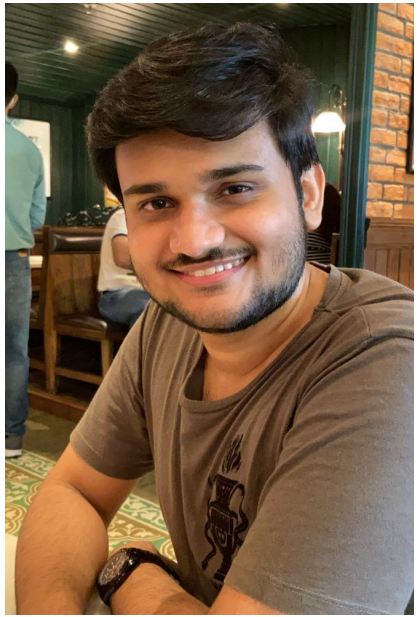
Truth Tables and Logic Gates

With Sanket Singh

Let’s crack Competitive Programming together!

Sanket Singh



- Software Development Engineer @ **LinkedIn**
- Former Software Developer @ **Interviewbit/Scaler**
- Former Product Engineer @ **Coding Blocks**
- Cracked **Google** Summer Of Code 2019 under **Harvard University**
- Offers From **Linkedin, Sprinklr, Dunzo, Works Application(Singapore), Interviewbit, Grofers, Splash Learn**
- **No. 1** Educator in Unacademy Competitive Programming Track
- Former Research Intern @ **ISRO (Indian Space Research Organisation)**
- Taught 7,500+ programmers in Data Structures, Algorithms and Fundamentals of Computer Science
- Got **Rank 1** in Codechef Long Challenges
- Won **Infosys** Digital Make-a-thon

1. Suppose the variable A denotes whether student “X” is present in the class (1 if present and 0 otherwise). Similarly variable B denotes presence of student “Y”. Which of the following indicates whether **both** are present or not?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

1. Suppose the variable A denotes whether student “X” is present in the class (1 if present and 0 otherwise). Similarly variable B denotes presence of student “Y”. Which of the following indicates whether **both** are present or not?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

Truth table and meaning of the operator AND

2. Suppose the variable A denotes whether student “X” is present in the class (1 if present and 0 otherwise). Similarly variable B denotes presence of student “Y”. Which of the following indicates whether **at least one of them** are present or not?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

2. Suppose the variable A denotes whether student “X” is present in the class (1 if present and 0 otherwise). Similarly variable B denotes presence of student “Y”. Which of the following indicates whether **at least one of them** are present or not?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

Truth table and meaning of the operator OR

3. Which of the following operations is same as multiplication? A and B are boolean variables, i.e. they are either 0 or 1.

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B. A OR B
C. A XOR B
D. NOT (A OR B)

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A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

From the truth tables, we can see that A AND B is same as A * B.

4. If p is a logic gate such that (A p A) = A, then which of the following logic gates can be p? A is a variable which is either 0 or 1.

A. AND
B. OR
C. XOR
D. Both A and B

4. If p is a logic gate such that (A p A) = A, then which of the following logic gates can be p? A is a variable which is either 0 or 1.

A. AND
B. OR
C. XOR
D. Both A and B ✓

Truth table
0 OR 0 = 0 0 AND 0 = 0
1 OR 1 = 1 1 AND 1 = 1
1 XOR 1 = 0

5. If p is a logic gate such that (A p A) = 0, then which of the following logic gates can be p? A is a variable which is either 0 or 1.

A. AND
B. OR
C. XOR
D. Both A and B

5. If p is a logic gate such that (A p A) = 0, then which of the following logic gates can be p? A is a variable which is either 0 or 1.

A. AND
B. OR
C. XOR 
D. Both A and B

Truth table
1 XOR 1 = 0, 0 XOR 0 = 0
1 OR 1 = 1, 1 AND 1 = 1
Also meaning of the word “exclusive or” indicates that answer should be C

6. Which of the following operations is same as flipping the value of A? (i.e. change A from 0 to 1 or from 1 to 0)

A. A AND 0
B. A OR 1
C. A XOR 1
D. A AND 1

6. Which of the following operations is same as flipping the value of A? (i.e. change A from 0 to 1 or from 1 to 0)

A. A AND 0
B. A OR 1
C. A XOR 1 ✓
D. A AND 1

From the truth tables we can see that only option C satisfies.

7. If A and B are the unit digits (rightmost digit) of numbers x and y in binary then what is the unit digit of x + y?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

7. If A and B are the unit digits (rightmost digit) of numbers x and y in binary then what is the unit digit of x + y?

A. A AND B
B. A OR B
C. A XOR B
D. NOT (A OR B)

We have
0 + 0 = 0
0 + 1 = 1 + 0 = 1
1 + 1 = 0 (with carry 1)

8. Using only the logic gates OR and XOR and the variable A, generate an expression which is always 0 regardless of whether A is 0 or 1.

A. (A OR 1) XOR 1
B. (A XOR 1) OR 1
C. (A OR 0) XOR 1
D. (A XOR 0) OR 1

8. Using only the logic gates OR and XOR and the variable A, generate an expression which is always 0 regardless of whether A is 0 or 1.

A. (A OR 1) XOR 1
B. (A XOR 1) OR 1
C. (A OR 0) XOR 1
D. (A XOR 0) OR 1

Truth table
A OR 1 = 1 always
1 XOR 1 = 0 always

9. Which of the following is equal to A AND B?

A. (A XOR B) OR (A XOR B)
B. (A XOR B) XOR (B XOR A)
C. (A OR B) OR (A XOR B)
D. (A OR B) XOR (A XOR B)

9. Which of the following is equal to A AND B?

A. (A XOR B) OR (A XOR B)
B. (A XOR B) XOR (B XOR A)
C. (A OR B) OR (A XOR B)
D. (A OR B) XOR (A XOR B)

Truth table
A AND B is 1 only when both A and B are 1

A OR B and A XOR B are different only when both A and B are 1

So option D is equal to A AND B

10. Which of the following is equal to A OR B?

A. (A XOR B) AND (A XOR B)
B. (A XOR B) XOR (B XOR A)
C. (A AND B) AND (A XOR B)
D. (A AND B) XOR (A XOR B)

10. Which of the following is equal to A OR B?

A. (A XOR B) AND (A XOR B)
B. (A XOR B) XOR (B XOR A)
C. (A AND B) AND (A XOR B)
D. (A AND B) XOR (A XOR B) ✓

Truth table
A OR B is 0 only when both A and B are 0

A AND B and A XOR B are same only when both A and B are 0

So option D is equal to A OR B