1806ICT Programming Fundamentals

Boolean Expressions: Examples and Problems

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Example 1

Given two integers a and b and two inclusive ranges -8..-4 and 10..16 write a boolean expression which is true if both integers are in one of these ranges or both integers are not in these ranges.

	Condition		C Boolean Expression
1	a is in the range -84		a >= -8 && a <= -4
2	a is in the range 10 16		a >= 10 && a <= 16
3	b is in the range -84		b >= -8 && b <= -4
4	b is in the range 10 16		b >= 10 && b <= 16
	1 or 2	bool alnRange =	(a >= -8 && a <= -4) (a >= 10 && a <= 16)
	3 or 4	bool blnRange =	(b >= -8 && b <= -4) (b >= 10 && b <= 16)
	((1 or 2) and (3 or 4)) or (not (1 or 2) and not (3 or 4))		(alnRange && blnRange) (!alnRange && !blnRange)
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Example 2

Given two integers a and b determine if a is in the inclusive range 1 .. 100 and a is less than the b OR if a is at least twice b and b is not in the inclusive range -8..16.

	Condition	C Boolean Expression
1	a is in the range 1 100	a >= 1 && a <= 100
2	a is less than b	a < b
3	a is at least twice b	a >= 2 * b
4	b is not in the range -816	$!(b \ge -8 \&\& b \le 16)$ which is equivalent to
		$!(b \ge -8) !(b \le 16)$ which is equivalent to
		(b < -8 b > 16)
	1 and 2	(a >= 1 && a <= 100) && a < b
	3 and 4	a >= 2 * b && (b < -8 b > 16)
	(1 and 2) or (3 and 4)	((a >= 1 && a <= 100) && a < b)
		(a >= 2 * b && (b < -8 b > 16))
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PROBLEM 1

Answer: A

The Boolean expression

(A && B) || (A && C)

is equivalent to which of the following expressions?

- (A) A && (B || C)
- (B) A || (B && C)
- (C) (A || B) && (A || C) (D) A && B && C
- (E) A || B || C

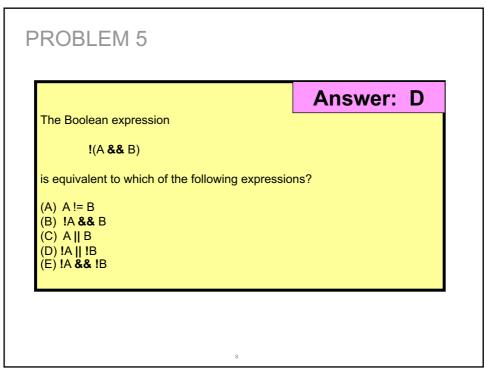
The Boolean expression (A || B) && B is true (A) only when A is true. (B) only when B is true. (C) whenever either A is true or B is true. (D) only whenever both A is true and B is true. (E) for all values of A and B.

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The Boolean expression (A && B) && A is true (A) only when A is true. (B) only when B is true. (C) whenever either A is true or B is true. (D) only whenever both A is true and B is true. (E) for all values of A and B.

The Boolean expression (A || B) && (A || B) is true (A) only when A is true. (B) only when B is true. (C) whenever either A is true or B is true. (D) only whenever both A is true and B is true. (E) for all values of A and B.

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PROBLEM 6

Answer: A

Answer: A

The Boolean expression

(A && B) && !(A && B)

evaluates to

- (A) false in all cases.
- (B) true in all cases.
- (C) true whenever only A is true or only B is true.
- (D) true whenever both A is true and B is true.
- (E) false only when both A is false and B is false.

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PROBLEM 7

The Boolean expression

(A | B) &&!(A | B)

evaluates to

- (A) false in all cases.
- (B) true in all cases.
- (C) true whenever only A is true or only B is true.
- (D) true whenever both A is true and B is true.
- (E) false only when both A is false and B is false.

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PROBLEM 8

Answer: A

Answer: A

Given integers x and y, the Boolean expression

(x > y) && (x <= y)

can be simplified to which of the following expressions?

- (A) false
- (B) true

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PROBLEM 9

The Boolean expression

(A && B) || (!A || !B)

evaluates to

- (A) true in all cases.
- (B) false in all cases.
- (C) true only whenever both A is true and B is true.
- (D) false only whenever both A is false and B is false.
- (E) true only whenever A is true or B is true.

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