATC(Q)=25(60)=1500. Therefore, profits equal 2100-1500=600.
Let the Love Boat’s total capacity be 200 passengers. Suppose total fixed costs (TFC) are $50,000 and marginal cost (at quantities less than and equal to capacity) is constant at $100. (The marginal cost is extremely high when quantity is more than capacity.) What are the Love Boat’s maximum profits if they are able to third degree price discriminate (i.e., charge senior citizens a different price than non-senior citizens)? SHOW CALCULATIONS.

The Love Boat would charge senior citizens a price of $200 and have 50 senior citizens as passengers. The Love Boat would charge non-senior citizens a price of $300 and have 100 non-senior citizens as passengers. [Note that the total number of passengers (150) is less than the total capacity of 200. Note also that the marginal cost curves for senior citizens and non-senior citizens are not precise on the graphs. The reason is that the marginal cost for the senior citizens depends on the number of non-senior citizens who are passengers. The reason this is the case is due to the capacity constraint.] Profits would be 200*50+300*100-50,000-100*150= -25,000.
8. Suppose you own a tennis club in East Lansing. You decide that your pricing structure will be a 2-part tariff (same as a two-part pricing scheme). You will charge a membership fee and a price per game of tennis. There are two types of consumers: Type I and Type II. There are twenty Type I consumers and five Type II consumers and you cannot tell them apart. Their demand curves for tennis games are depicted on the graphs below.

Suppose you set a price per game of $6. Based on this price per game, what membership fee should you set in order to maximize profits? Based on this 2-part tariff, what are your profits? Show your calculations and explain.

At a price per game of $6, Type I consumers play 7 games of tennis if the membership is not too high. Type I consumers are willing to pay a maximum of $19 + $17 + $15 + $13 + $11 + $9 + $7 = 91 or \(0.5 \times 7 \times (20 - 6) + 6 \times 7 = 91\) for the 7 games. Therefore, the maximum membership you can charge them is $91 - (6)7 = 49\). Type II consumers play 12 games and are willing to pay a maximum of $29 + $27 + $25 + $23 + $21 + $19 + $17 + $15 + $13 + $11 + $9 + $7 = 216 or \(0.5 \times 12 \times (30 - 6) + 6 \times 12 = 216\) for the 12 games. Therefore, the maximum membership you can charge Type II consumers is $216 - (6)12 = 144$.

By charging a membership fee of 49, everyone joins the tennis club and \(TR = 20[49 + 6(7)] + 5[49 + 6(12)] = 2425\). The total number of tennis games played is \(20(7) + 5(12) = 200\). At \(Q = 200\), \(ATC = 7.50\) so \(TC = 200(7.50) = 1500\). Therefore, profits are \(2425 - 1500 = 925\).

By charging a membership fee of 144, only Type II consumers join the tennis club and \(TR = 5[144 + 6(12)] = 1080\). The total number of tennis games played is \(5(12) = 60\). At \(Q = 60\), \(ATC = 16\) so \(TC = 60(16) = 960\). Therefore, profits are \(1080 - 960 = 120\).

Profits are greater if you set a membership fee at 49 so that everyone joins.