

**EC111 Class Exercise 5
Outline Answers**

1.a

The marginal product of labour MP_L is $\Delta Q/\Delta L$. $0.32 = \Delta L/\Delta Q = 1/MP_L$. Short run marginal cost is the wage divided by the marginal product of labour:

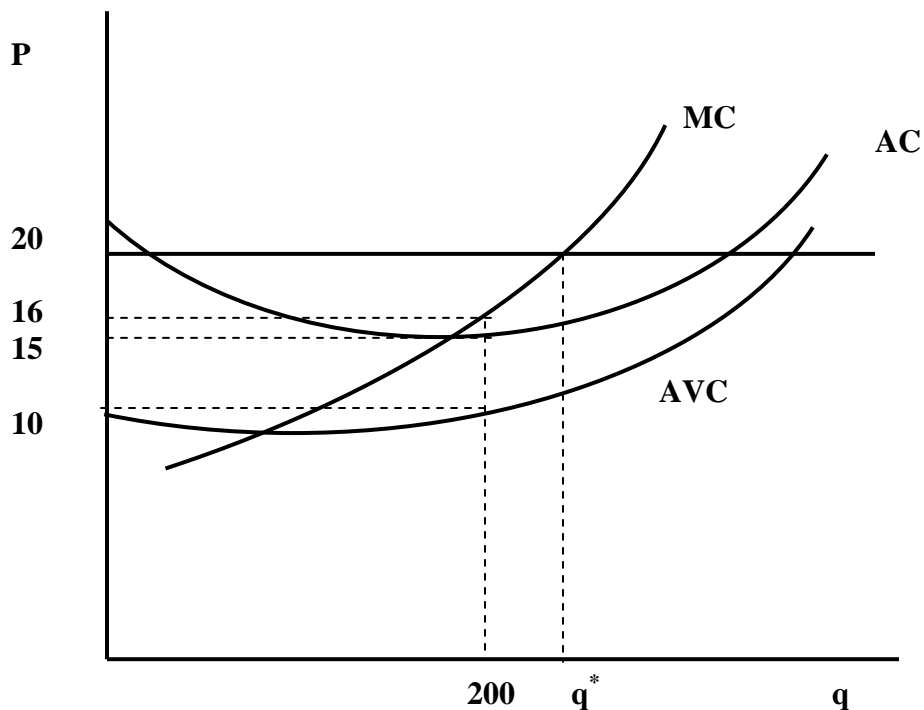
$$MC = w/MP_L = \pounds 50 \times 0.32 = \pounds 16$$

Short run average cost is total cost (which is fixed cost plus variable cost) divided by total output, where $VC = w \times L$.

$$AC = (FC + VC)/Q = (\pounds 1,000 + \pounds 50 \times 40)/200 = \pounds 15$$

$$\text{Profit} = (P - AC) \times Q = (\pounds 20 - \pounds 15) \times 200 = \pounds 1,000.$$

On the diagram:



b.

The firm is not maximising its profit because $P \neq MC$. The profit maximising output is somewhat higher at q^* .

c.

MC has not changed (because only fixed costs have altered).

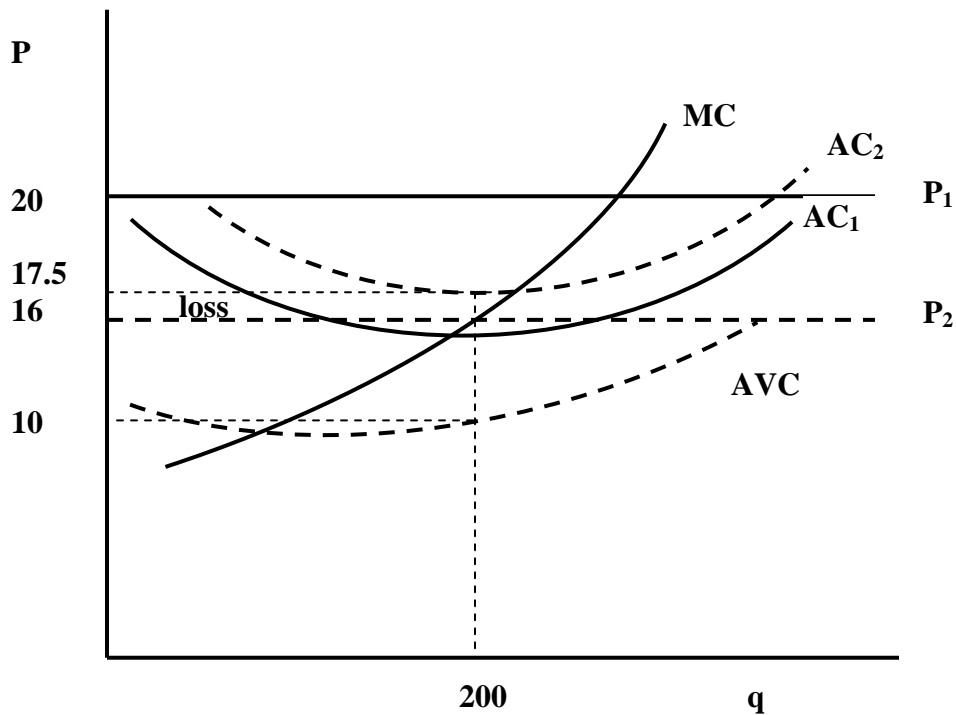
$$AC = (FC + VC)/Q = (£1,500 + £50 \times 40)/200 = £17.5$$

$$\text{Profit} = (P - AC) \times Q = (£16 - £17.5) \times 200 = - £300.$$

The firm is making a loss, but it will only shut down if price is less than average variable cost.

$$AVC = VC/Q = wL/Q = (£50 \times 40)/200 = £10.$$

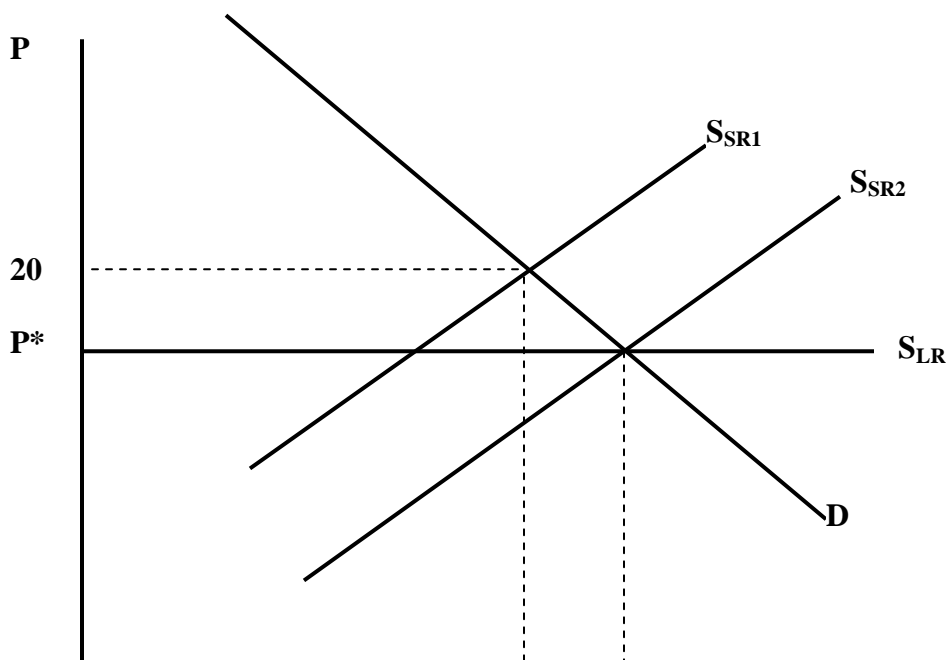
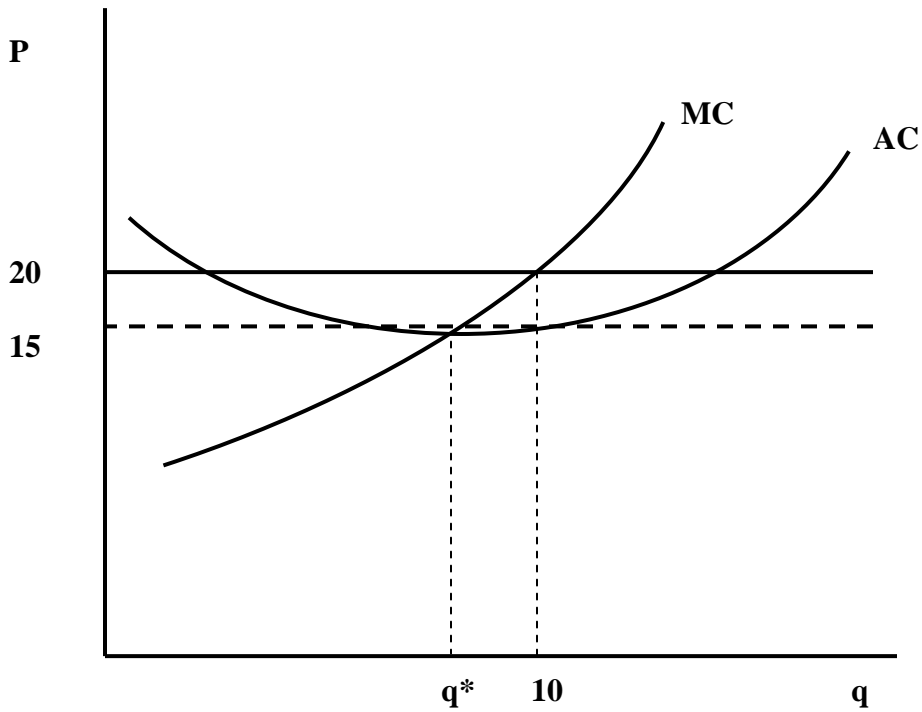
Since AVC is less than price, $10 < 16$, the firm stays in business in the short run.



The new situation is shown above, with the upward shift in AC and the downward shift in the price line (both drawn as dashed lines). Notice that the firm is now setting price equal

to marginal cost. It is maximising its profits even though it is making a loss. Nevertheless, it will stay in business in the short run because price is higher than AVC.
 2 (a).

In the long run profit maximisation for a perfectly competitive firm is where $P = LRMC = LRAC$. By producing $q = 200$ the firm is making supernormal profits of $200 * (20 - 15) = 1000$. This cannot be the long run equilibrium as there is free entry into the industry (we have assumed this by specifying perfect competition), and there is an incentive to enter.



b.

Q_1 Q_2 Q

In the long run new firms will enter, shifting the short-run industry supply curve to the right. The new equilibrium coincides with the horizontal long run supply curve. At that point the representative firm in the industry is making zero profits at the lowest point of its long run average cost curve. The price will be $P^* < 15$. The assumption we have made is that all firms have identical costs, even the new entrants.

3.

In this case we need to find the number of firms, n^* in long run industry equilibrium. As all firms are identical they must be making zero profits. For the representative firm, we have

Profit, $\pi = Pq - TC$.

We also have: $P = 10$, $q = 200/n$, and $TC = (200/n)^2$

$$\pi = 10 \times (200/n) - (200/n)^2$$

Setting this equal to zero and dividing both sides by $(200/n)$, we have:

$$0 = 10 - 200/n$$

$$n^* = 200/10 = 20$$

There are 20 firms in the industry. This is the number of firms that is consistent with each firm making zero profits.