What is Production Function?

Worksheet

A production function Q = f(L, K) expresses the maximum output a firm can produce with given quantities of labour (L) and capital (K), assuming efficient production.

$$Q = A \cdot L^{(\alpha)} \cdot K^{(1-\alpha)}$$

Q = Output (units)
A = Total Factor Productivity (technology) (scalar)
L = Labour input (hours/workers)
K = Capital input (machines/equipment)
α = Labour elasticity (0–1) (unitless)

Questions

1. A production function Q = f(L, K) shows...
A) the cost of production
B) maximum output for given inputs
C) the price of the product
D) worker salaries

2. In Cobb-Douglas Q = A × L^0.6 × K^0.4, if both L and K double, output...
A) doubles (homogeneous of degree 1)
B) quadruples
C) stays the same
D) halves

3. What does 'A' (scalar) in production functions represent?
A) Average cost
B) Total factor productivity and technology
C) Accounting profit
D) Asset value

4. If a firm's production function shows diminishing marginal product of labour, then...
A) output falls if labour increases
B) each additional worker adds less output than the previous worker
C) capital is infinite
D) the firm should stop hiring

5. A firm has Q = 2 × L^0.6 × K^0.4. With L=8 and K=5, find output.

6. Linear production function: Q = 3L + 2K. If L=10 and K=5, what is Q?

7. Cobb-Douglas: Q = 5 × L^0.7 × K^0.3. Labour elasticity is 0.7. If labour increases by 1%, how much does output increase?

8. Define: What is a production function?

9. Define: Why study production functions?

10. Define: Common form: Cobb-Douglas?

Answer Key

1. B) maximum output for given inputs — Production function is a technology relationship, not a cost or pricing function.

2. A) doubles (homogeneous of degree 1) — Exponents sum to 1 → constant returns to scale. L and K double → Q doubles.

3. B) Total factor productivity and technology — A is the efficiency multiplier — reflects technology level and organizational efficiency.

4. B) each additional worker adds less output than the previous worker — Diminishing MP is typical; each extra worker is less productive (with fixed capital).

5. Q = 2 × 8^0.6 × 5^0.4 = 2 × 3.52 × 1.77 = 12.5 units (approx.)

6. Q = 3(10) + 2(5) = 30 + 10 = 40 units

7. Output elasticity w.r.t. labour = 0.7 A 1% increase in L → 0.7% increase in Q (ceteris paribus)

8. A model showing the maximum output a firm can produce with given quantities of inputs (labour, capital, materials).

9. To understand efficiency, optimal input mix, returns to scale, and marginal productivity of inputs.

10. Q = A × L^α × K^(1−α), where α is the output elasticity of labour.