AP COMPUTER SCIENCE PRINCIPLES • EXERCISE SHEET

3.5 Boolean Expressions

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

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: $(5 > 3)$ AND $(2 > 4)$ = true AND false = **false**.

2 Practice

2.1 State what a Boolean expression evaluates to. [1]

2.2 Evaluate $(7 > 2)$ AND $(4 > 9)$. [2]

2.3 State what the NOT operator does. [1]

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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]

4 Go further

- work through the **3.5 Boolean Expressions** lesson on the **Learn** page;
- read the **Algorithms and Programming** section of the AP Computer Science Principles handout on the **Know** page.

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.