

LC 2015 (SET B): PAPER 1

QUESTION 8 (50 MARKS)

Question 8 (a)

$$p = 96x - 0.03x^2$$

$$x = 1000 : p = 96(1000) - 0.03(1000)^2 = 66\,000$$

$$x = 1500 : p = 96(1500) - 0.03(1500)^2 = 76\,500$$

$$x = 2000 : p = 96(2000) - 0.03(2000)^2 = 72\,000$$

$$x = 2500 : p = 96(2500) - 0.03(2500)^2 = 52\,500$$

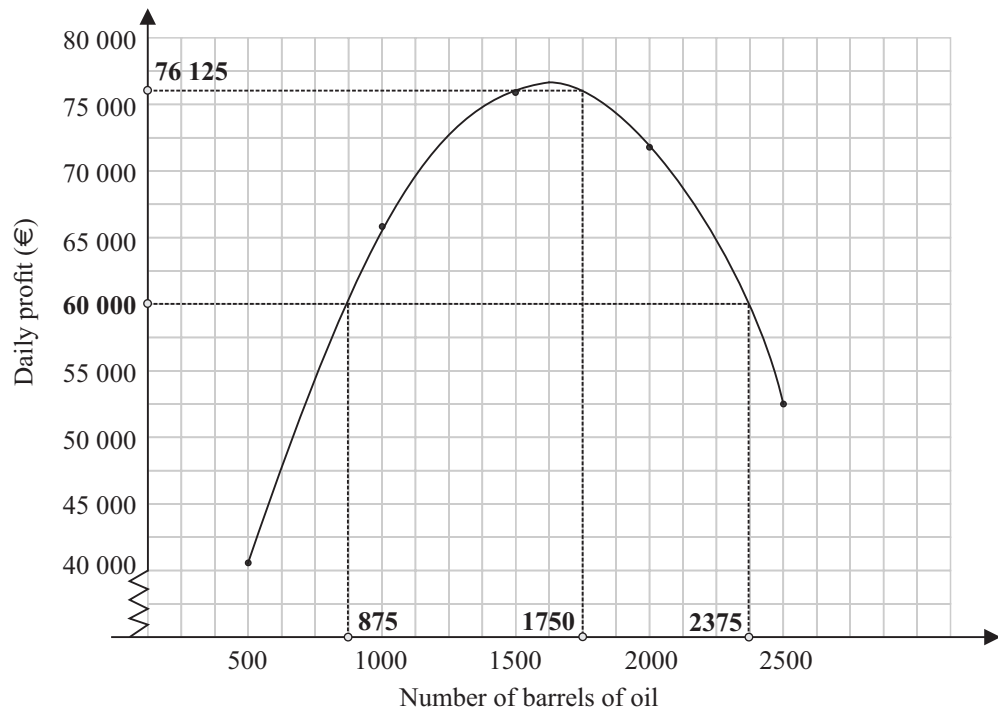
Number of barrels traded in a day	x	500	1000	1500	2000	2500
Daily profit (€)	p	40 500	66 000	76 500	72 000	52 500

MARKING SCHEME NOTES

Question 8 (a) [Scale 15D (0, 3, 7, 11, 15)]

- 3: • Relevant work towards finding one p value
- 7: • One correct p
- 11: • Two correct p values

Question 8 (b)



MARKING SCHEME NOTES

Question 8 (b) [Scale 15D (0, 3, 7, 11, 15)]

- 3: • One point plotted correctly
- Correct shape of graph
- 7: • Three or four points plotted incorrectly, with a correct shape
- 11: • Fails to join the five points or joins with a straight line
- One or two points plotted incorrectly, with a correct shape

Question 8 (c)

- (i) The daily profit when 1750 barrels are traded is €76 125.
 (ii) The number of barrels traded when the daily profits is €60 000 is 875 or 2375 barrels.

MARKING SCHEME NOTES

Question 8 (c) (i) (ii) [Scale 5C (0, 3, 4, 5)]

- 3: • Some indication from graph that 1750 or 60 000 or both are used
 4: • One correct answer

Question 8 (d) (i)

$$p = 96x - 0.03x^2$$

$$\frac{dp}{dx} = 96 - 0.06x$$

$$\frac{dp}{dx} = 0 \Rightarrow 96 - 0.06x = 0$$

$$96 = 0.06x$$

$$\therefore x = \frac{96}{0.06} = 1600$$

1600 barrels oil traded will yield the maximum profit.

FINDTURNINGPOINTS(LOCALMAXIMUM/MINIMUM)
 Put $\frac{dy}{dx} = 0$ and solve for x

MARKING SCHEME NOTES

Question 8 (d) (i) [Scale 5C (0, 3, 4, 5)]

- 3: • Indicates that differentiation is being used
 4: • Correct differentiation

Question 8 (d) (ii)

To find the maximum profit p_{Max} , replace x by 1600 in the profit formula.

$$x = 1600 : p_{\text{Max}} = 96(1600) - 0.03(1600)^2 = \text{€}76\,800$$

MARKING SCHEME NOTES

Question 8 (d) (ii) [Scale 5A (0, 5)]

Question 8 (e)

$p = 0, k = ?$ ← Find the value of k , the number of barrels produced, that will give you no profit.

$$p = 96x - 0.03x^2 \leftarrow \text{Replace } x \text{ by } k \text{ and } p \text{ by } 0.$$

$$\therefore 96k - 0.03k^2 = 0 \leftarrow \text{Factorise the quadratic by taking out } k \text{ in common.}$$

$$k(96 - 0.03k) = 0 \leftarrow \text{Put the bracket equal to } 0. k = 0 \text{ is a trivial solution which you can ignore.}$$

$$96 - 0.03k = 0 \leftarrow \text{Solve for } k.$$

$$96 = 0.03k \leftarrow \text{Divide both sides by } 0.03.$$

$$\therefore k = \frac{96}{0.03} = 3200 \leftarrow 3200 \text{ barrels yields no profit.}$$

MARKING SCHEME NOTES

Question 8 (e) [Scale 5C (0, 3, 4, 5)]

- 3: • $p = 0$
 • Evidence of more than one substitution
 • Graph extended to x -axis
 4: • Not more than two errors in solving