Tutorial 4 - Pricing

1. Discussion question

Read the following articles that are available on Canvas:

Daripa and Kapur (2001), 'Pricing on the internet', *Oxford Review of Economic Policy* 17(2), pp. 202-16.

Nikas, J. (2015), "Now prices can change from minute to minute" from *Wall Street Journal.*

Now consider the following questions:

- The article by Daripa and Kapur (2001) is somewhat dated, but nonetheless it is instructive as to how the internet might change 'pricing' behaviour. What are some of the key behaviours they identify? Have they come to fruition? Why or why not?
- What does the article by Nikas highlight has happened to pricing behavior of firms in light of the possibilities that are available from the internet?

Per Daripa & Kapur

- *There are a few competing considerations here. For some things that were previously paid for (they mention the Encyclopaedia Britannica), the internet has effectively made them free. While this is really a public good question/ problem, the example is illuminating. As an aside, goods (and in particular information such as Encyclopedia Britannica) is increasingly being 'paid for' through advertising. More recently, news sites are increasingly putting up pay walls. In some cases, the internet has driven prices down, in other cases it hasn't. Moreover, there is an assertion in the paper that we might expect price dispersion to fall as the comparison of prices across firms becomes easier. It is important to consider some of the issues.*

- *Why does/ might the internet make a difference to pricing? It might depend on:*
  a) *Cost structure of the industry – does online commerce facilitate ease of entry and exit?*
  b) *What does the internet do to search costs (remember these are really just part of the TCs associated with buying and selling). If search costs are reduced, it may be the case that price dispersion falls. But note the point highlighted in the article – the internet also gives the seller more information. In fact, the authors list four developments that the internet facilitates:*
     (i) Price comparisons can be fudged.
     (ii) Sellers can track rivals pricing decisions.
     (iii) Information on purchasers can now be collected.
     (iv) Switching costs can be created.

- *Some goods are homogeneous and comparisons are straightforward. You might think that this should lead to lower prices and less price dispersion. It might but then you might want to consider what online buying does to the **total** price paid by buyers. That is, consider how other parts of the prices paid by buyers (the TCs) might change. Moreover, price dispersion may still exist. Firms offer extras, or familiarity to the buyer and can sustain higher prices. The latter create switching costs through things like loyalty schemes.*
- *Information goods are tricky – think about what has been happening to newspapers over the past decade. Entertainment and the way it is delivered has changed the way that we live. Try to think about the strategies that firms use and why they use them. Pricing, pay walls, subscription services etc. The real problem here is one of the good being a purely public good in nature.*
- *Ask yourself if you think that price discrimination is likely to facilitated by the internet. Why or why not? What other examples are there of this (i.e. technology being used to track who we are, what we purchase etc). In the article they suggest that the internet makes it more difficult to discriminate on the basis of geography – do you agree? What other types of discrimination or pricing strategies might be facilitated by the internet which are identified in the paper (think of the reference to aggregation, versioning). These are some of the strategies that were discussed in the lecture. Recall the example of how a firm could offer two versions of software. This made sense when there was heterogeneity among customers and a profit maximising strategy was to get the price insensitive customers to pay more. A different example is presented in this tutorial where we discuss the problem of magazine subscriptions.*
- *Also, note the discussion about auctions. The internet has made the use of auctions much easier. This removes the need for a posted price – but note that auction are subject to pitfalls for buyers and sellers.*

In terms of the article by Nikas, the zoo can be thought of like a plane – there is a fixed capacity of individuals who can fit into it and if not used it expires. The dynamic pricing described here is just like what is described in terms of airlines.

What are the implications of such practices? For one they suggest in the article by Nicas that on average consumers or users will pay more. The results from the zoos use of dynamic pricing would suggest this is indeed the case – revenue increased by around 12%, though it is not clear what has happened to the average price. A classic case of the implications of such pricing practices is alluded to in the article by Nicas – previously taxis went to people who were in the right place at the right time (or stood in the que the longest). Now with Uber they go to the people that have the greatest willingness to pay – willingly or not.

Of course, the reason that such 'dynamic pricing is working' is because it is possible now with greater data available to identify just how much demand there is, along with historical data that allows for the determinants of demand to be identified. Think of Coca-Cola and hot days (discussed in the article), even if it is not always successful.

2. Suppose that the demand curve for telephone services is given by the following:

$$P = 20 - Q$$

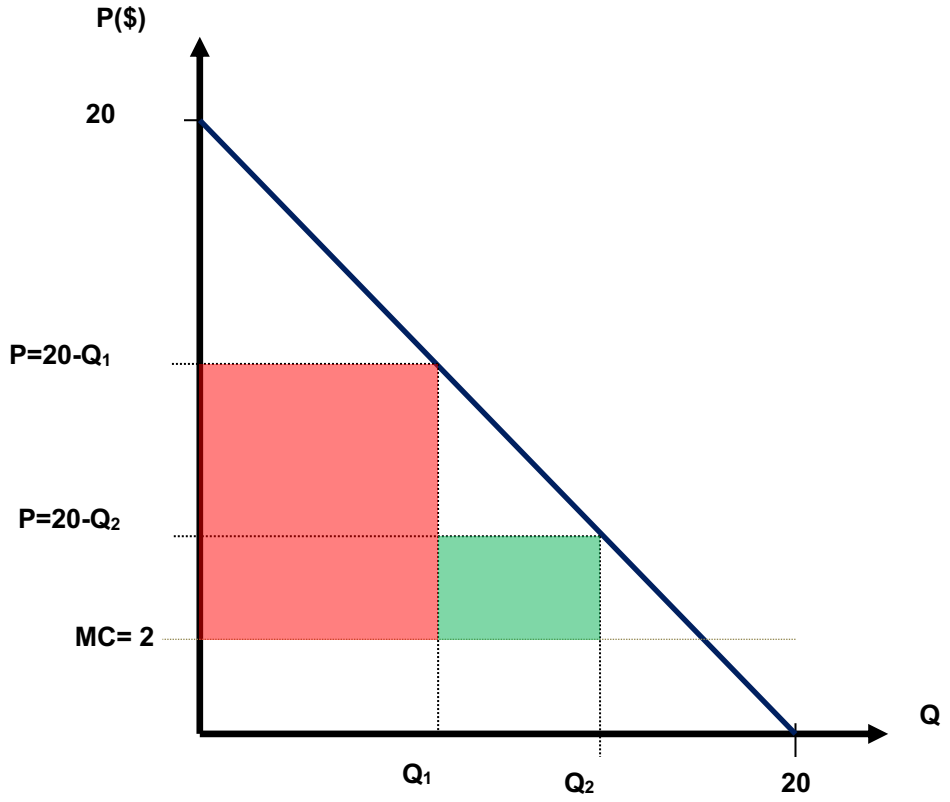
If a telecommunications firm uses quantity discounts to maximise profits, what is the price and quantity associated with each block?

Hint: Assume that there are only two blocks. That is, for this question the firm charges one price for the first Q_1 units and a different (lower) price for the second set of units.

Solution:

Here, the best way to go about the question is to first draw a diagram. Suppose that the firm chooses to use two blocks, with the first block equal to Q_1 and the second block at Q_2. It charges one price (P_1) for the first block, and a second price of P_2 for the second block. Given a constant MC of 2, with this strategy the firm's profit will be given by the red shaded area (for the first block) plus the green shaded area (for the second block) in the diagram below.

Now we can write out the firm's maximisation problem.



$$\max_{Q_1, Q_2} = (20 - Q_1)Q_1 + (20 - Q_2)(Q_2 - Q_1) - 2Q_2$$

The First order conditions are:

FOC Q_1:

$$20 - 2Q_1 - (20 - Q_2) = 0$$

$$Q_1 = 0.5Q_2$$

FOC Q_2:

$$20 - 2Q_2 - Q_1 - 2 = 0$$

$$Q_1 = 2Q_2 - 18$$

So, solving for Q_1 and Q_2 we get Q_1 = 6 and Q_2 = 12 with corresponding prices P_1 = 14 and P_2 = 8.

3. Assume that a travel agency is selling holidays to Europe. Those holidays consist of an airfare and or a hotel. Assume there are three customer types with valuations given by the following:

Customer	*Airfare*	*Hotel*
1	100	800
2	500	500
3	800	100

Finally, assume that the marginal cost of the airfare and the hotel is $300.

What are the optimal prices of the air fare and the hotel if there is no bundling?

If the airfare and hotel are sold as a bundle, what is the optimal price of the bundle?

If optional bundling is used, what are the optimal prices of the airfare, the hotel and the bundle?

Solution: Let's work through the possibilities methodically.

(i) No bundling

$P_A = P_H = 100$ *here the firms sells both the flight and hotel to everyone but makes a loss because the MC of each is 300*
$P_A = P_H = 500$ *here the firms sells two hotels and two flights (each customer buys as long as their valuation is greater than or equal to the price). Profits are \$800 = 4x\$500-4x\$300.*
$P_A = P_H = 800$ *here the firms sells one hotel and one flight (each customer buys as long as their valuation is greater than or equal to the price). Profits are \$1000*

(ii) Pure bundling – that is only offer a bundle

$P_B = 900$ *here the firms sell the bundle to each customer. Revenues are \$2700 and costs are \$1800 for a profit of \$900*
$P_B = 1000$ *here the firms sell only one bundle to customer 2. Revenues are \$1000 and costs are \$600 for a profit of \$400*

(ii) Mixed or optional bundling – that is offer a bundle but also the items individually. Note that here that customer 1 has a valuation for the air ticket that is less than its MC, similarly customer 3 has a valuation of the hotel room that is less than its MC.

What to do? Adding an extra through bundling won't increase profit for these customers because the additional costs for customers 1 and 3 doesn't exceed the extra surplus that could be extracted. Hence, you don't really want these customers to take the bundle. Instead, you want to sell them the individual items at the highest possible price while still encouraging the second customer to take the bundle.

$P_A = 800, P_H = 800, P_H = 1000$ *. In this case the firm will sell the hotel to customer 1, the ticket to customer 3 and the bundle to customer 2. Total sales are \$2600, costs are \$1200 and profit is \$1400. This strategy maximizes profit.*

4. Consider a newspaper that creates an online portal through which to sell stories. Assume that there are two types of buyers, students and non-students. Each has the following demand where *q* represents the number of stories read each month:

$$P_N = 100 - q$$

$$P_S = 80 - q$$

Further, assume that the marginal cost of producing stories is zero.

(a) If the newspaper can identify different types of buyers, what price will they charge students and non-students for an all or nothing deal? That is, one in which a package of a maximum number of stories is offered at a fixed price per month?

(b) What is the most that students will pay for reading 80 articles per month? How much will non-students pay to read up to 80 articles per month?

(c) What is the maximum price that the newspaper could charge for the 100 articles per month if it wanted the non-students to prefer this to the 80 article per month option?

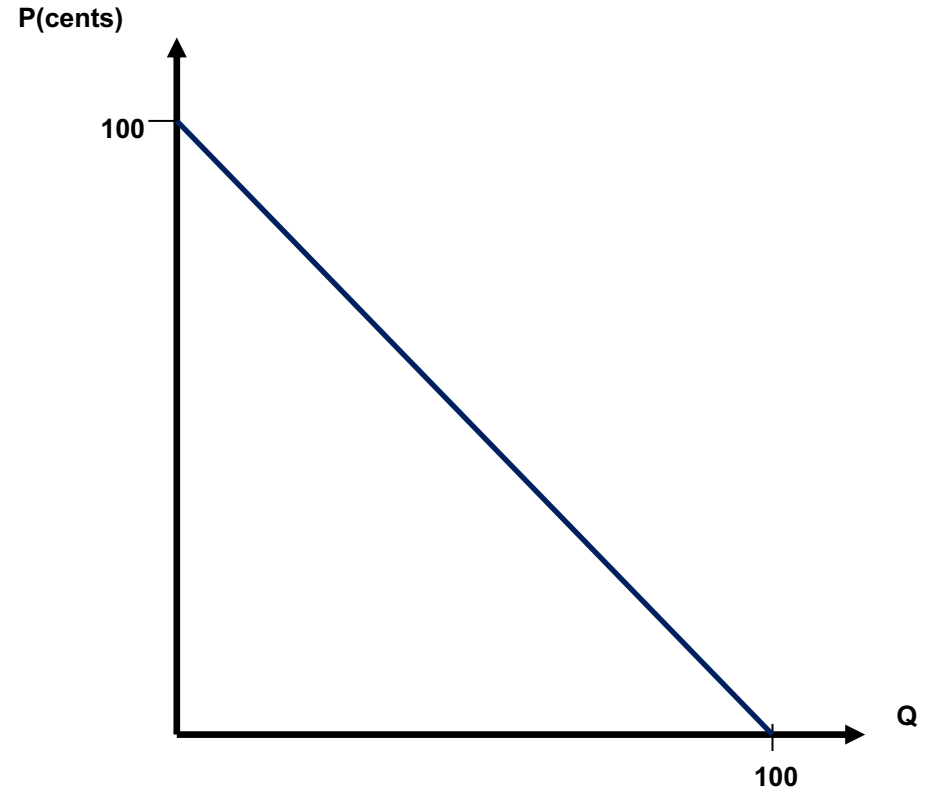
(d) Suppose that only 60 articles per month are included in the student subscription, what is the maximum it could charge for this and still get students to pay? How much surplus would a non-student get from the student package?

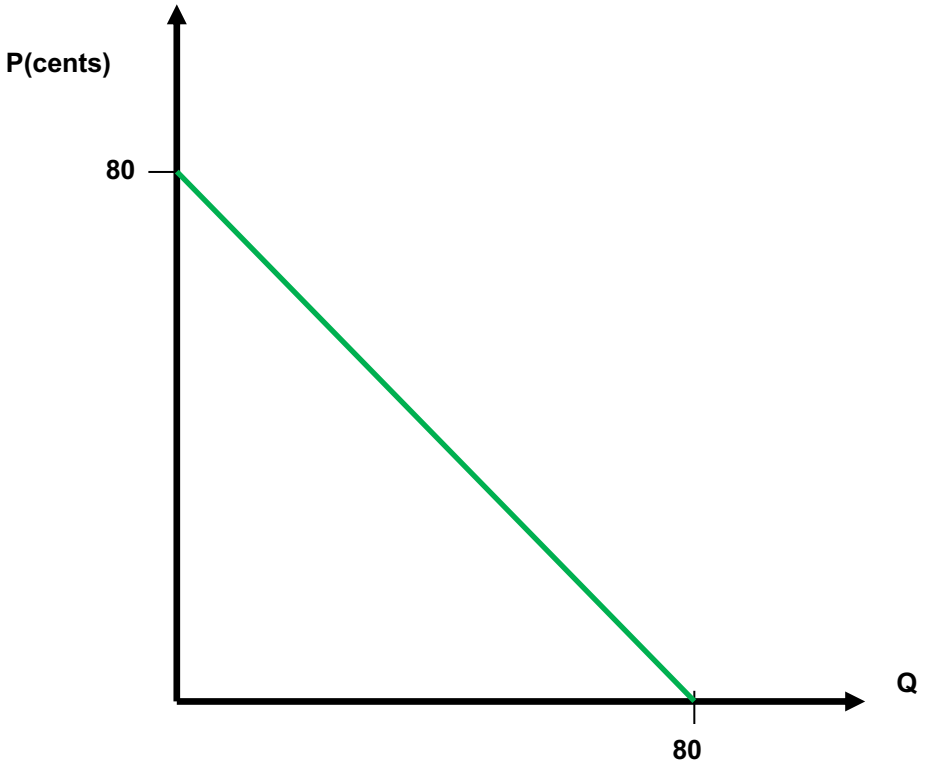
(e) How much could the newspaper charge for the 100-article package and still ensure that non-students buy it rather than the student package?

(f) Which set of offers (the 60 and 100 article subscriptions, or the 80 and 100 article subscriptions) offers the highest profits?

Solution:

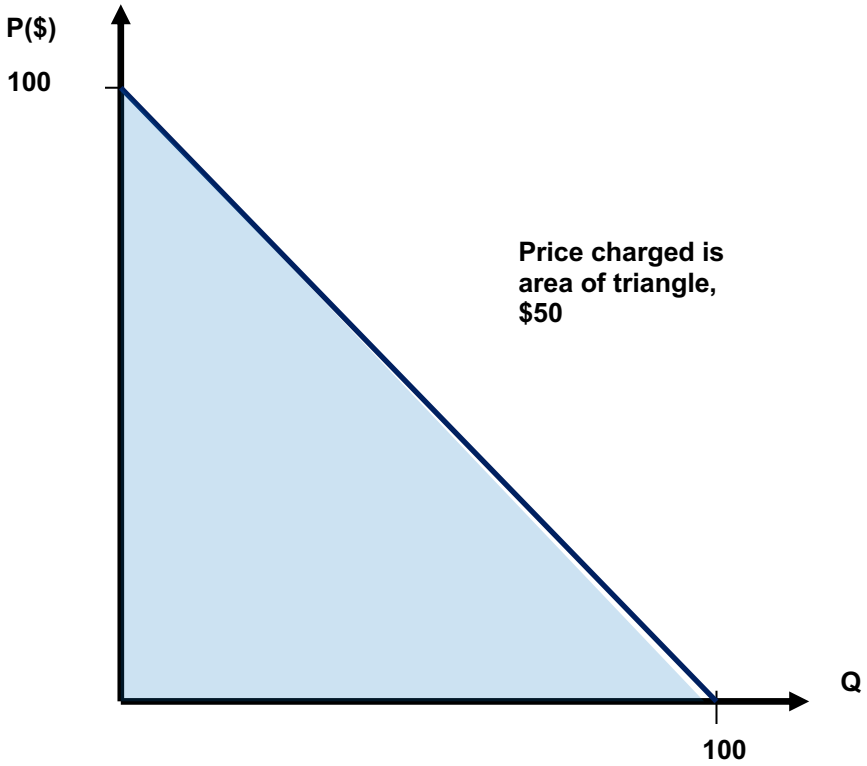
This is really just a menu pricing problem. The key to understanding it is that the area under the demand curve is equal to the total willingness to pay. Below we have the demand curves for the non-student and students.

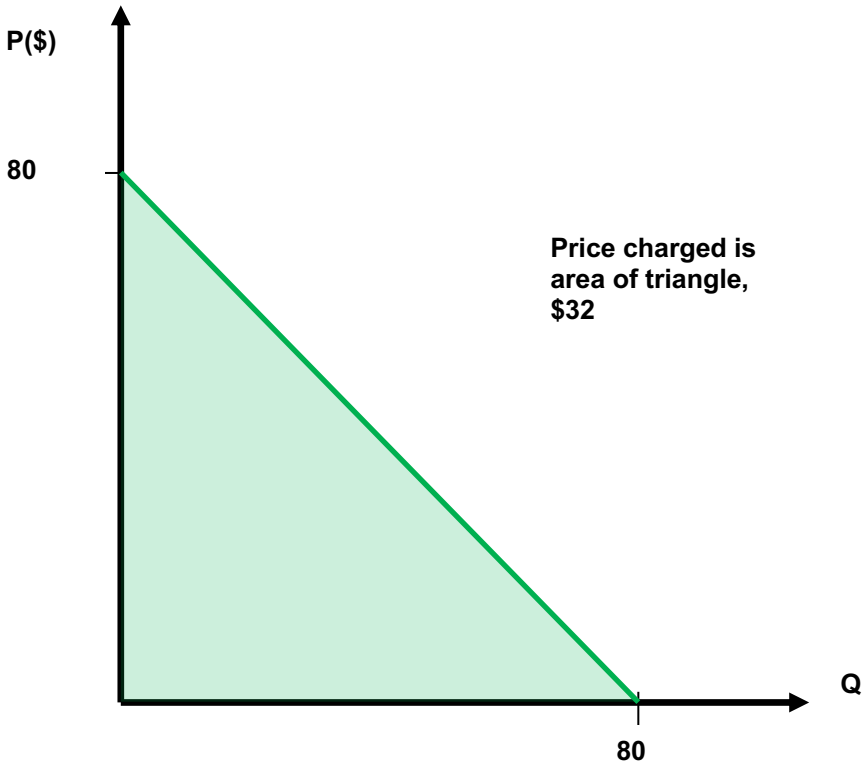




(a) If the newspaper can identify different types of buyers, what price will they charge students and non-students for an all or nothing deal? That is, one in which a package of a maximum number of stories is offered at a fixed price per month?

In this case it is effectively first degree price discrimination, the firm would charge the maximum willingness to pay or the area under the demand curves.





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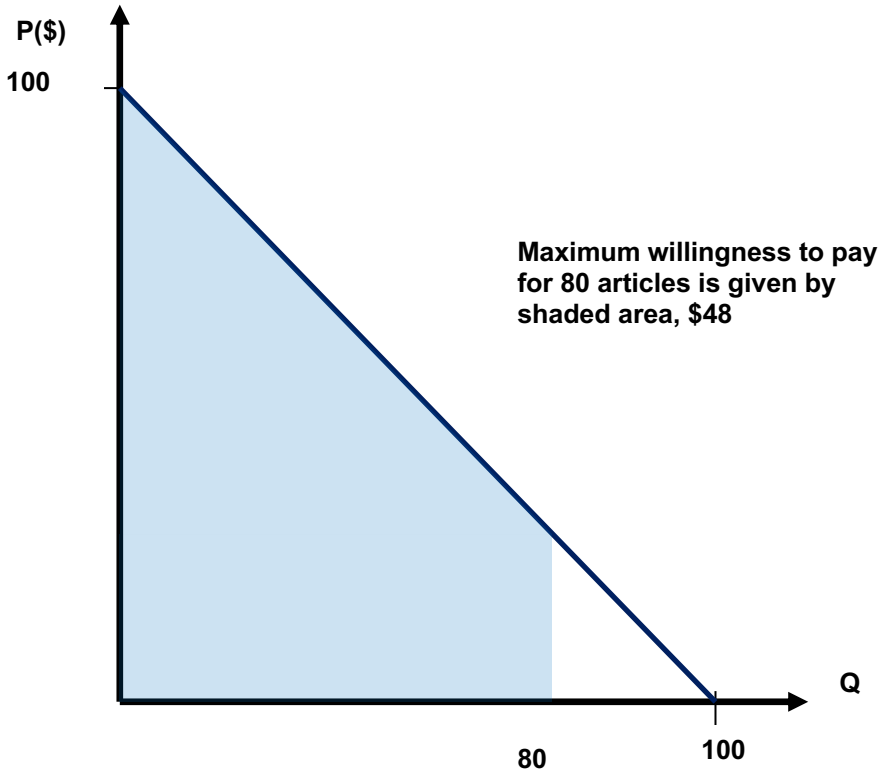
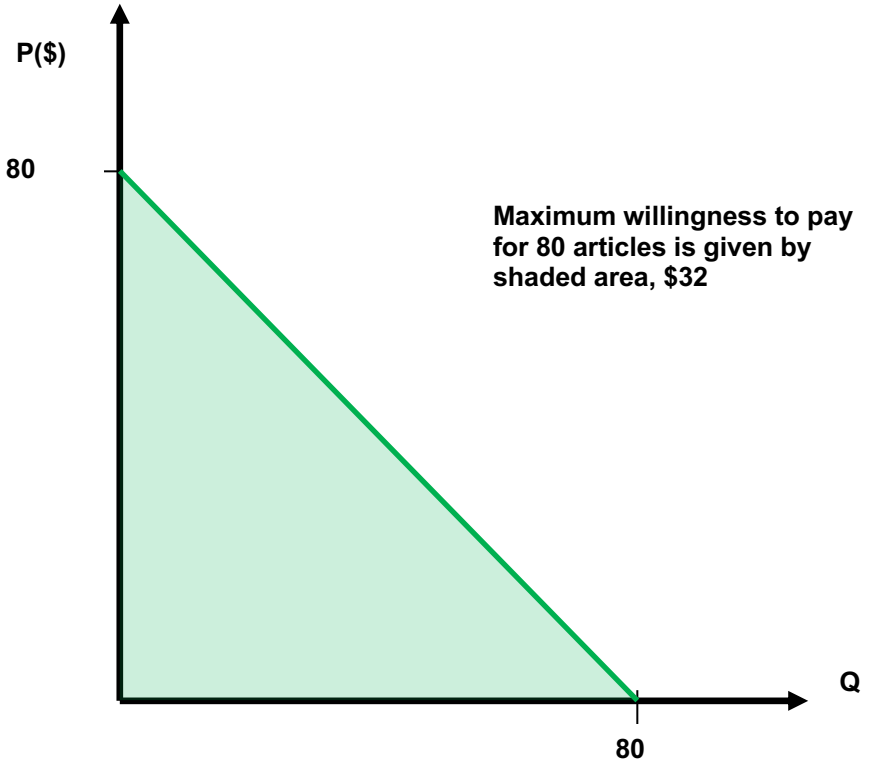
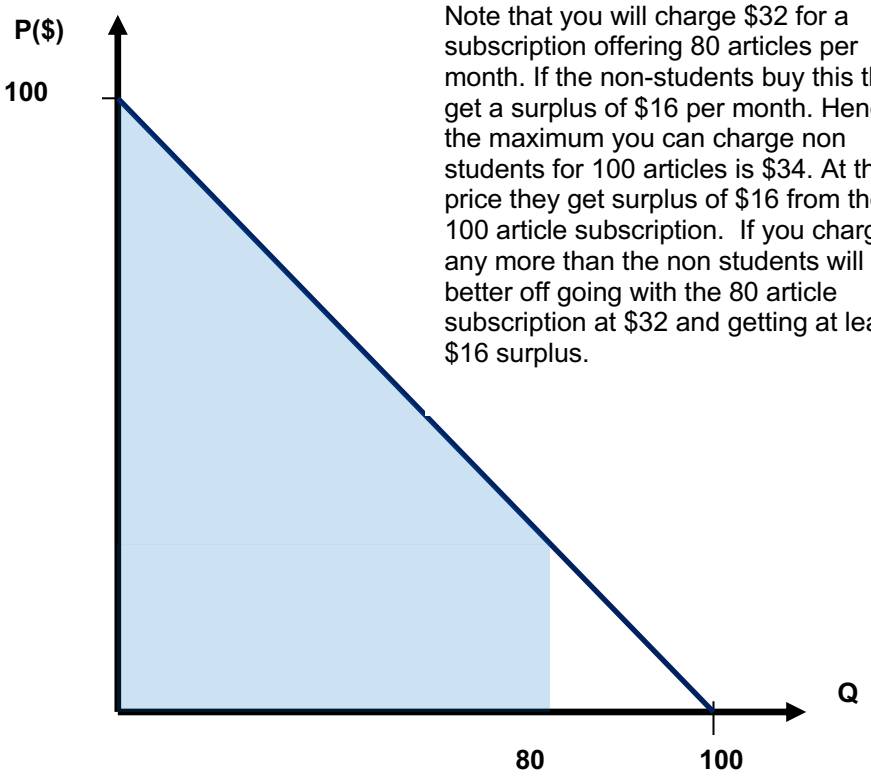
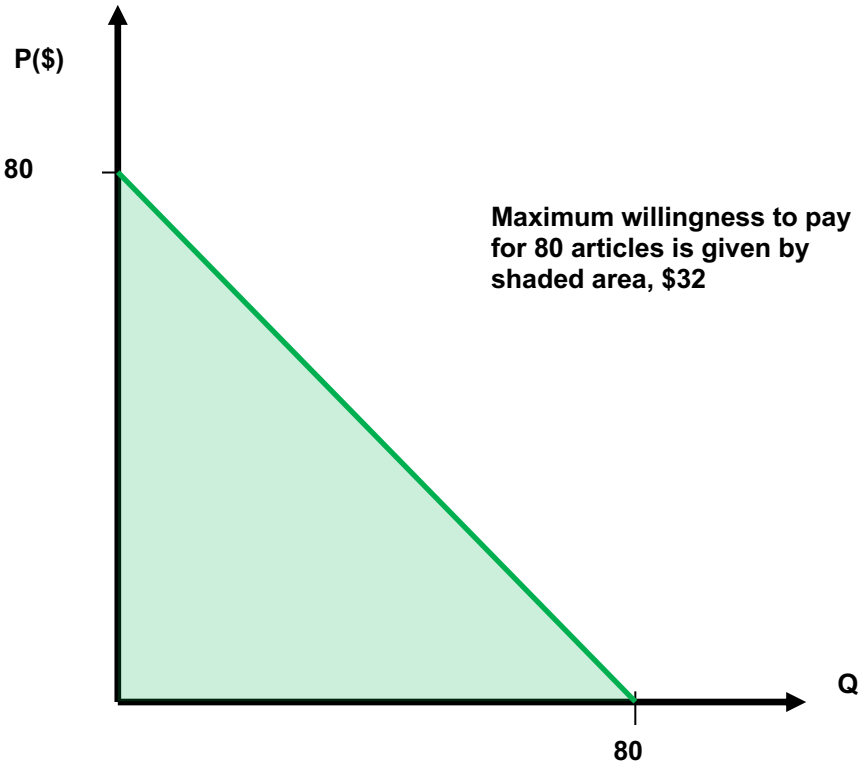




(c) What is the maximum price that the newspaper could charge for the 100 articles per month if it wanted the non-students to prefer this to the 80 article per month option?

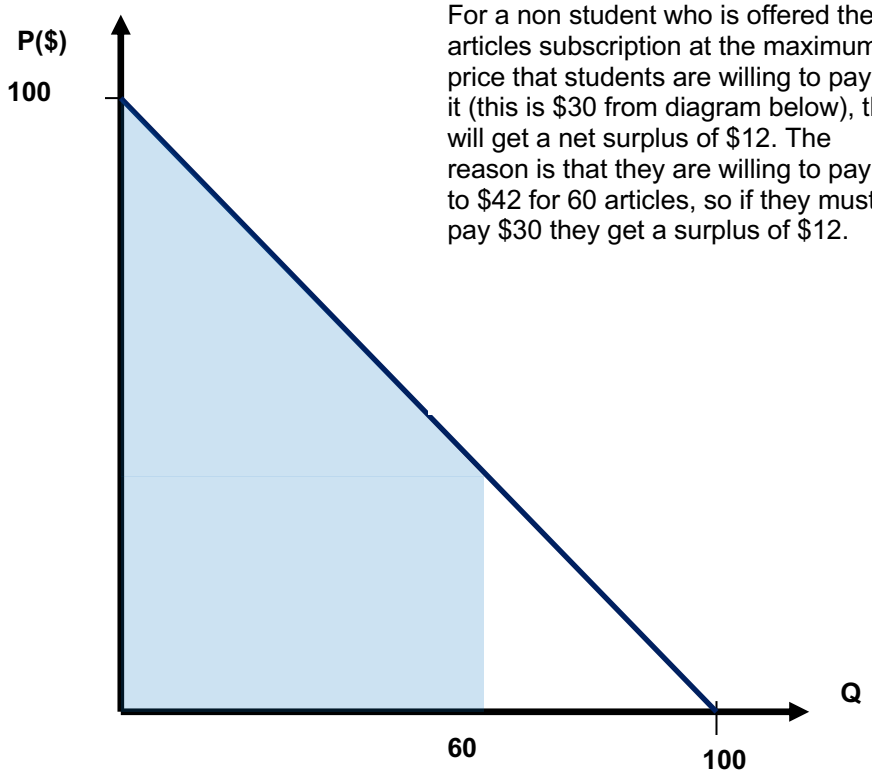


Note that you will charge $32 for a subscription offering 80 articles per month. If the non-students buy this they get a surplus of $16 per month. Hence the maximum you can charge non students for 100 articles is $34. At this price they get surplus of $16 from the 100 article subscription. If you charge any more than the non students will be better off going with the 80 article subscription at $32 and getting at least $16 surplus.



Maximum willingness to pay for 80 articles is given by shaded area, $32

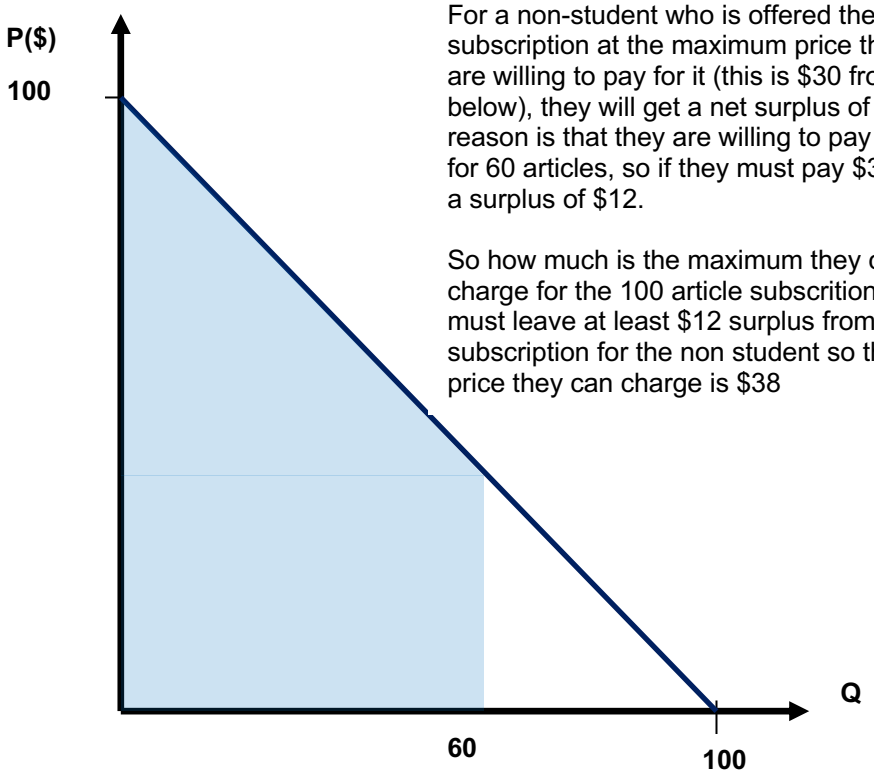
(d) Suppose that only 60 articles per month are included in the student subscription, what is the maximum it could charge for this and still get students to pay? How much surplus would a non-student get from the student package?



For a non student who is offered the 60 articles subscription at the maximum price that students are willing to pay for it (this is $30 from diagram below), they will get a net surplus of $12. The reason is that they are willing to pay up to $42 for 60 articles, so if they must pay $30 they get a surplus of $12.

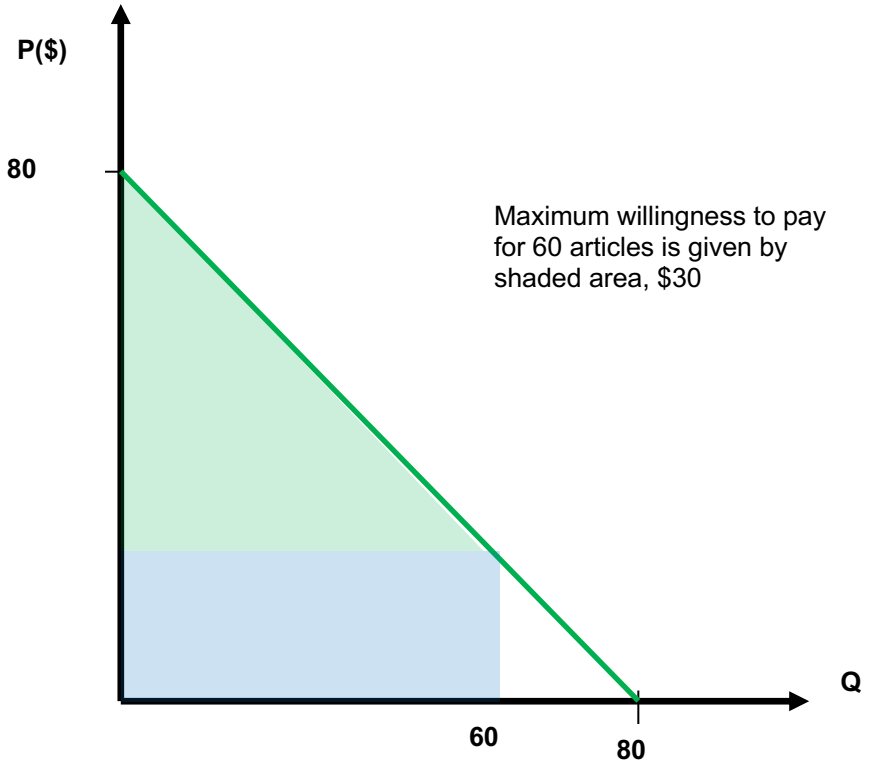
Maximum willingness to pay for 60 articles is given by shaded area, $30

(e) How much could the newspaper charge for the 100 article package and still ensure that non-students buy it rather than the student package?



For a non-student who is offered the 60 articles subscription at the maximum price that students are willing to pay for it (this is $30 from diagram below), they will get a net surplus of $12. The reason is that they are willing to pay up to $42 for 60 articles, so if they must pay $30 they get a surplus of $12.

So how much is the maximum they can now charge for the 100 article subscrition? They must leave at least $12 surplus from such a subscription for the non student so the max price they can charge is $38



Maximum willingness to pay for 60 articles is given by shaded area, $30

(f) Which set of offers (the 60 and 100 article subscriptions, or the 80 and 100 article subscriptions) offers the highest profits?

An 80 and 100 article menu gives profit of $66. That is, they can charge a price of $32 for the 80-article subscription and $34 for the 100-article subscription. The students buy the 80-article subscription and the non-students buy the 100-article subscription.

A 60 and 100 article menu gives profit of $68. That is, they can charge a price of $30 for the 80-article subscription and $38 for the 100 article subscription.