

Answer Keys & Grading Notes

Objective-aligned exemplars, full-credit models, and the mistakes to watch for. **Do not distribute to students.**

True-up step: the objective sections below are built from the AP learning objectives. Paste your real Code.org prompts into chat and I'll fill exact question-by-question keys. The *AI-Proof Worked Answers* section matches the handwritten assignment exactly.

A · De Morgan's laws

Expression	Equivalent
<code>!(a && b)</code>	<code>!a !b</code>
<code>!(a b)</code>	<code>!a && !b</code>
<code>!(x > 5)</code>	<code>x <= 5</code>
<code>!(x >= 0 && x <= 9)</code>	<code>x < 0 x > 9</code>

Common mistakes: Forgetting to flip `&&` to `||` (and vice-versa) when distributing the `!`; only negating one side; flipping only the comparison without the connective.

B · Short-circuit & object comparison

Full-credit exemplar: In `a && b`, if `a` is false, `b` is never evaluated (short-circuit) — useful to guard null checks: `obj != null && obj.method()`. Use `.equals()` to compare object contents.

Common mistakes: Assuming both sides always evaluate; using `==` on objects; ordering a null-guard incorrectly.

AI-Proof Worked Answers — Boolean & if — Handwritten FRQ

Grade the handwritten sheet against these. Item numbers match the assignment.

Item	Correct answer
1a) <code>a && !b</code>	true (true && true)
1b) <code>!(x > 5)</code>	false
1c) <code>(x > y) b</code>	true
1d) <code>!(a b)</code>	false
1e) <code>(x%2==0) && (y<x)</code>	false (7%2==0 is false)
2a) <code>!(x>0 && y>0)</code>	<code>x <= 0 y <= 0</code>
2b) <code>!(a b)</code>	<code>!a && !b</code>
3) grade if/else-if	<code>if(score>=90) A; else if(score>=80) B; else if(score>=70) C; else if(score>=60) D; else F</code>