

Math for CS. Problem Set 2

1. The following facts are known to be true.

- No kitten, that loves fish, is unteachable.
- No kitten without a tail will play with a gorilla.
- Kittens with whiskers always love fish.
- No teachable kitten has green eyes.
- No kittens have tails unless they have whiskers.



Will a kitten whose eyes are green play with a gorilla?

2. On the Island of Knights and Liars, three inhabitants A, B, C are being interviewed. A and B make the following statements:

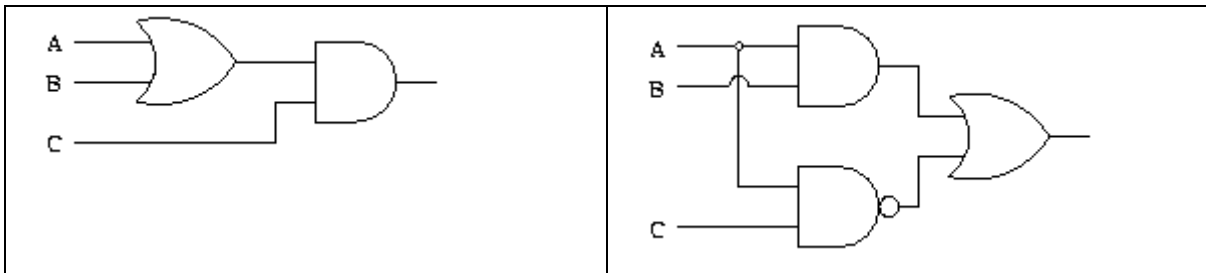
- A: B is a knight.
- B: If A is a knight so is C

Can it be determined what any of A, B, C are?

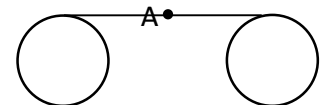
3. Write truth tables for these Boolean formulas. Check the answers using Venn Diagrams. For parts (a) and (b), can you find a simpler formula that would have the same answer?

- a) $(A \wedge \neg B) \vee (B \wedge \neg A)$
- b) $(A \vee B) \wedge (A \wedge C)$
- c) $C \wedge \neg(B \wedge C)$

4. Write a Boolean expression for the output, Q, in terms of the inputs A, B, and C.



5. The diagram shows the rolling track of a bulldozer, seen from the side. The bottom is in contact with the ground. If the bulldozer moves forward 10 inches, how many inches does the point marked A moves?



6. A broken robot can do one mathematical operation only. The robot calls this operation \odot , and it is calculated as follows: $A \odot B = 1 - a/b$. (The robot can store the results of intermediate calculations of \odot . It is also able to reuse these results.) Show that using this robot, one is still able to perform any of the 4 arithmetic operations.

- division,
- multiplication,
- subtraction
- addition.