

Exercise walk-through

Population Dynamics ■ 2.4

eXercise

You must be able to

- define **crude birth rate** 粗出生率 (CBR), **crude death rate** 粗死亡率 (CDR), and **rate of natural increase** 自然增长率 (RNI)
- define **total fertility rate** 总和生育率 (TFR) and **infant mortality rate** 婴儿死亡率 (IMR)
- calculate RNI from CBR and CDR
- explain **doubling time** 倍增时间

Method — Key rates

CBR = births per 1,000 people per year. **CDR** = deaths per 1,000. **RNI** = $(\text{CBR} - \text{CDR}) \div 10$, as a percent (migration excluded).

Method — TFR and IMR

TFR = average children per woman; a TFR near **2.1** is replacement level. **IMR** = deaths under age 1 per 1,000 live births — a strong indicator of development.

Method — Doubling time

Doubling time $70 \div \text{RNI (in \%)}.$ An RNI of 2% doubles a population in about 35 years.

Practice 2.1 ■ 2 marks

Define the rate of natural increase.

Solution 2.1

Worked steps

the percentage growth of a population from births minus deaths **B1**, excluding migration **B1**.

Practice 2.2 ■ 2 marks

A country has a CBR of 30 and a CDR of 10. Calculate its RNI.

Solution 2.2

Worked steps

$$(30 - 10) \div 10 = 2.0\% \quad \text{M1 A1 for CBR-CDR; for 2.0\%}.$$

Practice 2.3 ■ 1 mark

Country Y has a TFR of 1.6.

- (a) State whether this is above or below replacement level.
- (b) Predict what happens to the population size over time, ignoring migration.

Solution 2.3

Worked steps

(a) below replacement (2.1) **B1**. (b) the population will shrink/decline over time **B1**.

Exam-style 3.1 ■ 1 mark

Replacement-level fertility is a total fertility rate of about

A 0.5

B 1.0

C 2.1

D 4.0

Solution 3.1

Method: TFR and IMR

A 0.5

B 1.0

C 2.1



D 4.0

Worked steps

C. about 2.1 children per woman replaces a couple plus child mortality.

Exam-style 3.2 ■ 1 mark

With an RNI of 2% per year, the population doubles in roughly

- A** 7 years
- B** 35 years
- C** 70 years
- D** 140 years

Solution 3.2

Method: Doubling time

A 7 years

B 35 years



C 70 years

D 140 years

Worked steps

B. $70 \div 2 = 35$ years.

Exam-style 3.3 ■ 1 mark

A country's infant mortality rate falls sharply over 20 years.

- (a) State what IMR measures.
- (b) Explain what the fall suggests about development.

Solution 3.3

Method: Doubling time

Worked steps

(a) deaths of infants under age 1 per 1,000 live births **B1**. (b) improving health care, nutrition, and sanitation — rising development **B1**.