

Exercise walk-through

7.2

Indifference curves and budget lines

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 *indifference curve*.

[2]

2.2 State where **consumer equilibrium** occurs on an indifference diagram.

[1]

2.3 State the difference between the income effect and the substitution effect.

[2]

Exercises 2.1-2.3

2.1 Define the term *indifference curve*. [2]

2.1

- a curve showing all combinations of two goods that give a consumer the same total utility (2 for a clear definition; 1 for a partial idea)

2.2 State where **consumer equilibrium** occurs on an indifference diagram. [1]

2.2

- where the budget line is tangent to the highest reachable indifference curve (1)

2.3 State the difference between the income effect and the substitution effect. [2]

2.3

- the substitution effect is the change in quantity from a good becoming relatively cheaper; the income effect is the change from the consumer's real income rising (2 for a clear difference; 1 for a partial idea)

Exercises 3.1·3.2

3.1 Consumer equilibrium occurs where the budget line is:

[1]

☐

- A above the highest indifference curve
- B tangent to the highest reachable indifference curve
- C parallel to the indifference curve
- D at the origin

3.2 Using an indifference-curve diagram, explain how a consumer reaches equilibrium.[8]

Exercises 3.1·3.2

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3.1 B

- Equilibrium is at the tangency with the highest reachable indifference curve

3.2 Using an indifference-curve diagram, explain how a consumer reaches equilibrium.[8]

3.2

- [8] AO1 1 + **AO3 diagram up to 4** (budget line, indifference map, tangency) + AO2/AO3 up to 3 – the consumer wants the highest utility they can afford
- they reach the highest indifference curve the budget line touches
- at the tangency the slope of the budget line equals the slope of the indifference curve (the marginal rate of substitution equals the price ratio)

Exercise 3.3

3.3 Explain, using income and substitution effects, why the demand for a Giffen good slopes upward. [8]

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3.3

- [8] AO1 1 + AO3 up to 7 – when a Giffen good's price falls, the substitution effect raises quantity, but it is a very inferior good, so the income effect (higher real income buy less of it) is **stronger** and works the opposite way
- the net effect is that quantity demanded falls as price falls
- demand slopes upward