Solutions Manual: Part I

Markets in context

Summary answers to the 'By yourself' questions
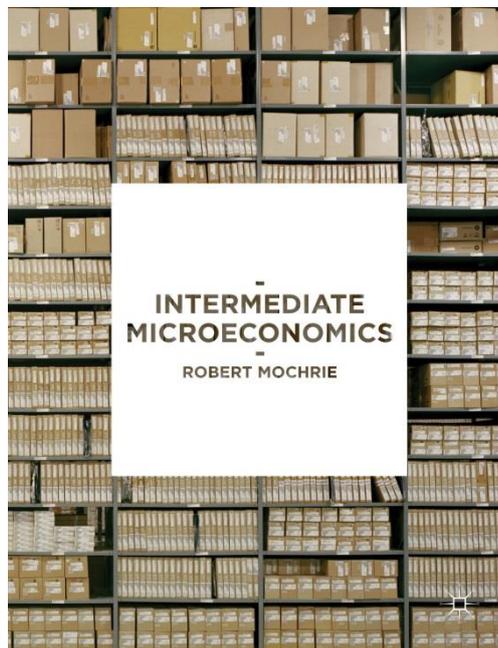
Chapter 1

X1.1   **The fruit market is a location in the city.**
   a)   **When considering pairs of goods from the viewpoint of a consumer, it is often useful to distinguish between those that are *substitutes* because either can be used to meet a particular need, and those that are *complements* because they tend to be used together. Give examples of pairs of goods traded in the fruit market that seem likely to be strongly substitutable and pairs that are strongly complementary.**
   Substitutes: goods which are alternatives to each other, such as apples and plums.
   Complements: goods which tend to be consumed together, such as coffee and sugar, or peaches and cream.

   b)   **How might a consumer approach the problem of identifying from which of the 50 sellers she wishes to buy goods? We consider here consumers who are making a single visit to the market. In what ways might people's approach differ if they are: (i) very experienced shoppers, who have used the market for several years; and (ii) newly arrived in the city, and visiting for the first time?**
   (i)   Very experienced shoppers will already know the layout of market stalls, so are likely to rely on that knowledge to buy from preferred locations.
   (ii) Newly arrived shoppers lack that knowledge, and may either attempt to identify the best stalls simply by walking around the market before buying from any of them, or may choose stalls on the basis of convenience. In both cases, they are likely to experiment, trying different stalls until they are satisfied that they have done as well as they might.

   c)   **How easy might it be for stallholders to give their stalls unique identities? How might experienced shoppers distinguish between stalls?**
   Stallholders are going to have relatively limited capacity to brand their stalls. They have limited space available, and may not be able to alter the design of the space available to them very much. They are unlikely even to benefit from use of signage if we assume that most customers are regular visitors.

   d)   **Suppose that the market is owned by the city council, which rents space to stallholders. What extent of variation in rents might there be?**
   Some stalls will be at locations where more people pass by, for example those close to entrances, or at a junction of paths through the market. These may be more expensive to rent, with the difference in rents reflecting the value of the location to the stall.

   e)   **How easy would you expect it to be for new stalls to set up in the market?**
   Difficult. The area of the stall is fixed; only when a business closes, or is sold, can a new entrant join the market. Even then, the total number of stalls will remain constant.

X1.2   **We assume that the bakeries produce a single standard 800g loaf and that they use the same technology. Presented with a loaf from each bakery, consumers would not be able to distinguish between them.**
   a)   **How easy would it be for someone recently arrived in the town to confirm whether the experience of buying bread is almost identical at both locations?**
   The easiest way is by experimentation. Since the bakeries are close together, and the value of the purchase is small, the costs of the experiment will be low.

b) **To what extent do you think that each bakery would have loyal customers, who would prefer buying bread from that bakery rather than from its competitor? Would your answer be different if the two shops were at opposite ends of the main shopping street?**
With the bakeries close together, there is no reason to expect substantial consumer loyalty. If the quality of the bread and the prices charged are very similar in the two bakeries, then customers should not be concerned which one they use. On the other hand, if the bakeries are far apart, then some people will find it much more convenient to go to one bakery rather than the other.

c) **Suppose that one bakery were to increase the price of a loaf by £0.10. Before the price change, both bakeries were selling 1,000 loaves per day. How might sales (at each bakery) change as a result of the price change? What do you conclude about the prices that the two shops will set?**
We might consider £0.10 to be a sufficiently large difference in prices that customers will tend to switch to the cheaper store. If it does not increase its output or prices, then it will sell its bread first. If it increases output, then it might obtain a larger share of the market. People who have to pay more for bread might buy less of it.

d) **There are two firms in this market. What characteristics of the market might prevent other bakeries from setting up in business?**
Since the bakeries serve a limited market, we might expect that the costs of setting up a third bakery would mean that it could never be profitable.

X1.3 **We assume that the cafés sell a standard cup of coffee.**
  a) **How would someone newly arrived in the town determine the price that they would be willing to pay for a coffee at each café? If there is no difference between the willingness-to-pay measures for the two cafes, what do you conclude about the price that the cafés will set?**
People would experiment, trying both cafés. If people are willing to pay the same amount in each café, then we might expect the cafés to set the same price.

  b) **Were one café to reduce its price by £0.10, what would you expect to happen to sales of coffee in the two cafés?**
The café with the higher price would make no sales; the other café would obtain the whole market.

  c) **Suppose that one café decides to differentiate itself from the other one by using certified coffee. (Certification schemes for coffee cover organic production, environmental protection, and fair trade.) Explain how this might affect the cost incurred in making a cup of coffee, but also the price that potential customers might be willing to pay.**
The additional cost using certified coffee is very low. However, some customers may be willing to pay substantially more for these types of coffee.

  d) **This market is served by two cafés. What characteristics of the market might ensure that no one else decided to set up a third café?**
We expect the number of cafés to be determined by the extent of demand.

X1.4 **In this case:**
  a) **How might we define the market?**
Competition between petrol stations seems likely to involve all that are typically alternatives for custom; that would mean all those that are close to the city.

b) **I regularly use all three petrol stations on this route because I find this to be convenient. How might someone who has never driven on this route make decisions about which petrol station to use?**
We would expect them to make the choice randomly.

c) **How might the willingness to pay for fuel at a given petrol station differ between the time when I plan my journey and the time when I turn off the road onto that petrol station's forecourt?**
My willingness to pay at a particular petrol station might increase when I am close to it because it is now easier for me to complete my plan.

d) **Suppose that I usually buy about 40 litres of petrol at a time and I notice as I pull onto the forecourt that the petrol station has increased its price by £0.05 per litre. How might that affect my decision about which petrol station I use?**
If the inconvenience of changing my plan exceeds the additional cost of £2.00, then I will just use the petrol station, rather than searching to see if I can obtain fuel at a lower price.

e) **Suppose that I see no difference in price from the last time I used a particular petrol station. How might this affect my decision making?**
I will have no reason to search for a lower price.

f) **How do you think two petrol stations might sustain a difference in price of £0.05 per litre over a period of a year?**
With difficulty. This is approximately the difference in price between privately owned petrol stations, which have been closing regularly, and supermarket owned petrol stations, which have been expanding market share; this reflects changes in customer buying patterns. Such persistent differences do not, though, lead to rapid switching of custom to the cheaper site.

X1.5 **While the range of services provided by the hairdressers is essentially the same, we expect the method of delivery to differ across salons. We say that there is product differentiation across the salons.**

a) **To what extent might these salons face competition from businesses in other towns?**
This will depend very much on the ease of transport to other locations, and the local reputation of hairdressers in other places.

b) **Thinking of the measures of willingness to pay and willingness to accept, what might be the effects of allowing product differentiation on choice?**
We expect product differentiation to lead to higher prices.

c) **How important do you consider repeat business will be to the success of a salon?**
Very important. Most clients need their hair cut several times per year.

d) **Suppose that the price charged in a salon increases by 10%. What effect might this have on the business of the salon?**
Assuming that clients have some loyalty to the business, we would expect there to be little immediate change. If the business is able to persuade clients that this reflects improved services, then it is possible that this will in fact benefit the business.

e) **Suppose that all five salons cut their prices by 10%. What effect might this have on their business?**

We might not expect this to have any substantial effect on the total volume of sales; the average time between appointments might fall a little though, and some clients may choose to use more expensive treatments such as hair colouring.

f) **Salons might charge different prices for men and women. Why?**
We might assume that there is a systematic difference in WTP measures between men and women.

X1.6 **Consider the railway service between two cities.**
a) **Between most pairs of cities, there is only one train operator. How might the lack of alternative suppliers affect the price that potential buyers will have to pay?**
We would expect prices to be higher in the absence, rather than in the presence, of competition.

b) **Once a train operator has made a decision to run a service, what is the lowest ticket price that the operator might set for carrying an additional passenger?**
Since the train operator experiences no additional costs, it would be reasonable to set a price of zero.

c) **Given that there are periods of the day in which there are capacity constraints, how might train operators manage demand at these times? In this case, what might lead to differences in the amounts that passengers would pay to travel on a particular train?**
We would expect train operators to charge more for travel at times when they are operating within capacity constraints. The most obvious reason for this is the need for many people to arrive in work at the same time. Such people obtain substantial benefits from making the journey at that particular time, so will pay more.

d) **Assume that the operating company sets a standard price for travel on the same day. Give examples of discounts that might be offered to different types of passengers, and discuss the rationale for offering these.**
Among the most obvious are child, student and pensioner discounts. In all cases, members of these groups are considered to have a lower WTP than others, and so offering them discounts on the standard fare increases their use of the service.

Chapter 2

X2.1   **Consider the following goods and services. Discuss the extent to which there is likely to be a violation of the assumptions made above when they are traded. (We consider these examples from the perspective of the consumer, or buyer. Remember to include discussion of production by the seller.)**

a)   **Filling the fuel tank of a car with petrol.**
   Demand likely to conform to most assumptions. However restricted range of sellers, so limited competition in consumption.

b)   **Buying a loaf of bread.**
   Demand side likely to conform well to assumptions given that there will usually be repeated purchases. There may be a limited range of sellers, especially with bread being supplied through supermarkets.

c)   **Having a haircut.**
   Expect it to be reasonable to treat customers as being partially informed about the market, given the extent of product differentiation; but again, repeat purchases will reduce this problem. Competition in supply likely to be intense, with many small scale providers of the service.

d)   **Buying a pair of trousers.**
   Although a regular occurrence, there is much product innovation, with choices being determined by fashion as well as functional attributes. Search and reputation are likely to be important determinants of buyer behaviour. Sellers will include some firms that are engaged in intense competition, but there will also be sellers which have substantial market power.

e)   **Buying a car.**
   A relatively infrequent choice for an individual, in which seller's reputation is likely to be relatively important. Car manufacturing is a very capital intensive business, and so it is likely that there will be limited competition in supply.

f)   **Booking a holiday.**
   We expect to see substantial product differentiation across possible products (location, type, quality of accommodation, etc.) but also very substantial competition. On the other hand, potential consumers have very little experience of each possible product, so that there will be much missing information about the product being purchased.

g)   **Buying greeting cards, such as for birthdays or Christmas.**
   People can quickly scan the alternatives open to them in a single card shop, and so we might expect there to be no substantial problem with competition. We would expect there to be a very large variety of products in the market, and there will be some suppliers who benefit from economies of scale in design and distribution.

h)   **Registering for a university degree.**
   This is a decision that most people make at most once in their lives. They do so with very limited information, choosing from a relatively restricted range of suppliers, all of whom seek to differentiate the service that they are providing. Purchasers seem likely to depend upon signals about the quality of the education available, including produce reputation.

i) **Buying a copy of a creative work, such as a novel, a film, or a music album.**
In these markets, we expect there to be intense competition in supply. There will be very substantial product differentiation in supply. Purchasers are likely to be affected by the purchasing decisions of a reference group, and so some producers of creative works, especially in film, where costs are very high, can generate very substantial sales, and so have considerable market power.

j) **Buying seeds which, when sown, might grow into decorative (rather than edible) plants.**
This is likely to be a largely competitive market, with many nurseries providing seeds. Buyers will include many frequent customers, who are able to experiment at low cost in making purchases.

X2.2 **We define fast-moving consumer goods (FMCGs) as items that are purchased repeatedly but in small quantities. There are no long-run contracts, so people are free to switch supplier every time that they make a purchase.**

a) **Discuss the extent to which the market environments discussed in Section 2.2.1 are likely to involve the sale of such goods, and the potential value to the firms in the market of securing regular repeat purchases.**
Most of the examples that we have considered are in this category; including fruit, coffee, bread and petrol.

b) **There are many FMCG industries – such as those for detergents, carbonated water, and toiletries – where firms have established strong brand identities, supported by extensive marketing activity. Why might FMCG markets be particularly susceptible to this form of activity? (Think of the role of repeat purchasing, but also of the impact on consumers of disappointment if they are dissatisfied with their purchase.)**
FMCG markets seem likely to be supported by extensive marketing because purchasers can very easily change their behaviour, but can also be persuaded to make repeat sales; and being able to capture repeat sales in this way is important for sellers.

c) **Tobacco companies have argued against restrictions on marketing activity on the basis that such activity is designed to encourage existing users to switch brands rather than to encourage new users. How reasonable do you consider this claim to be?**
While on the one hand, it is entirely reasonable to make this claim, an important role of advertising and marketing activity in general is to alert new customers to the fact that there is a particular way of satisfying a need; and this may attract new purchasers.

X2.3 **Advances in technology rarely occur by accident. Suppose that a firm expects that an advance in technology will not be copied by other firms.**

a) **What effect might we expect more efficient use of resources to have on a firm's production plans?**
The firm would be able to produce the same output as before using fewer resources. So it will produce each unit at a lower cost.

b) **How might the advance in technology used by only one firm affect other firms?**
With the firm having a cost advantage, it is able to set a lower price than its competitors and still make profits, so we would expect the competitors to make fewer sales.

c) **Why might we expect a firm to be willing to pay for the ability to make a technological advance? If we consider technological advances to be a good, how much might firms be willing to pay to achieve them?**

A technological advance reduces costs of production, allowing the firm to cut prices, increase sales and make larger profits. We would expect firms to be willing to pay as much as the increase in profits to achieve a technological advance.

X2.4 **Suppose that a firm expects that any advance in technology will immediately be disseminated across all other firms in the industry.**
  a) **How might we expect firms' production plans to respond?**
  With all firms achieving the same technological advance, all will reduce their production costs. Depending on demand conditions within the market, we would expect all businesses to increase their output by the same proportion, but for the market price to fall.

  b) **Compared with the situation in X2.3, what might happen to the output of the firm that had originated the technological advance?**
  The firm originating the technological advance will make a much smaller increase in profits since it is disseminated immediately.

  c) **How might this affect firms' willingness to pay for the investment need for technological advances?**
  The smaller increase in profits from developing a technological advance means that the firm will pay less to achieve it.

  d) **What might we conclude about the rate of technological advance in an industry in which all firms obtain unrestricted access to technology, compared with one in which firms are able to use proprietary technology that they can prevent competitors from using?**
  Unrestricted access to technology may slow the rate of technological advance within an industry.

X2.5 **Suppose that an opportunity arises for a firm to enter a market and start trading, but that the firm is aware that the opportunity is transient. Explain why the existence of entry costs might mean that some opportunities could not be exploited.**
  Since profits will last only for a short period of time, the firm may not make them for long enough to cover the costs of setting up business.

X2.6 **Every summer, soft fruits come into season. Explain how the price that consumers would pay for these goods might change during the summer; how the price that stallholders charge might change; and what happens at the end of the season.**
  We do not expect any change in WTP; but with the higher frequency of purchases, it is possible that this value will fall. We expect stallholders to reduce the price that they charge; and at the end of the season, prices and WTP will both increase again.

X2.7 **Assume that Assumptions A2.1– A2.4 hold.**
  a) **Explain why smaller firms will always have a lower breakeven price than larger firms, and that larger firms can reduce their breakeven price by reducing their size.**
  Cost per unit of output increases with output. So the larger a firm, the higher the breakeven price; by breaking up into many smaller units, a large firm then reduces its cost per unit of output, and so its breakeven price.

  b) **Assume that firms want to achieve the lowest possible breakeven price. Confirm that with entry being possible, the market will come to be served by a very large number of very small businesses.**

New firms can always achieve a lower cost per unit of output than existing ones by choosing to be very small. If many firms enter the market, they will drive out the existing larger firms, or force them to reduce their output.

X2.8   **Consider the two cafés located opposite each other in the main street of a small town. Every day their proprietors, Aimee and Bianca, set boards outside their premises announcing the price at which they intend to sell cups of coffee. They can set different prices every day.**
   a)   **Given our assumptions, what might we infer about the price that each café would want to charge for a cup of coffee?**
        We expect them both to charge the same price.

   b)   **How reasonable do you consider it to be that the cost of making each additional cup of coffee will remain constant as output increases?**
        This seems reasonable, so long as the café does not run into any production constraints, such as being full, or needing to buy more equipment.

   c)   **Suppose that Bianca sees the price that Aimee intends to charge before she sets her own price, and realizes that Aimee's price is higher than the price she herself planned to charge. What might Bianca do? (Bianca wants to make the greatest possible profits.)**
        Bianca might charge very slightly less than Aimee, expecting to secure a greater share of the market than Aimee.

   d)   **Given Bianca's decision, what might Aimee notice? How might she respond?**
        Aimee will presumably be surprised that her café is almost empty. So, she will check the price that Bianca is charging, and then either match, or else undercut, it.

   e)   **Why might Bianca and Aimee end up competing very intensely with each other? What would you expect to be the outcome of this competition?**
        Neither wishes to charge a higher price than the other; and the only way to ensure that is to charge the breakeven price, since then any attempt at undercutting by the other café will lead to losses. This means that neither firm makes any profits.

X2.9   **Suppose that the *WTA* for each farmer is different: 0.5, 0.75, 1, 1.5 and 2. Similarly, suppose that for the potential buyers the *WTP* values are: 1.75, 2.25, 2.5, 3 and 3.25.**
   a)   **Suppose that potential buyers are matched to potential sellers in the order listed. Explain why all five transactions will take place.**
        Since in each transaction, WTP > WTA, it is possible for both parties to each transaction to agree a mutually acceptable price.

   b)   **If all sales took place at a single price, *p* = 1.8, what would the outcome be?**
        There could not be a transaction involving the first buyer.

   c)   **Suppose that, after matching, it is possible for any of the buyers to engage in resale. What opportunities, if any, might there be? After resale, what characterizes the valuations of the people who have apples compared with those who do not?**
        We have a buyer who paid no more than 1.75; and a seller who would have received at least 2. These two can now enter into a transaction at a price between 1.75 and 2.

   d)   **Why is it credible that all transactions might take place at the price *p* = 1.8?**
        This ensures that the final consumers value the goods the most.

X2.10   **Confirm that the following statements are false. (You may use the technique of proof by contradiction.)**

a)   **All transactions take place at a price *p* < *p**.**
Suppose this were to happen. There cannot be more than seven transactions completed. There is one purchaser with WTP $\geq$ p* who has not completed a transaction. This potential buyer will be able to enter into a transaction with someone whose WTA $\leq$ p*.

b)   **There will be some transactions that take place at price *p* > *p**.**
Suppose this were to happen. Then there would be a buyer at a price p > p*, who would be able to find some other party to the transaction, with lower WTA.

c)   **There will be some transactions that take place at price *p* < *p**.**
Suppose this were to happen. Then there would be a seller at a price p < p*, who would be able to find some other party to the transaction, with lower WTP.

X2.11   **Suppose that people and firms agree to exchanges at a range of prices. Some prices are higher than *p** and some are lower. The transactions have still to conclude.**

a)   **Show that there is at least one buyer who can find a better bargain.**
Suppose that this were to be impossible. Then there would be some sellers with WTA $\geq$ p.* But if that were the case, then buyers in those transactions could certainly find sellers with lower WTA.

b)   **Show that there is at least one seller who can find a better bargain.**
Suppose that this were to be impossible. Then there would be some buyers with WTP $\leq$ p*. But if that were the case, then sellers in those transactions could certainly find buyers with higher WTP. Even were the transaction to go ahead, the buyers could then enter into a second transaction as a seller, finding a buyer with WTP $\geq$ p*

c)   **Hence confirm that no buyer whose *WTP* < *p**, and no seller whose *WTA* > *p**, will complete the proposed transaction.**
Suppose that this were to be impossible. Then there would be some sellers with WTA $\geq$ p*. But, if that were the case, then buyers in those transactions could certainly find sellers with lower WTA. Even were the original transaction to go ahead, the sellers could then enter into a second transaction as a buyer, finding a seller with WTA $\leq$ p*.

X2.12   **Given the market price, *p**, suppose that one seller, for whom *WTA* < *p**, insists on a price just above the market price. What would you expect to happen? Why do you think that no seller would do this?**
Potential buyers, knowing that other sellers will sell at p*, will go to the other sellers. If the higher price supplier is the only one left with goods to sell, then there is a risk of only the buyer for whom WTP = p* being in the market, and no sale being concluded.

X2.13   **Repeat X2.12 for a seller considering accepting a price just below *p**.**
Potential buyers, knowing that other sellers will sell at p*, will go to this seller first. The seller can be certain of making a sale, but at a lower price than all other sellers.

X2.14   **Consider the situation facing Yvonne, who is considering how many loaves of bread to purchase on a shopping trip. She can purchase any quantity of bread at a price of £1.50 per loaf. Her willingness to pay for each (additional) loaf may be written as *WTP* = 2.5 − 0.5*b*, where *b* is the number of loaves that the consumer would then be purchasing.**

a)   **Explain why Yvonne will choose to purchase 3 loaves.**

Facing the price p_B = 1.5, for Yvonne, WTP $\geq$ 1.5 for the first three loaves only.

b) **Suppose that the bakery offers 5 loaves for £7.00. How should Yvonne respond?**
For Yvonne, the total value of five loaves, V_5 = 2.5 + 2 + 1.5 + 1 + 0.5 = 7.5. Since V_5 > 7, Yvonne generates a surplus from the additional purchases. However, note that the surplus (of 0.5) is less than the surplus of 1.5 from buying three loaves at full price; she therefore continues to maximize surplus by buying loaves individually.

X2.15 **We define Yvonne's consumer surplus as the amount of money she would be willing to pay in excess of the total cost of purchases.**
a) **Showing the number of loaves purchased on the horizontal axis and her *WTP* on the vertical axis, sketch a graph of Yvonne's *WTP* as a function of the number of loaves.**

b) **Show her consumer surplus on the diagram as the difference between the total valuation of the loaves purchased and the cost of purchase.**
This is the shaded area.

c) **Sketch Yvonne's demand for bread on the diagram.**
Yvonne's demand for bread is the WTP curve, already drawn, but understood as running from price to quantity demanded.

X2.16 **Now consider a small economics class in which there are 5 students, each willing to purchase one and only one copy of a textbook. Students are respectively willing to pay £100, £75, £60, £40 and £30. The campus bookstore has set a price for the text of £40.**
a) **Draw a diagram showing the willingness to pay across students. Explain why the bookshop will sell 4 copies of the textbook, and calculate the total consumer surplus across all the students.**

WTP and demand for books
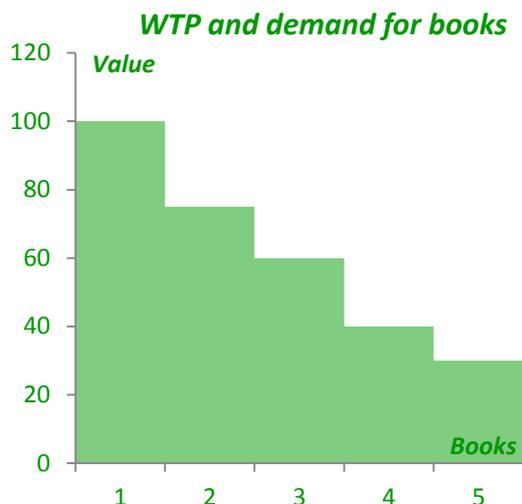
There are four students for whom WTP ≥ 40, who all buy the textbook.
Total surplus S = (100 + 75 + 60 + 40) – 4*40 = 275 – 160 = 115.

b) **Adapt your diagram so that the vertical axis now measures the (variable) price that the campus bookstore charges. Show how the number of books sold varies with the price that the bookstore sets.**
Demand increases by one unit each time that the price falls below the WTP of another student; it is the vertical segments of the shape in the diagram above.

X2.17 **A new producer of smartphones has to decide the price that it should set for handsets. After conducting some market research, it concludes that the demand for its product can be written as $q = 100 – 0.5p$, where q is the quantity of handsets and p is the price that the firm can charge.**

a) **Explain why the firm would be unable to give away more than 100 handsets free of charge.**
Giving handsets away, p = 0. q(0) = 100.

b) **Explain why there cannot be any consumer with a *WTP* greater than 200.**
WTP is the inverse of demand. At the highest WTP, q = 0, so 100 – 0.5p = 0; and p = 200.

c) **Sketch the demand curve for the firm.**
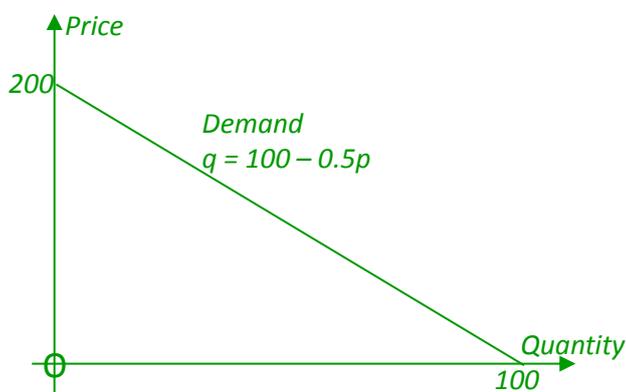
X2.18 **Go back to the discussion of the café, recalling the assumption that any consumer can buy any number of cups of coffee for a fixed price:**
a) **Does this maximize the sales revenue that the café might obtain from the consumer?**

No: the customer should pay the full willingness to pay.

b) **Describe a mechanism that might increase revenue further. Do you consider that the café could reasonably introduce such a mechanism?**
One way of the café increasing revenue in this way would be to auction off cups of coffee. But there is a problem that potential customers might refuse to bid, since the price that they pay is now going to be uncertain.

X2.19 **We have assumed that consumers will display a diminishing *WTP*. Suppose that assumption were not true. What sort of behaviour might we expect to observe?**
With an increasing WTP, businesses would have the problem of persuading customers to enter the market, but would then be able to sell any amount at a fixed price.

X2.20 **How might we best interpret *WTP* when the quantity consumed is a continuous variable, and not just a whole number? [*Hint:* It may be useful to start by thinking in terms of the change in consumer surplus associated with a one unit increase in consumption.]**
With quantity varying by very small amounts, WTP becomes a measure of the marginal change in value derived from consumption.

X2.21 **Draw two individual demand curves that are downward-sloping straight lines that intersect the price axis of your diagram at different prices. Show that the market demand for these two consumers is kinked when the price is equal to the maximum willingness to pay of the second consumer, and that the lower segment of the market demand is flatter than the upper segment.**
Call the two consumers Ruth and Simone. Ruth's demand curve intersects the price axis at p_R, which is higher than the intersection of Simone's demand curve at p_S. For any price between p_R and p_S, the market demand is Ruth's demand. When the market price falls below p_S, Simone starts buying the good. As price falls further, as well as the increase in Ruth's demand, there will also be an increase in Simone's demand. Demand is then more responsive to price than when only Ruth was in the market.
Writing demand functions for Ruth, $q_R = a_R - b_R p$; and for Simone, $q_S = a_S - b_S p$, then when $p > p_S$, market demand is Ruth's demand, but $p < p_S$, then $Q = q_R + q_S = a_R + a_S - (b_R + b_S)p$. The effect of a one unit increase in price below the threshold price, p_S is $b_R + b_S$; above it is b_R.

X2.22 **Define the individual linear demand functions $q_A = 60 - 0.25p$ and $q_B = 50 - 0.5p$.**
a) **Calculate the values of q_A and q_B when $p = 0$. How would you interpret a price of zero?**
$q_A = 60$; $q_B = 50$. These are the individual demands when the good is given away for free.

b) **Calculate the values of p for which (i) $q_A = 0$ and (ii) $q_B = 0$. How would you interpret a demand of zero?**
If $q_A = 0$, $p \geq 240$. If $q_B = 0$, $p_B \geq 100$.

c) **Sketch the individual demand curves, which are straight lines that intersect the horizontal axis at the values found in (a) and the vertical axis at the values found in (b).**
With price on the vertical and quantity on the horizontal axis, the demand curve for A intersects the horizontal axis at (60, 0) and the vertical axis at (0, 240).
The demand curve for B intersects the horizontal axis at (50, 0) and the vertical axis at (0, 100)

d) **Calculate: (i) the quantity of the good that will be demanded in the market when *p* = 0; and (ii) the quantity of the good demanded when *p* = 100. Hence or otherwise, sketch the market demand curve.**

    (i)   When p = 0, Q(0) = q_A(0) + q_B(0) = 110.
    (ii)   When p = 100, Q(100) = q_A(100) + q_B(100) = 35 + 0 = 35.
The market demand curve consists of two straight line segments. Starting from the vertical (price) axis, at (0, 240), the first segment ends at (35, 100). In this segment, only A demands the good. The demand curve kinks, and the second, flatter line meets the horizontal (quantity) axis at (110, 0).

e) **If the price is less than 100, by how much will demand increase if the price falls by one (euro)?**
Every time that price falls by one, A's demand increases by 0.25, and B's by 0.5. Demand increases by 0.75. This is the slope of the flatter line segment.

X2.23 **Recall Exercise X2.16, in which we explored the relationship between *WTP* and consumer surplus. Sketch a diagram that shows a firm's *WTA* as increasing with output, which is perfectly divisible. Show how the *WTA* can be related to changes in producer surplus as output increases.**
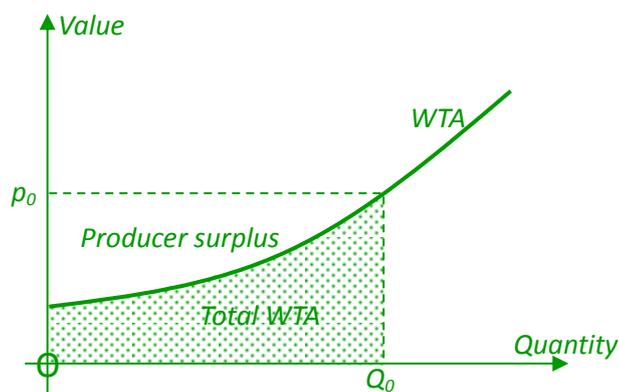
X2.24 **Consider the markets for bread on an island where the market is supplied by two bakeries, and the market for freshly brewed coffee in a small town where the market is supplied by two cafés. We argued that coffee shops respond to demand when brewing each cup, but that bakeries fix the number of loaves available for sale the day before they sell them.**

a) **What is the cost of making one additional cup of coffee? How reasonable would it be to expect a café's *WTA* to remain constant?**
This will be the cost of ingredients plus staff time. This is unlikely to change over a large range of output.

b) **Consider the situations where (i) the baking process has been completed and loaves have to be sold that day; and (ii) the baking process is about to start. How might the bakery's *WTA* differ between these two situations?**
With loaves already baked, WTA may be close to zero; with baking still to take place, WTA should be at least the cost of production.

c) **Assume that the bakery has a fixed production capacity of 1,000 loaves, and that its willingness to accept an offer for a loaf of bread is £1.50 until that limit is reached. Sketch a diagram showing its *WTA* as a function of quantity.**

WTA will be reverse L-shape; horizontal segment at price p = 1.50, beginning from vertical (price) axis; vertical segment where quantity supplied, Q = 1,000.

X2.25 **A third café (Caroline's) opens. Assume that the cafés have maximum outputs (measured by cups of coffee per day): m_A = 500, m_B = 750 and m_C = 1,000. The *WTA* for each firm is constant until it achieves its production limit. WTA_A = 1.2, WTA_B = 1.5 and WTA_C = 2.0.**

a) What happens to a café's *WTA* at its maximum output?
It becomes infinite.

b) Sketch diagrams showing each café's *WTA* (output on the horizontal axis and *WTA* on the vertical axis). How much output will each café be willing to produce given market price p: (i) $p < WTA$; (ii) $p = WTA$; and (iii) $p > WTA$?
WTA will be reverse L-shape; horizontal segment at each café's WTA, beginning from vertical (price) axis; vertical segment where quantity constraint, m, reached.
These graphs indicate that when p < WTA, the café will not supply anything. When p = WTA, the café will supply any amount up to its capacity limit; and when p > WTA, it will be operating at full capacity.

c) Sketch a diagram showing the market supply of the three cafés, assuming that they are each able to sell as much of the good as they wish at a given price p. Discuss how the market supply increases with the price that firms are able to obtain for their output.
The market supply is a step function, with the steps at prices of 1.2, 1.5 and 2.0., and each step the capacity of the café entering the market.

X2.26 **Suppose that every firm that might enter the market can produce up to 100 units of a good at a cost of €10.00 each, and that each of 1,000 potential consumers will demand a quantity $q_c = 10 - 0.5p^M$.**

a) For any firm, what is the *WTA* for the first unit of the good, *WTA*(1)? And for the hundredth, *WTA*(100)?
For any level of output, WTA = 10.

b) Confirm that if the market price, p^M, is less than 10 ($p^M < 10$), then the market supply, Q^S, equals 0 ($Q^S = 0$).
Since p^M < WTA, this follows immediately.

c) Explain why all firms will enter the market as soon as p^M = 10, and why they will be willing to produce to their production capacity of 100 units at that price.
When p^M = 10 = WTA, costs of production covered for all units.

d) Sketch a graph showing, for any single firm, the quantity of output that will be brought to market as the market price changes.
The graph is a reverse L-shape – horizontal at p^M = WTA = 10 then vertical at q = 100.

e) On a single diagram, show how the market supply will change if there are: (i) 25 firms; (ii) 50 firms; and (iii) 100 firms in the market.
The market supply is also a reverse L, horizontal at p^M = WTA = 10 then vertical at Q^S = 100N, where N is the number of firms in the market.

f) Calculate the quantities of the good that each consumer will demand if the market price is: (i) 20; (ii) 15; (iii) 10; and (iv) 5. Sketch the relation between market price and individual demand.

p^M	20	15	10	5
$q_c = 10 - 0.5p^M.$	0	2.5	5	7.5

The demand curve is a straight line, downward sloping and passing through the vertical (price) axis at $p_0 = 20$ and the horizontal (quantity) axis at $q_0 = 10$.

g) **To the diagram showing the relationship between market price and supply, add a line illustrating the relationship between market price and demand.**
This is a straight line intersecting the vertical (price) axis at $p_0 = 20$ and the horizontal (quantity) axis at $Q_0 = 10,000$.

h) **On this diagram, identify the market-clearing price and quantity when there are: (i) 25 firms; (ii) 50 firms; and (iii) 100 firms in the market. Explain why the market price will not fall below €10.00, and outline the circumstances under which it will be higher than €10.00.**
(i)   Quantity traded 2,500, price 15
(ii)   Quantity traded 5,000, price 10.
(iii)   Quantity traded 5,000, price 10.
No trade can occur at a price p < 10 since price is less than WTA. Price higher than 10 when less than 50 firms in the market, for market supply and demand to be equal.