

3.5 Boolean Expressions

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS boolean expression 布尔表达式 • logical operators 逻辑运算符 • relational operators 关系运算符
• list 列表 • string 字符串

Objective

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

You must be able to:

- explain how a **Boolean expression** 布尔表达式 evaluates to true or false
- build one with **relational operators** 关系运算符 (equal to, greater than, less than)
- combine conditions with the **logical operators** 逻辑运算符 AND, OR, NOT
- predict the result of a compound Boolean expression

1 Worked examples

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

■ Boolean expression

Always evaluates to **true** or **false**.

■ Operators

- **Relational:** =, >, < (and $\geq$, $\leq$).
- **Logical:** **AND** (both true), **OR** (either true), **NOT** (the opposite).

■ Compound expressions

Evaluate each part, then combine: $(5 > 3) \text{ AND } (2 > 4) = \text{true AND false} = \text{false}$.

2 Practice

2.1 State what a Boolean expression evaluates to.

[1]

2.2 Evaluate $(7 > 2) \text{ AND } (4 > 9)$.

[2]

2.3 State what the NOT operator does.

[1]

3 Exam-style questions

3.1 A Boolean expression evaluates to

[1]

- **A** a number
 - **B** a string
 - **C** true or false
 - **D** a list
-

3.2 The expression $(3 > 1)$ OR $(5 < 2)$ is

[1]

- **A** true
 - **B** false
 - **C** undefined
 - **D** 3
-

3.3 Given $a = 5$ and $b = 8$:

(a) evaluate $a < b$.

[1]

(b) evaluate $(a < b)$ AND $(b < 10)$.

[1]

(c) evaluate NOT $(a < b)$.

[1]

Solutions

2.1 either true or false.

2.2 $7 > 2$ is true; $4 > 9$ is false; true AND false = **false**.

2.3 it reverses a Boolean value (true becomes false and vice versa).

3.1 C.

3.2 A — the first part is true, so OR is true.

3.3 (a) true. (b) true (both parts true). (c) false.