3.1 Scarcity and opportunity cost

Name: _____ Class: _____ Date: _____ **Total: 22 marks**

KEY WORDS production possibilities frontier • opportunity cost • scarcity

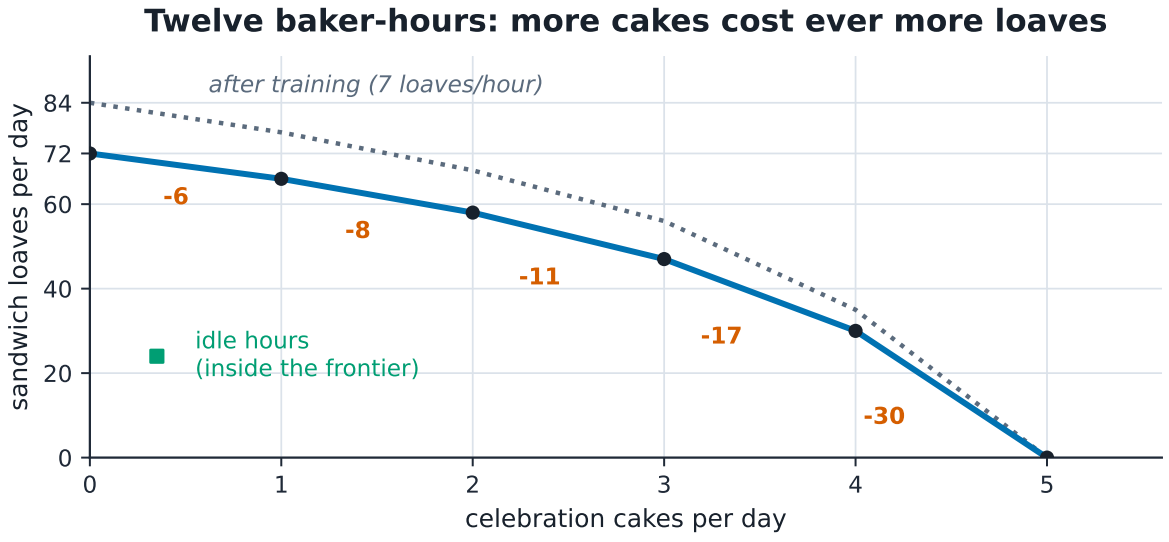
Objective

Compute and interpret opportunity cost on a production frontier; classify points as on, inside or beyond the frontier; price a trade-off in money; decide a boundary case where benefit exactly equals cost.

1 Key knowledge and worked examples

The frontier and its slope

The **production possibilities frontier** lists every efficient combination of two goods fixed resources can make. The slope between two points is the **opportunity cost** of the extra unit: the other good those hours would have produced. The outward bow IS increasing opportunity cost.



Each extra cake costs more loaves than the one before

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■ **Worked example. Nimbus's twelve hours**

Frontier (cakes, loaves): (0,72), (1,66), (2,58), (3,47), (4,30), (5,0). Second cake: 66 − 58 = 8 loaves ✓. At £4 a loaf that is £32 – bake a second cake only if it nets more than £32. After training (7 loaves an hour): (0,84), (1,77), (2,68), (3,56), (4,35), (5,0) – third cake now costs 68 − 56 = 12 loaves, up from 11 ✓: growth shifts the menu, not the need to choose.

2 Practice

2.1 A market garden's day splits between carrots and peas (both in crates). Its frontier is (0,60), (1,52), (2,42), (3,30), (4,16), (5,0). Compute the opportunity cost of the second and the fourth crate of peas, and state the pattern. [4]

2.2 Against that same frontier, classify each plan: (2, 40), (3, 35), (1, 52). For each, say on, inside or beyond, and why. [3]

2.3 A grant lifts the garden to 70, 61, 50, 37, 22, 0. Compute the new opportunity cost of the third crate of peas, and compare it with the old one. [3]

2.4 On Nimbus's original frontier with loaves at £4: a celebration cake sells for £45 and uses £8 of ingredients. Taking the second cake costs 8 loaves. Should Nimbus bake it? Show the comparison. [4]

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2.5 A customer offers £50 for Nimbus's THIRD cake; ingredients are £6 and loaves still £4. Compute the net benefit and the opportunity cost, state the decision, and explain what the equality means. [5]

2.6 True or false, one line each: (a) flour already bought counts in a cake's opportunity cost; (b) a straight frontier shows increasing opportunity cost; (c) every point on the frontier is efficient. [3] *(2 marks for the set, 1 for reasons)*

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Solutions

2.1

- Second crate: $60 - 52 =$ **8 carrots**.
- Fourth crate: $30 - 16 =$ **14 carrots**.
- The costs rise (8, 10, 12, 14, 16) – increasing opportunity cost.
- Each later crate displaces ground better suited to carrots.

2.2

- (2, 40): **inside** – the frontier offers 42 at 2 crates, so hours sit idle.
- (3, 35): **beyond** – 3 crates allow at most 30.
- (1, 52): **on** – exactly the frontier's second point.

2.3

- New third-crate cost: $50 - 37 =$ **13 carrots**.
- Against the old cost of 12 carrots.
- Growth shifted the frontier out but scarcity remains – the third crate still costs carrots, and more than before.

2.4

- Net benefit of the cake: $45 - 8 =$ £37.
- Opportunity cost: 8 loaves $\times$ £4 = £32.
- £37 $>$ £32, so **bake it**.
- The margin is £5.

2.5

- Net benefit: $50 - 6 =$ £44.
- Opportunity cost: the third cake costs $47 - 30 = 11$ loaves $\times$ £4 = **£44**.
- Benefit equals cost exactly: Nimbus is **indifferent**.
- The offer prices the cake at precisely its opportunity cost.
- That is the boundary of the bake / don't-bake rule.

2.6

- (a) False – the flour is sunk; the cost is the forgone loaves.
- (b) False – a straight frontier has constant cost.
- (c) True – all on-curve points use resources fully; choosing among them is preference, not efficiency.