

Exercise walk-through

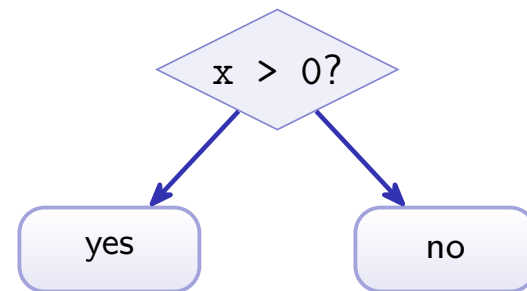
2.6

Comparing Boolean Expressions

AP Computer Science A

What we will cover

- 1 Boolean expressions
- 2 The if statement
- 3 Compound & nested conditions
- 4 while & for loops
- 5 Nested iteration & run-time



The integer patterns the exam tests directly

reading digits

repeatedly take $n \% 10$ for the **last digit**, then $n /= 10$ to drop it
– loop while $n > 0$

why it works

$\%$ gives the remainder and integer $/$ truncates, so together they peel one digit per pass

a running total

declare the accumulator **outside** the loop, add inside it

a counter

the same shape, but incrementing on a condition rather than adding a value

a flag

a boolean recording **whether something happened** – set inside the loop, tested after it

Total, count, max/min and flag cover most free-response loop questions. Decide which the wording is asking for before writing anything.

Exam tips

- Get boundary conditions right: use `<` vs `<=` deliberately, and watch the first and last iteration of every loop (off-by-one is the classic bug).
- Build compound conditions with `&&`, `||`, `!` and remember **short-circuit** evaluation (put the null check first).
- Trace nested loops by counting how many times the **inner** body runs in total.
- Choose the right structure – `if/else if` for ranges, a loop for repetition – and avoid an infinite loop by updating the loop variable.
- Apply **De Morgan's laws** when you simplify or negate a boolean condition.

Exercises 2.1-2.3

2.1 State what it means for two Boolean expressions to be equivalent. [1]

2.2 Rewrite `!(a && b)` using De Morgan's Law. [1]

2.3 Rewrite `!(x > 5)` as a simpler comparison. [1]

Exercises 2.1-2.3

2.1 State what it means for two Boolean expressions to be equivalent. [1]

2.1

- they give the same result for every possible input
-

2.2 Rewrite `!(a && b)` using De Morgan's Law. [1]

2.2

- `!a || !b`
-

2.3 Rewrite `!(x > 5)` as a simpler comparison. [1]

2.3

- `x <= 5`

Exercises 3.1-3.2

3.1 $!(a \ || \ b)$ is equivalent to

[1]

☐

A $!a \ || \ !b$

B $!a \ \&\& \ !b$

C $a \ \&\& \ b$

D $a \ || \ b$

3.2 Two Boolean expressions are equivalent if they

[1]

☐

A look the same

B always give the same result

C are both `true`

D both use `&&`

Exercises 3.1-3.2

3.1 $!(a \ || \ b)$ is equivalent to

[1]

☐

A $!a \ || \ !b$

B $!a \ \&\& \ !b$

C $a \ \&\& \ b$

D $a \ || \ b$

3.1 B

- $!a \ \&\& \ !b$.

3.2 Two Boolean expressions are equivalent if they

[1]

☐

A look the same

B always give the same result

C are both `true`

D both use `&&`

3.2 B

- always give the same result.

Exercise 3.3 (a)

3.3 Simplify or rewrite the following.

(a) Rewrite $!(p \ \&\& \ q)$.

[1]

Exercise 3.3 (a)

3.3 Simplify or rewrite the following.

(a) Rewrite $!(p \ \&\& \ q)$.

[1]

(a)

- $!p \ || \ !q$

Exercise 3.3 (b)

3.3 Simplify or rewrite the following.

(b) Rewrite $!(x \geq 10)$ as a comparison.

[1]

Exercise 3.3 (b)

3.3 Simplify or rewrite the following.

(b) Rewrite $!(x \geq 10)$ as a comparison.

[1]

(b)

- $x < 10$

Exercise 3.3 (c)

3.3 Simplify or rewrite the following.

(c) State whether `!(true)` equals `false`.

[1]

Exercise 3.3 (c)

3.3 Simplify or rewrite the following.

(c) State whether `!(true)` equals `false`.

[1]

(c)

- yes