Grade 8 Cambridge Mathematics
Topic 1: Integers and Directed Numbers

A. Notes – Summary for Students

Integers and Directed Numbers

Integers: Whole numbers, including positive, negative, and zero.
Directed Numbers: Numbers with a direction (positive or negative), used in contexts like temperature, elevation, and finance.

Key Concepts

- **Addition of integers:**
  - Same signs: Add, keep the sign.
    Example: $-3 + (-2) = -5$
  - Different signs: Subtract, take the sign of the number with greater absolute value.
    Example: $4 + (-6) = -2$
- **Subtraction of integers:** Use the KCC method (Keep, Change, Change).
  Example: $-5 - (-3) = -5 + 3 = -2$
- **Multiplication and Division:**
  - Same signs: Result is positive.
    Example: $(-4) \times (-3) = 12$
  - Different signs: Result is negative.
    Example: $(-6) \times 5 = -30$

Real-World Examples

- **Temperature:** Dropping from 3°C to −5°C.
- **Banking:** A withdrawal of \$200 is represented by −200.
- **Elevation:** A submarine at −150 meters.

B. Practice Problems (Cambridge Style)

Problem 1. Conceptual Understanding

(a) Place the following numbers on a number line: -5, 0, 4, -2, 3.

(b) What is the difference between -3 and 4?

Problem 2. Procedural Practice

(a) Evaluate: $-6 + 9$

(b) Evaluate: $-8 - (-3)$

(c) Simplify: $(-4) \times (-7) \div 2$

(d) Simplify: $(-18) \div 3 + (-2)$

Problem 3. Real-World Application

The temperature in a city was 4°C in the afternoon. Overnight, it dropped by 9°C.

(a) What was the temperature the next morning?

(b) Later, it rose by 5°C. What is the new temperature?

Problem 4. Cambridge-Style Word Problem

A diver descends from the surface of the water to a depth of -18 meters. Then he rises 5 meters, descends another 7 meters, and finally ascends 8 meters.

(a) Represent the diver's movement using integers.

(b) What is his final position relative to sea level?

C. Mark Scheme and Solutions

Problem 1. (a) Correct placement of all numbers on number line. [1 mark]

(b) $4 - (-3) = 7$ [1 mark]

Problem 2. (a) $-6 + 9 = 3$ [1 mark]

(b) $-8 - (-3) = -8 + 3 = -5$ [1 mark]

(c) $(-4) \times (-7) = 28$; $28 \div 2 = 14$ [1 mark]

(d) $(-18) \div 3 = -6$, then $-6 + (-2) = -8$ [1 mark]

Problem 3. (a) $4 - 9 = -5$°C [1 mark]

(b) $-5 + 5 = 0$°C [1 mark]

Problem 4. (a) $-18 + 5 - 7 + 8$ [1 mark]

(b) Final position: -12 meters [1 mark]