

2.5 Compound Boolean Expressions

Name: _____ Class: _____ Date: _____ Total: 8 marks

KEY WORDS short-circuit evaluation 短路求值 • logical operators 逻辑运算符
• boolean expression 布尔表达式

Objective

Build the skills to answer exam questions on **compound Boolean expressions**.

You must be able to:

- combine conditions with **AND** (`&&`) and **OR** (`||`)
- use **NOT** (`!`) to reverse a Boolean value
- understand **short-circuit evaluation** 短路求值

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Logical operators

- `&&` (**AND**) is **true** only when **both** sides are true.
- `||` (**OR**) is **true** when **either** side is true.
- `!` (**NOT**) reverses the value: `!true` is **false**.

■ Short-circuit evaluation

`&&` stops as soon as the left side is **false**; `||` stops as soon as the left side is **true** — the right side is not even checked.

2 Practice

2.1 State what the `&&` operator requires in order to be **true**. [1]

2.2 Evaluate `(5 > 3) || (2 > 8)`. [1]

2.3 State what short-circuit evaluation means. [1]

3 Exam-style questions

3.1 The logical AND operator in Java is [1]

- A `&`
- B `&&`
- C AND
- D +

3.2 `!(true)` evaluates to [1]

- A `true`
- B `false`
- C 1
- D an error

3.3 Given `int a = 4, b = 0`:

(a) evaluate `(a > 0) && (b > 0)`. [1]

(b) evaluate `(a > 0) || (b > 0)`. [1]

(c) State what the `!` operator does. [1]

Solutions

2.1 both of its sides must be **true**.

2.2 **true** (the left side is true).

2.3 **&&** and **||** stop evaluating as soon as the result is known.

3.1 **B**.

3.2 **B**.

3.3 (a) **false**. (b) **true**. (c) it reverses the Boolean value.