

### Workshop Lecture 3 Solution

**Tuesday**

Sales	20,000 units	100,000 units
SP	£220	£140

(i) Sales Revenue = 100,000 x £140 = £14,000,000

Costs: (VC = 10+20+8+22 = £60/unit)

Total VC = 60x100,000 = 6,000,000

Contribution = 8,000,000

Fixed Costs

Manufacturing 40x100,000 = 4,000,000

Selling and admin 1,000,000      5,000,000

**Annual profit = £3,000,000**

- (ii) Let q = quantity (000 units)  
p = price/unit

because of the linearity assumption we can state that q and p are related such that  
p = mq + c (equation of a straight line)  
where m and c are both constants, so:

$$220 = 20m + c$$

$$140 = 100m + c$$

$$\Rightarrow -80 = 80m$$

$$\Rightarrow m = -1 \text{ and } c = 240$$

$$\Rightarrow p = -q + 240$$

Let R equal Sales Revenue = p x q = (-q + 240) x q  
= -q<sup>2</sup> + 240q

$$\Rightarrow \text{Marginal Revenue (MR)} = \frac{dR}{dq} = \underline{-2q + 240}$$

Marginal cost (MC) = 60 (from above)

For max profit: MC = MR  $\Rightarrow -2q + 240 = 60$

$$\Rightarrow 2q = 180 \Rightarrow q = \underline{90} \text{ (90,000 units)}$$

$$p = -90 + 240 = \underline{£150}$$

Maximum Profit:

	£m
Revenue = 90,000 x 150	= 13.5
VC = 60x90,000	= <u>5.4</u>

	= 8.1
Contribution	= 8.1
Fixed cost	<u>5.0</u>

	= <u>3.1 (an increase in profit of £100,000)</u>
<b>Profit</b>	<b>= 3.1 (an increase in profit of £100,000)</b>

- (iii) At maximum revenue MR = 0 (think of the slope of the revenue curve)  
 $\Rightarrow \frac{dR}{dq} = 0 \Rightarrow 2q + 240 = 0$

$$\Rightarrow q = \underline{120 \text{ (120,000 units)}}$$

- (iv) See lecture notes and text.