TUTORIAL 4

PRICING

OLIGOPOLY – THE COURNOT MODEL

Start with a simple example in which two firms (A & B) have constant marginal cost equal to zero:

$$MC_A = Mc_B = 0$$

The industry demand curve is given by:

$$P = 100 - Q$$

Industry output equals the sum of each firms output so:

$$Q_A + Q_B = Q$$

The anticipated or residual demand curve for firm A is given by:

$$P_A = (100 - \overline{Q_B}) - Q_A$$

OLIGOPOLY – THE COURNOT MODEL

$$P = 100 - Q$$

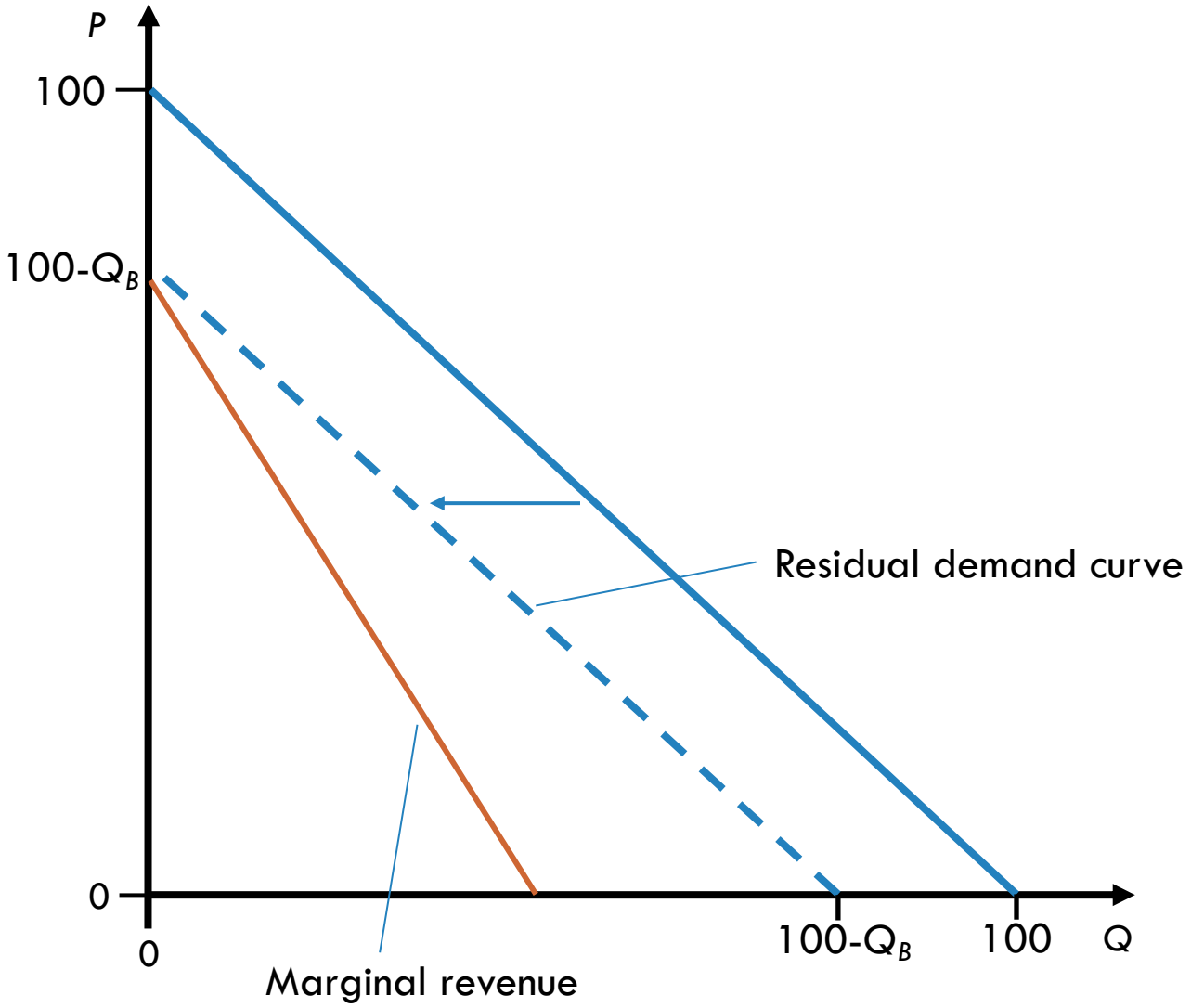
$$Q_A + Q_B = Q$$

$$P = 100 - (Q_A + Q_B)$$

$$P = 100 - Q_A - Q_B$$

$$P_A = (100 - \overline{Q_B}) - Q_A$$

THE RESIDUAL DEMAND CURVE



OLIGOPOLY – THE COURNOT MODEL

The MR curve for firm A is given by:

$$MR_A = (100 - \overline{Q_B}) - 2Q_A$$

(This is because $Revenue_A = P_A Q_A = \big((100 - \overline{Q_B}) - Q_A\big)Q_A$. Take the derivative to get marginal revenue.)

The usual profit maximizing rule applies so we set marginal revenue equal to marginal cost to give:

$$0 = (100 - \overline{Q_B}) - 2Q_A$$

Or

$$Q_A = 50 - 0.5Q_B$$

Or

$$Q_B = 100 - 2Q_A$$

Which represents the firm A's ***reaction function.***

QUESTION 1

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?

QUESTION 2

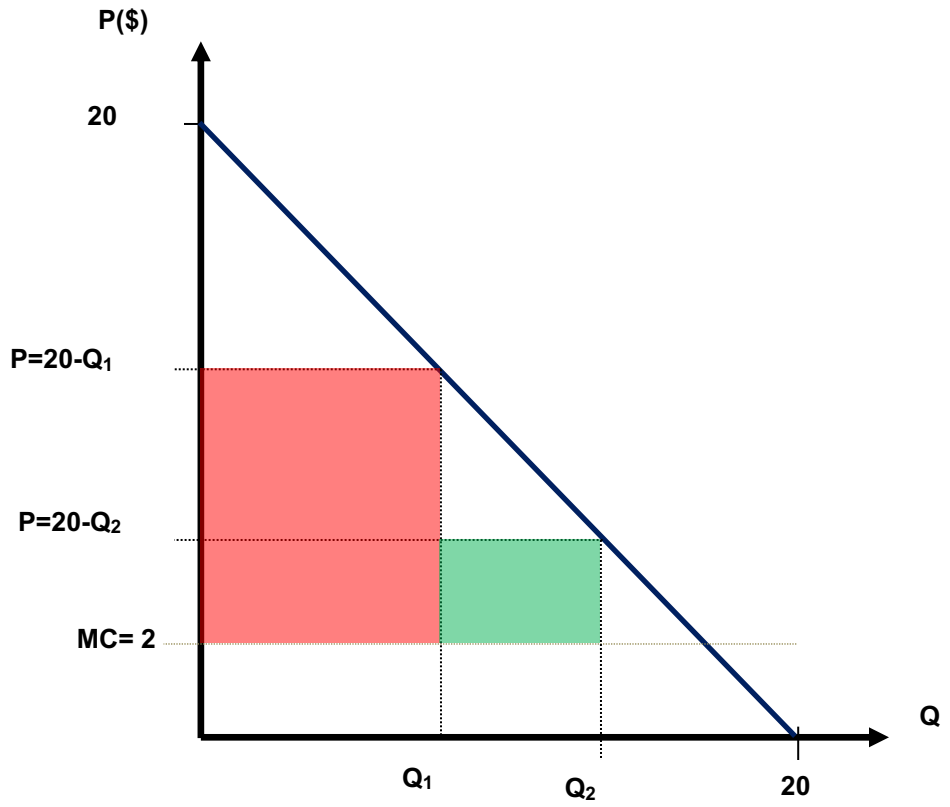
Suppose that the demand curve for telephone services is given by the following:

$$P = 20 - Q$$

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 Q1 units and a different (lower) price for the second set of units.

QUESTION 2



QUESTION 2

Firm's maximisation problem:

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

The First order conditions are:

- FOC Q_1:

$$20 - 2Q_1 - (20 - Q_2) = 0$$
$$Q_1 = 0.5Q_2$$

- FOC Q_2:

$$20 - 2Q_2 - Q_1 - 2 = 0$$
$$Q_1 = 2Q_2 - 18$$

QUESTION 2

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

QUESTION 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?

QUESTION 3

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

QUESTION 3

Pure bundling

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.

QUESTION 3

Mixed or optional bundling

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.

QUESTION 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:

$$P_N = 100 - q$$

$$P_S = 80 - q$$

QUESTION 4

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?

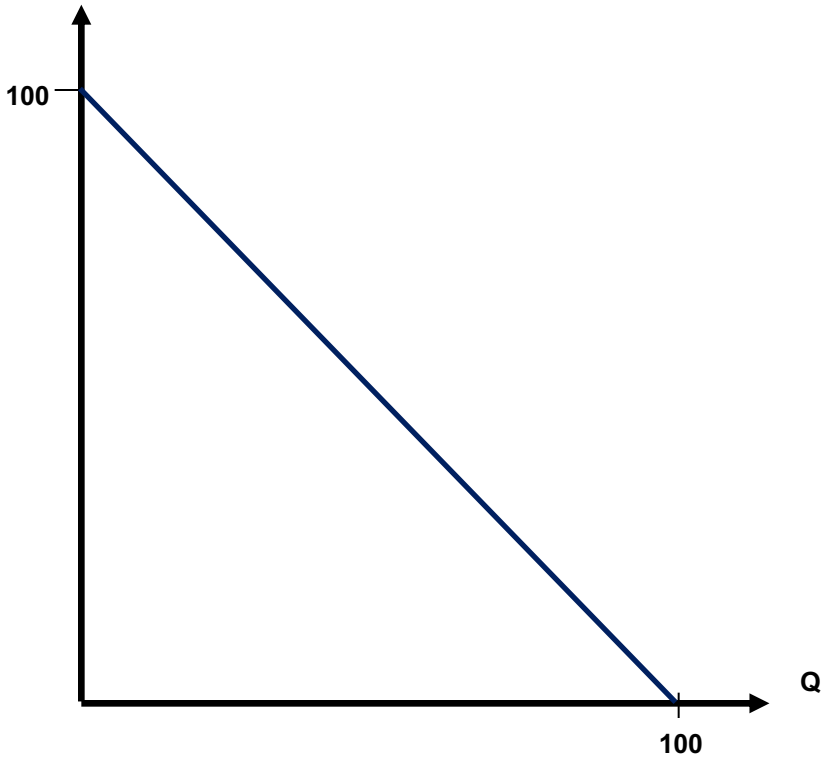
c) What is the maximum price that the newspaper could charge for the 100 articles per month if it wanted the non-students to prefer this to the 80 article per month option?

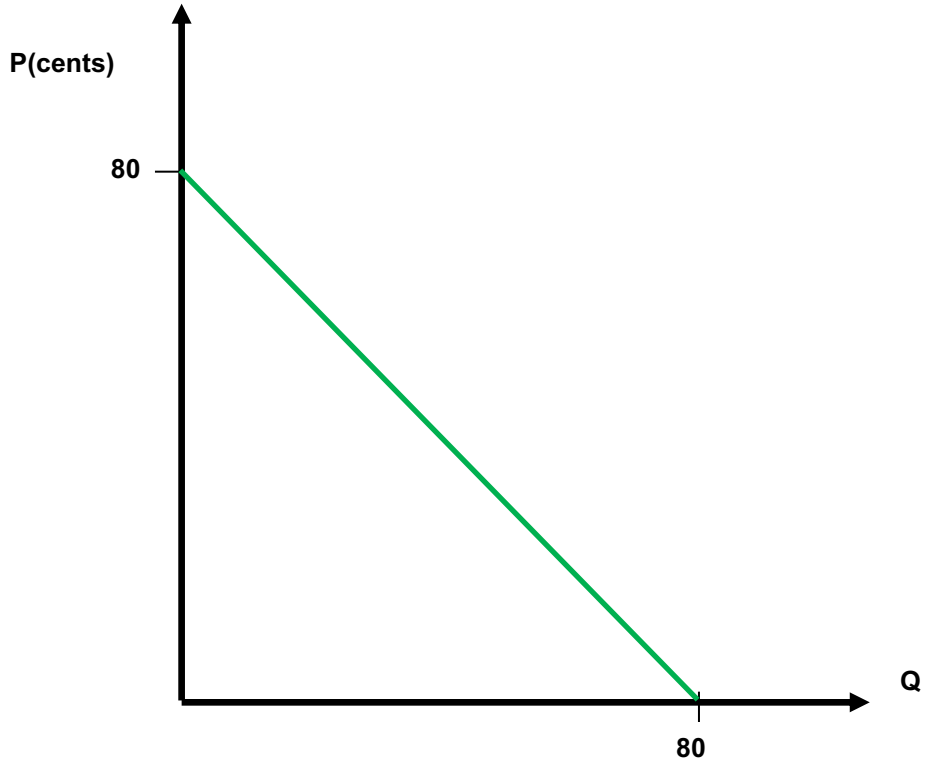
d) Suppose that only 60 articles per month are included in the student subscription, what is the maximum it could charge for this and still get students to pay? How much surplus would a non-student get from the student package?

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?

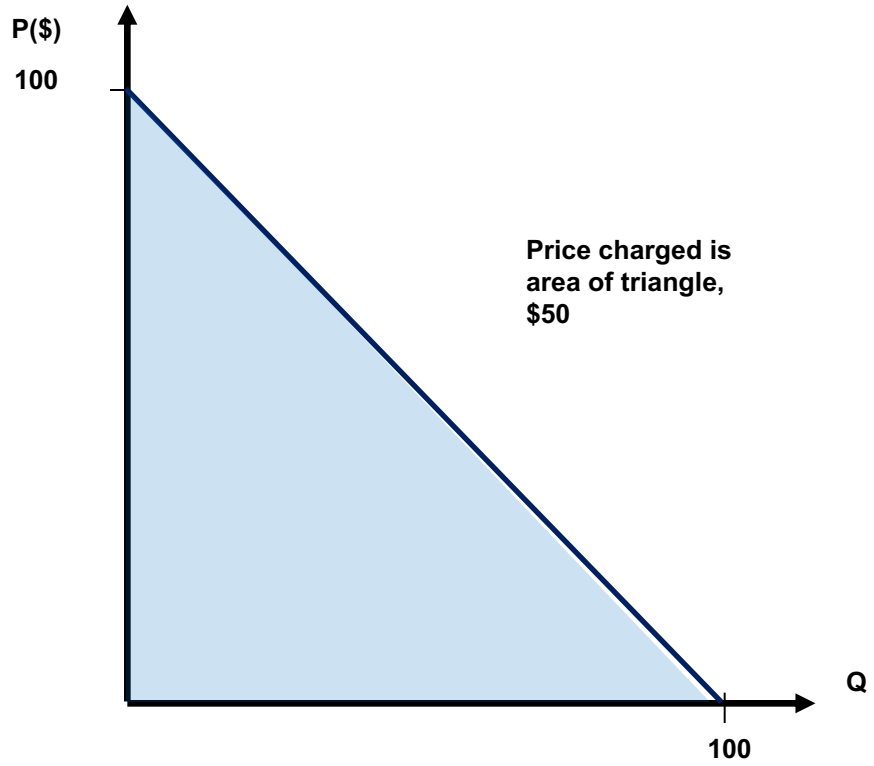
f) Which set of offers (the 60 and 100 article subscriptions, or the 80 and 100 article subscriptions) offers the highest profits?

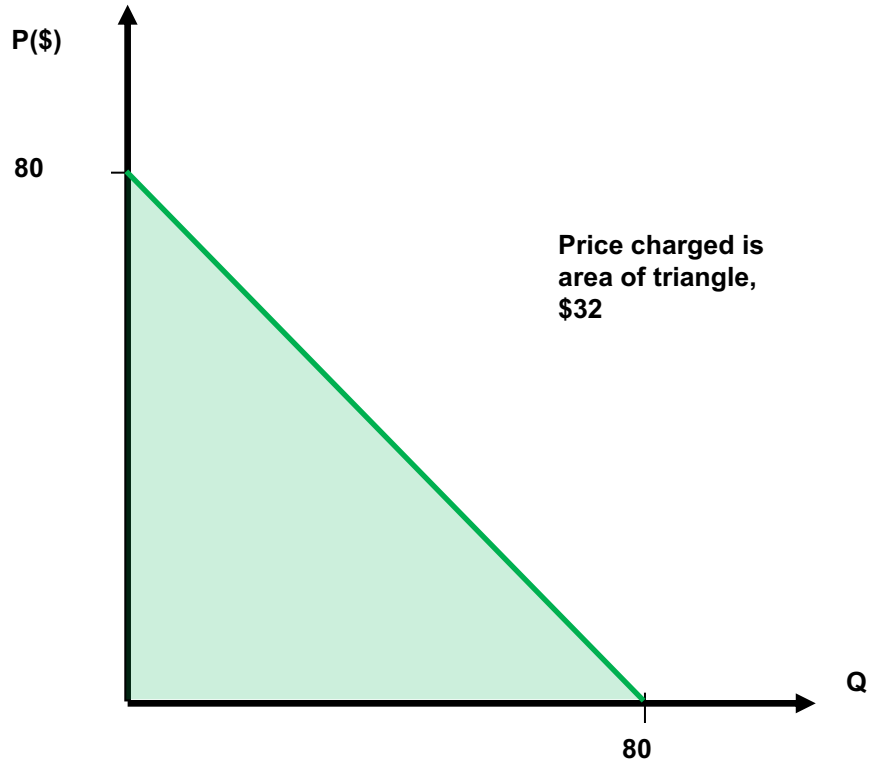
QUESTION 4



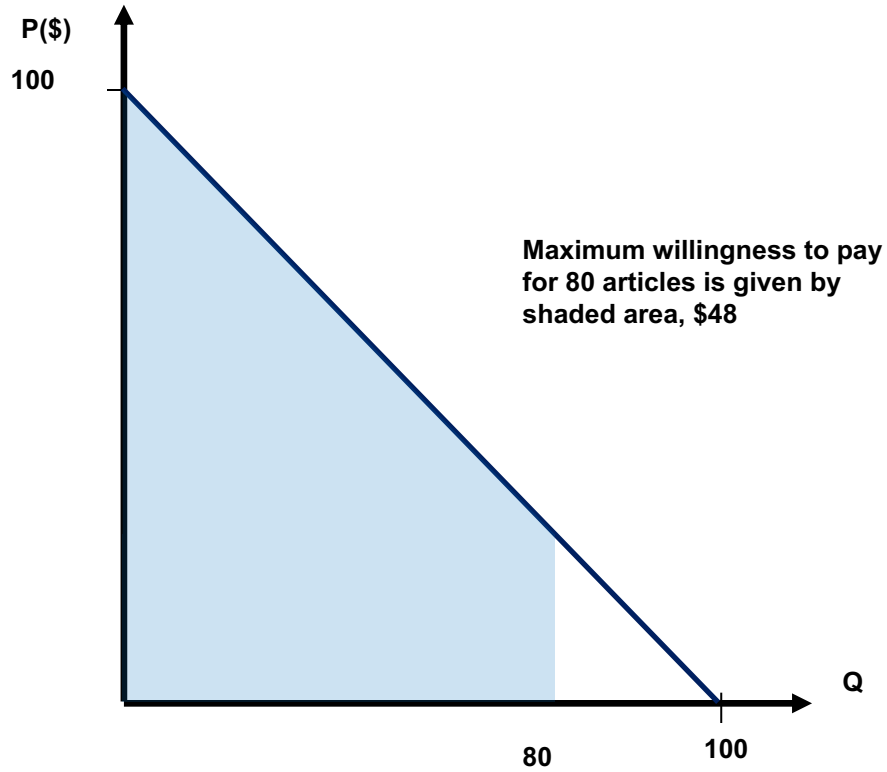


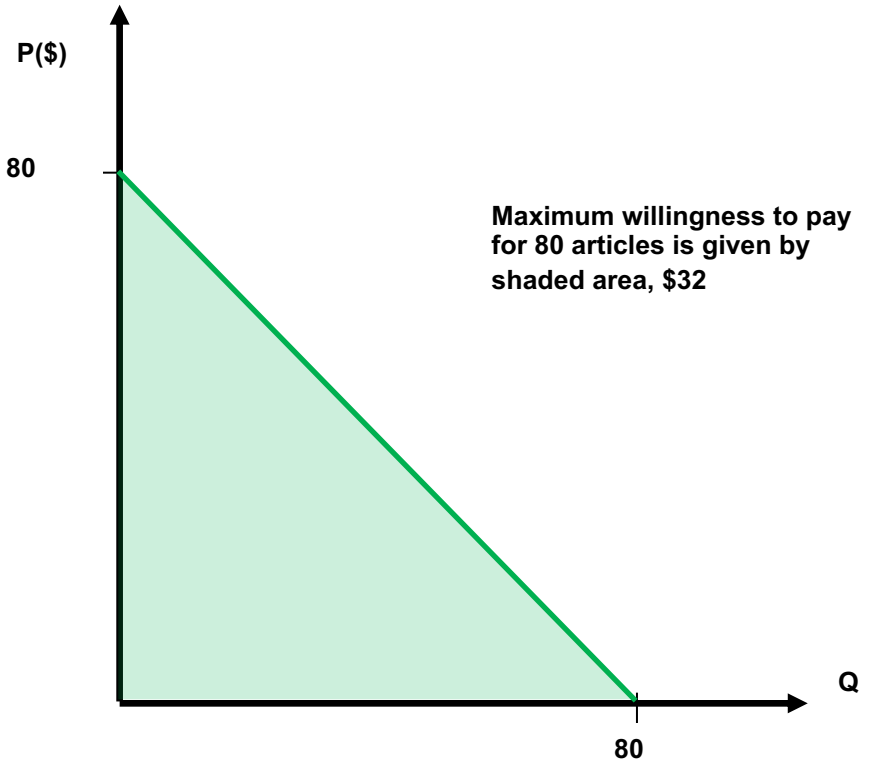
QUESTION 4(A)


P($)
100
Price charged is area of triangle, $50
Q
100

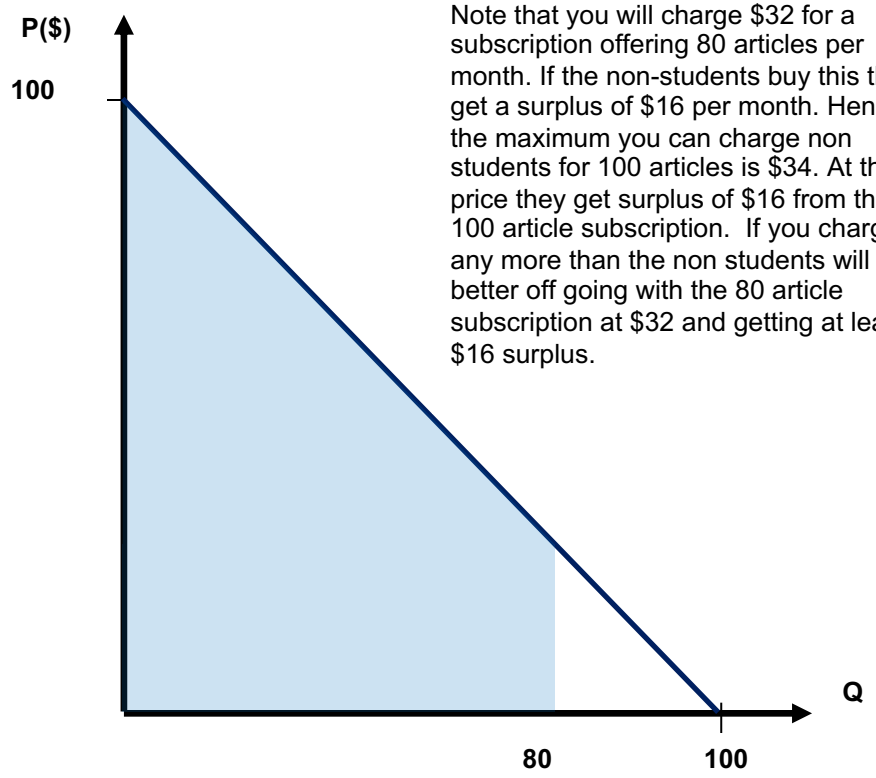

P($)
80
Price charged is area of triangle, $32
Q
80

QUESTION 4(B)

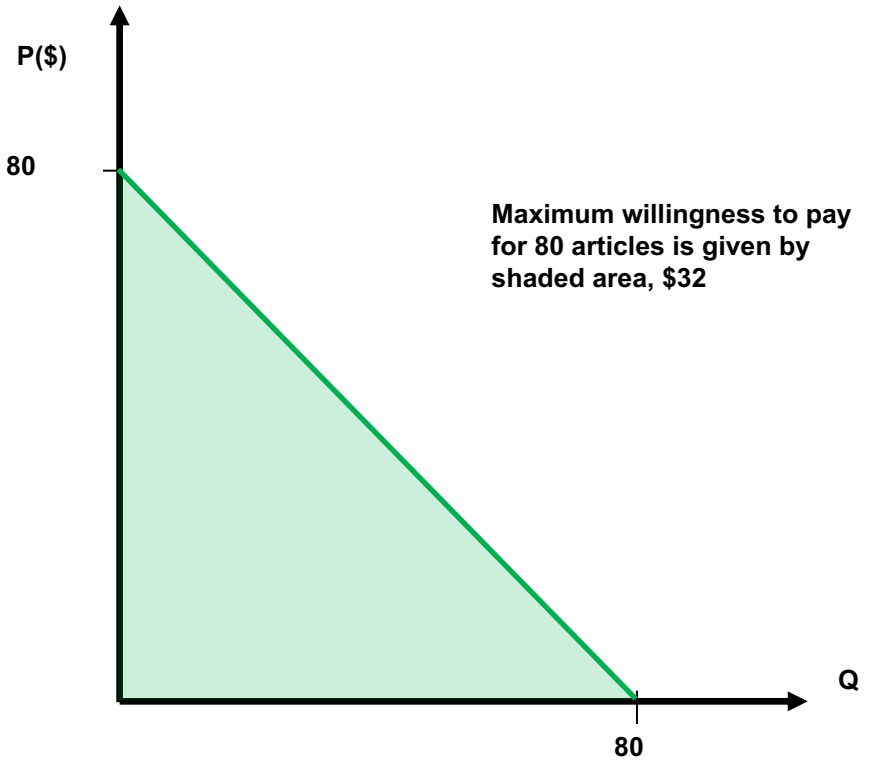

P($)
100
Maximum willingness to pay for 80 articles is given by shaded area, $48
Q
80
100


P($)
80
Maximum willingness to pay for 80 articles is given by shaded area, $32
Q
80

QUESTION 4(C)

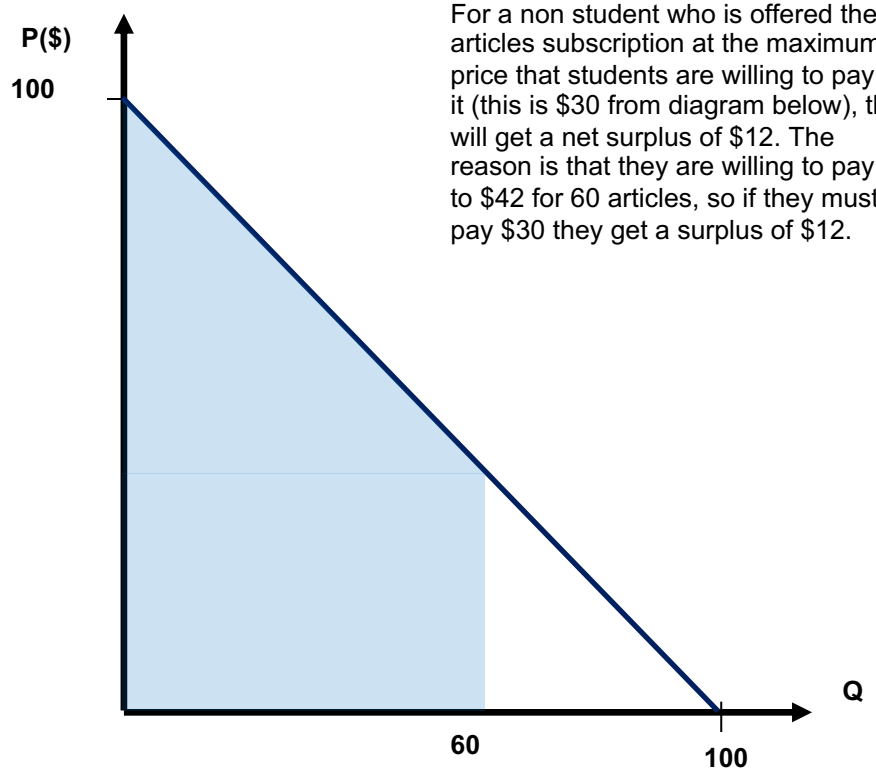


Note that you will charge $32 for a subscription offering 80 articles per month. If the non-students buy this they get a surplus of $16 per month. Hence the maximum you can charge non students for 100 articles is $34. At this price they get surplus of $16 from the 100 article subscription. If you charge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

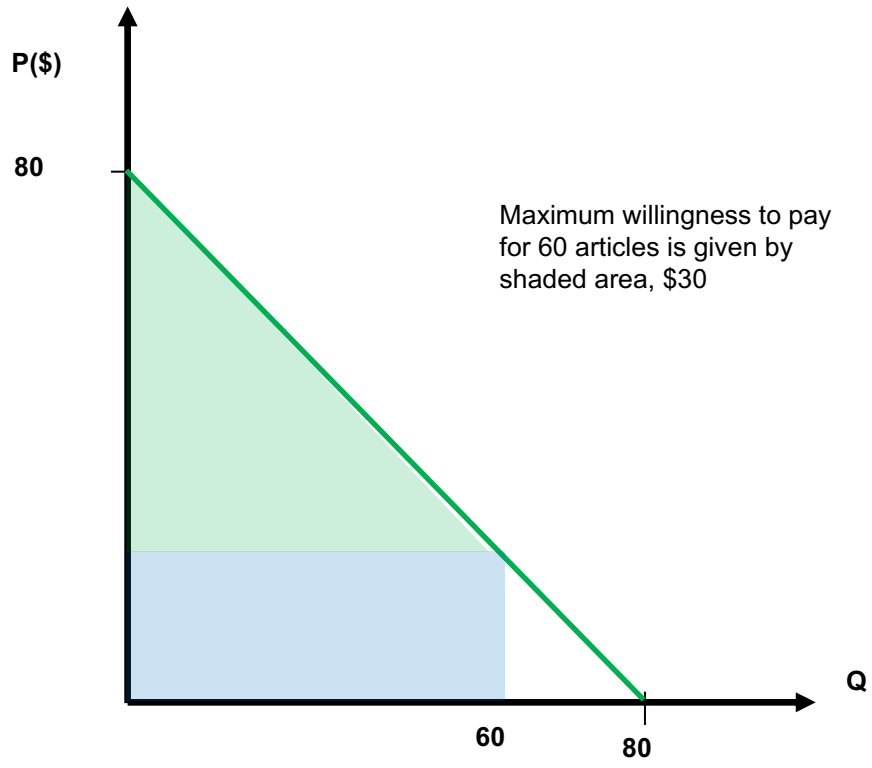


Maximum willingness to pay for 80 articles is given by shaded area, $32

QUESTION 4(D)

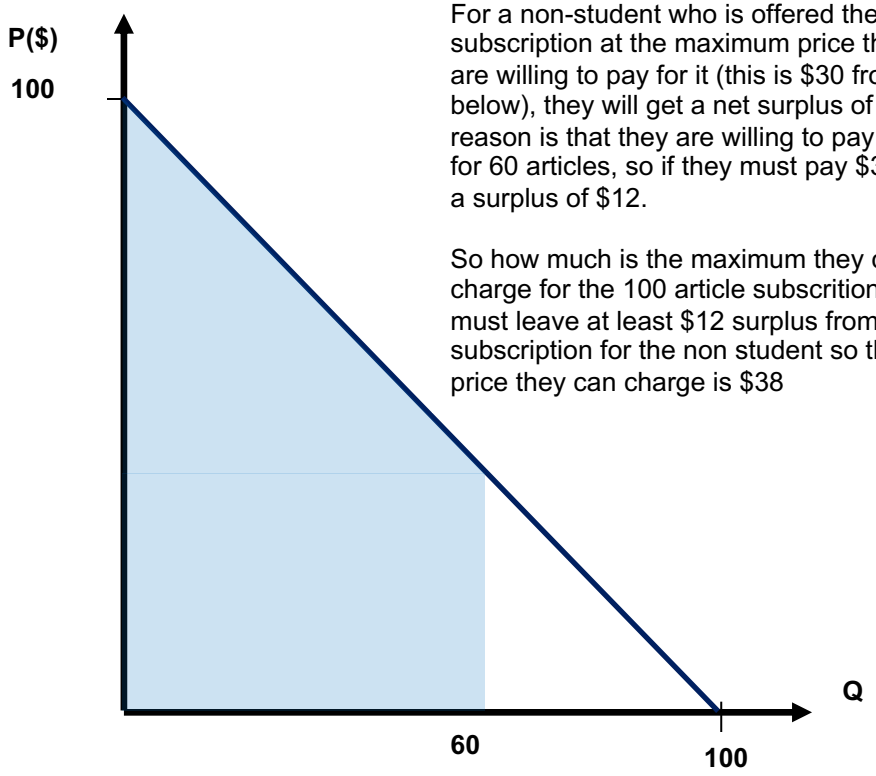


For a non student who is offered the 60 articles subscription at the maximum price that students are willing to pay for it (this is $30 from diagram below), they will get a net surplus of $12. The reason is that they are willing to pay up to $42 for 60 articles, so if they must pay $30 they get a surplus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



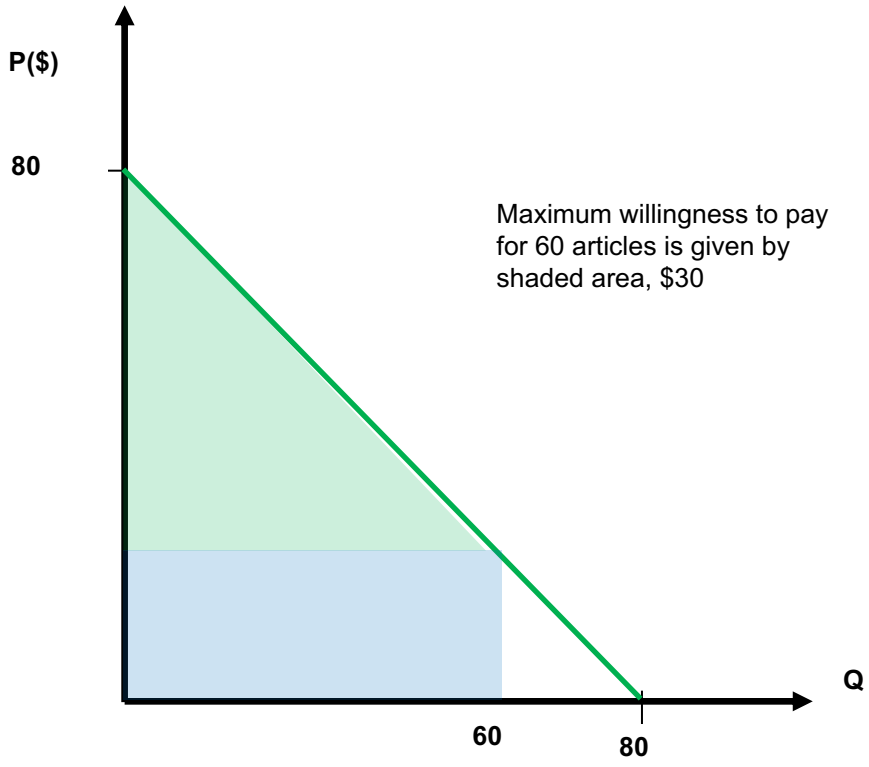
Maximum willingness to pay for 60 articles is given by shaded area, $30

QUESTION 4(E)



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

QUESTION 4(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.

2019 MID-SEMESTER QUESTION 1

- Bubbles and Crazy Juices are two rival bottled drink manufacturers. Both are considering launching a new carbonated guava juice drink on the Sydney University campus. There is sufficient demand to sustain only one carbonated guava drink. Bubbles and Crazy must simultaneously decide whether to launch or stay out of the market. The matrix below summarises payoffs.

		Crazy: Launch	Crazy: Out
Bubbles	Launch	$-60, -80$	$120, 0$
	Out	$0, 120$	$0, 0$

2019 MID-SEMESTER QUESTION 1

(a) Identify all Nash equilibria to this game.

		Crazy: Launch	Crazy: Out
Bubbles: Launch		$-60, -80$	$120, 0$
Bubbles: Out		$0, 120$	$0, 0$

2019 MID-SEMESTER QUESTION 1

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2019 MID-SEMESTER QUESTION 1

(a) Identify all Nash equilibria to this game.

What of mixed strategy Nash equilibria?

Let *p* be the probability that Bubbles chooses Launch, and *q* be the probability that Crazy chooses Launch. Bubbles is indifferent if:

$$-60q + 120(1 - q) = 0 \Rightarrow p = 2/3$$

		Crazy: Launch	Crazy: Out
Bubbles	Launch	$-60, -80$	$120, 0$
	Out	$0, 120$	$0, 0$

2019 MID-SEMESTER QUESTION 1

(a) Identify all Nash equilibria to this game.

What of mixed strategy Nash equilibria?

Let *p* be the probability that Bubbles chooses Launch, and *q* be the probability that Crazy chooses Launch. Crazy is indifferent if:

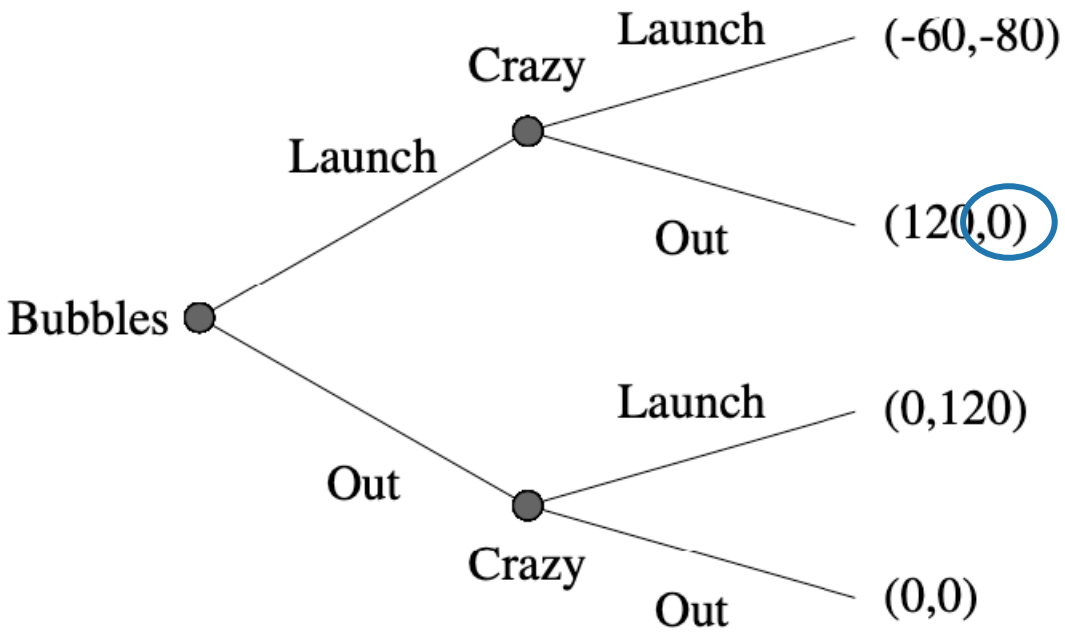
$$-80p + 120(1-p) = 0 \Rightarrow p = 3/5$$

		Crazy: Launch	Crazy: Out
Bubbles	Launch	$-60, -80$	$120, 0$
	Out	$0, 120$	$0, 0$

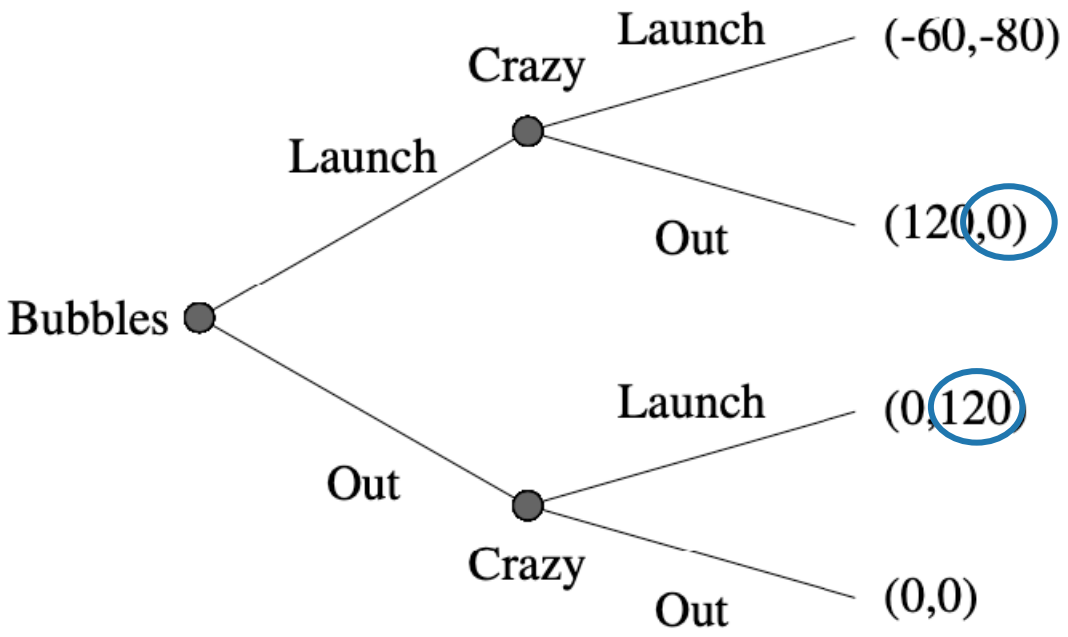
2019 MID-SEMESTER QUESTION 1

(b) The CEO at Crazy Juices thinks it would be a good idea to wait to gather information before deciding whether to launch. Consider a sequential moves game in which Bubbles makes their launch decision first. Crazy observes this decision and then chooses whether to launch. Illustrate this game with a diagram and solve for the subgame perfect Nash equilibrium to the game. Would you advise the CEO at Crazy to wait? Explain.

2019 MID-SEMESTER QUESTION 1



2019 MID-SEMESTER QUESTION 1



2019 MID-SEMESTER QUESTION 1