# Exercise walk-through

## Effect of Density on Populations ▪ 8.4

eXercise

# You must be able to

- distinguish **density-dependent** 密度制约 from **density-independent** 非密度制约 factors
- give examples of each
- predict which limits a population

# Method — Density-dependent factors

These have a **stronger effect** as the population gets **denser**: competition for food, disease spread, predation, and waste build-up. They help regulate the population toward carrying capacity.

# Method — Density-independent factors

These affect the population **regardless** of its size: weather, natural disasters (fire, flood), and temperature. A storm kills the same fraction whether the population is large or small.

# Method — A worked identification

Disease spreading faster in a crowded population = **density-dependent**. A drought killing many plants regardless of number = **density-independent**.

## Method — Why the distinction matters

Density-dependent factors **regulate** populations around $K$; density-independent factors can cause sudden crashes unrelated to density.

## Practice 2.1 ▪ 1 mark

Give one density-dependent factor.

# Solution 2.1

**Worked steps**

Any one: competition, disease, predation, waste build-up B1.

## Practice 2.2 ▪ 1 mark

Give one density-independent factor.

# Solution 2.2

**Worked steps**

Any one: weather, natural disaster, temperature B1.

## Practice 2.3 ▪ 1 mark

Which type of factor helps regulate a population near carrying capacity?

# Solution 2.3

Method: Density-dependent factors

**Worked steps**

Density-dependent factors B1.

## Exam-style 3.1 ▪ 1 mark

A disease that spreads faster in a crowded population is a

**A** density-independent factor

**B** density-dependent factor

**C** carrying capacity

**D** producer

# Solution 3.1

Method: A worked identification

**A** density-independent factor

**B** density-dependent factor ✓

**C** carrying capacity

**D** producer

## Worked steps

**B** — a density-dependent factor.

## Exam-style 3.2 ▪ 1 mark

A sudden flood kills many organisms in a population.
(a) Classify this factor.
(b) Explain why its effect does not depend on population density.

# Solution 3.2

Method: Density-independent factors

**Worked steps**

(a) Density-independent B1. (b) A flood affects the same proportion of organisms whether the population is large or small — its effect does not change with density M1 A1.

## Exam-style 3.3 ▪ 2 marks

Explain how density-dependent factors help keep a population near its carrying capacity.

# Solution 3.3

Method: Density-dependent factors

**Worked steps**

As density rises, competition, disease, and predation increase, raising deaths and lowering births; this pushes the population back down toward the carrying capacity M1 A1.