

Exercise walk-through

7.5

Types of cost, revenue and profit, short-run and long-run production

A-Level Economics

Short-run production: one oven, more workers

A bakery keeps the same oven and technology

Output is loaves per day. Labour is the number of workers employed each day; the oven is fixed. Find each worker's extra output and the average output per worker.

L	TP (loaves/day)	AP	MP
0	0	—	—
1	12	?	?
2	30	?	?
3	42	?	?
4	48	?	?
5	50	?	?
6	48	?	?

Calculate average and marginal product separately

Total product is all output. **Average product** is output per unit of the variable factor; **marginal product** is extra output per extra unit of that factor.

$$AP_L = TP/L = 30 \text{ loaves/day}/(2 \text{ workers}) = 15 \text{ loaves/worker/day.}$$

$$MP_L = \Delta TP / \Delta L = (30 - 12) \text{ loaves/day} / (2 - 1) \text{ workers}$$

$$MP_L = \Delta TP / \Delta L = 18 \text{ loaves/worker/day.}$$

The second worker adds 18, although the average of both workers is 15. At zero workers, AP is undefined, not zero.

Diminishing marginal returns do not mean falling total output

<i>L</i>	<i>TP</i> (loaves/day)	<i>AP</i> (loaves/worker/day)	<i>MP</i> (loaves/worker/day)
1	12	12	12
2	30	15	18
3	42	14	12
4	48	12	6
5	50	10	2
6	48	8	-2

From the third worker, MP falls: extra workers share the same oven. TP still rises while MP is positive; it falls only when MP becomes negative.

MP above AP pulls AP up; MP below AP pulls AP down. In this discrete table AP peaks at two workers, without exact equality $MP=AP$.

Separate fixed cost, variable cost and total cost

A daily cost schedule; output is loaves/day

The bakery pays £60/day for its oven even at zero output. Variable costs are £0, £40, £60, £90 and £140/day at output 0, 10, 20, 30 and 40. Calculate total cost and the marginal cost of each ten-loaf increase.

Fixed cost does not vary with output in this short-run period. **Variable cost** changes with output.

$$TC = TFC + TVC, \quad MC = \Delta TC / \Delta Q = \Delta TVC / \Delta Q.$$

The fixed cost cancels from the change. A fixed cost is not necessarily a sunk cost: fixed describes output dependence; sunk describes recoverability.

Read marginal cost as an interval average

Q (loaves/day)	TFC (£/day)	TVC (£/day)	TC (£/day)	MC (£/loaf)
0	60	0	60	–
10	60	40	100	4
20	60	60	120	2
30	60	90	150	3
40	60	140	200	5

For the increase from 20 to 30 loaves/day:

$$MC = \frac{\Delta TC}{\Delta Q} = \frac{(150 - 120)\text{£/day}}{(30 - 20) \text{ loaves/day}} = \text{£}3/\text{loaf}.$$

This is the average extra cost of that ten-loaf block, not an observation of each individual loaf's cost.

Exercises 2.1-2.3

2.1 Define the term *marginal cost*.

[2]

2.2 State the difference between *normal* and *supernormal* profit.

[2]

2.3 State the output rule for profit maximisation.

[1]

Exercises 2.1-2.3

2.1 Define the term *marginal cost*. [2]

2.1

- the addition to total cost from producing one more unit of output ($\Delta TC / \Delta Q$) (2 for a clear definition; 1 for a partial idea)
-

2.2 State the difference between *normal* and *supernormal* profit. [2]

2.2

- normal profit is just enough to keep the firm in the industry (it counts as a cost); supernormal profit is any profit above normal (2 for a clear difference; 1 for a partial idea)
-

2.3 State the output rule for profit maximisation. [1]

2.3

- produce where marginal revenue equals marginal cost ($MR = MC$) (1)

Exercises 3.1-3.2

3.1 A firm maximises profit at the output where:

[1]

☐

A average cost is lowest

B marginal revenue equals marginal cost

C total revenue is highest

D price equals average cost

3.2 Explain, using diminishing returns, why the marginal cost curve is U-shaped.

[6]

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3.1 B

- Profit is maximised where $MR = MC$

3.2 Explain, using diminishing returns, why the marginal cost curve is U-shaped.

[6]

3.2

- [6] AO1 1 + AO3 up to 5 – at low output, adding a variable factor to fixed factors raises productivity, so MC falls; beyond a point, diminishing returns set in (each extra worker adds less output)
- the cost of each extra unit rises
- MC rises
- the curve is U-shaped

Exercise 3.3

3.3 Discuss why a firm's long-run average cost may fall and then rise as output increases. [12]

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3.3

- [12] AO1/AO2/AO3 up to 8 + AO4 up to 4. **Falls:** economies of scale – bulk buying, large machines, specialisation, financial economies lower average cost as the firm grows. **Rises:** diseconomies of scale – poor communication, control and coordination problems raise average cost if it grows too large. Judgement: there is an optimum size at minimum LRAC; whether a firm gains net economies depends on the industry and how well it is managed