

Computer Science Basics

1. Create a truth table for the following statements.

if that is a fact

a. I am sick OR lazy and at home

I am sick	lazy & at home	OR
Input 1	Input 2	Output
true	true	true
true	false	true
false	true	true
false	false	false

I am sick OR lazy and at home.

Final output

Input 1	Input 2	1 OR 2	Input 3	(1 or 2) and 3
true	true	true	true	true
true	true	true	false	false
true	false	true	true	true
true	false	true	false	false
false	true	true	true	true
false	true	true	false	false
false	false	false	true	false
false	false	false	false	false

* there could also be 1 or (2 and 3)

Exercise 2

b. I do not like ice-cream and I work at gelateria
eat ice cream

Input 1	Not 1	Input 2	(Not 1) and 2
true	false	true	false
true	false	false	false
false	true	true	true
false	true	false	false

c. I am at the zoo and I want to see lions
or tigers or bears.

Input 1 (zoo)	Input 2 (lions)	Input 3 (tigers)	Input 4 (bears)
false	false	false	false
false	false	false	true
false	false	true	false
false	true	false	false
false	false	true	true
false	true	false	true
false	true	true	false
true	false	true	false
true	false	true	true
true	true	false	false
true	true	false	true
true	true	true	false
true	true	true	true

2. Create a truth table for the following expressions

a. $\neg p$

b. $p \vee \neg q$

Input 1	Output	Input 1	Input 2	Not 2	Output
true	false	true	true	false	false
false	true	true	false	true	true
false	false	false	true	false	false
false	false	false	false	true	false

2 or 3 or 4

1 and (2 or 3 or 4)
false
true
false
true
false
true

Exercise 2

c. $(p \wedge q) \vee (\neg p \wedge r)$

Input 1	Input 2	NOT 2	1 and 2	(1 and 2) or (NOT 2)
true	false	true	false	true
true	true	false	true	true
false	false	true	false	true
false	true	false	false	false

or and and
do $(p \vee q) \wedge (q \wedge r)$

Input 1	Input 2	Input 3	1 or 2	2 and 3	(1 or 2) and 3
true	true	true			
true	true	false			
true	false	true			
true	false	false			
false	true	true			
false	true	false			
false	false	true			
false	false	false			

e. $(p \vee q) \wedge (\neg p \wedge r)$

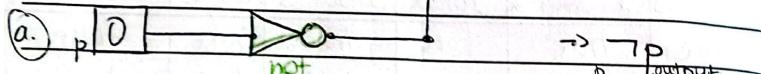
Input 1	Input 2	1 or 2	Input 3	Not 3	(1 or 2) and Not 3
true	true	true	true	false	false
true	true	true	false	true	true
true	false	false	true	false	false
true	false	false	false	true	true
false	true	true	true	false	false
false	true	true	false	true	true
false	false	false	true	false	false
false	false	false	false	true	true

f. $\neg ((p \vee q) \wedge q)$

Input 1	Input 2	1 or 2	(1 or 2) and 2	NOT (1 or 2) and 2
true	true	true	true	false
true	false	false	false	true
false	true	false	false	true
false	false	false	false	true

3) Consider the following circuits, and write down the expression

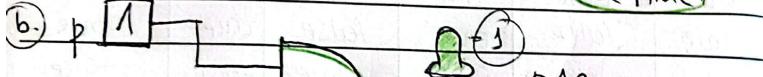
$$= 1$$



$$\rightarrow \neg p$$

Output
true | false

false | true

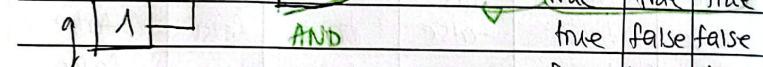


$$p \wedge q$$

p
true | true | true

false | true | false

false | false | false

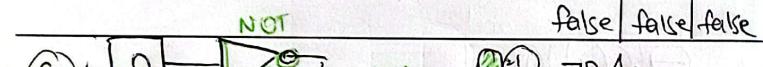


$$\neg p \wedge q$$

~p
true | false | true

false | true | false

false | false | false

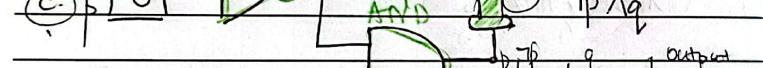


$$(p \vee q)$$

p
true | false | true

false | true | true

false | true | false



$$\neg p \oplus q$$

~p
true | false | false

false | true | true

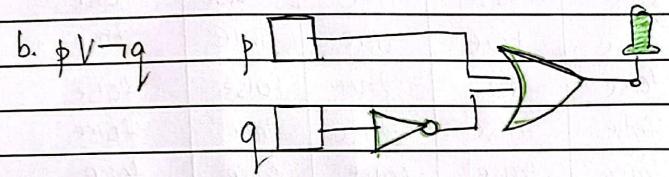
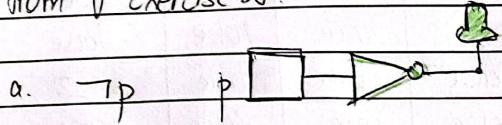
false | false | false

p	q	Input 1	Input 2	Input 3	(Input 2) AND 3
true	true	true	true	true	true
true	true	true	true	false	false
true	false	false	true	true	true
false	true	false	true	false	false
false	false	false	false	false	false
false	true	true	false	false	false
true	false	false	false	true	true

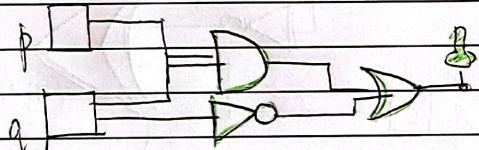
p	q	Input 1	Input 2	Input 3	(Input 2) AND 3
true	true	true	true	true	true
true	true	true	true	false	false
true	false	false	true	true	true
false	true	false	false	false	false
false	false	false	false	false	false

p	q	Input 1	Input 2	Not 1	(Not 1) XOR 2
true	true	true	true	false	true
true	false	false	true	false	false
false	true	true	false	true	false
false	false	false	false	true	true

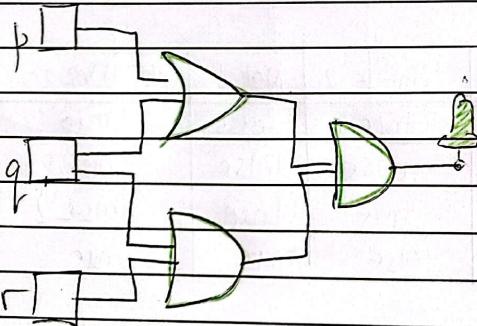
1) Using CircuitVerse.org, build the circuits from Exercise 2.



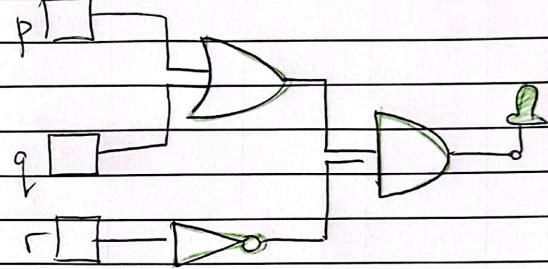
c. $(p \wedge q) V \neg q$



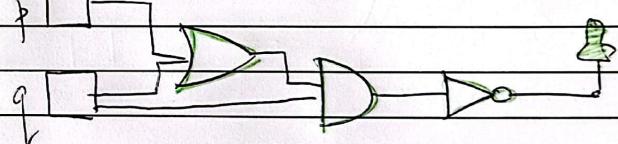
d. $(p V q) \wedge (q \wedge r)$



e. $(p V q) \wedge \neg r$



f. $\neg \neg [(p V q) \wedge q]$



CIRCUIT ELEMENTS

Search...

- Input
- Output
- Gates
- Decoders & Plexers
- Sequential Elements
- Annotation

TESTBENCH

Misc

TIMING DIAGRAM

