1. Complete the truth table for $(P \vee \neg Q) \wedge (\neg P)$.

P	Q	$\neg P$	$\neg Q$	$P \vee \neg Q$	$(P \vee (\neg Q)) \wedge (\neg P)$
T	T				
T	F				
F	T				
F	F				

What is a simpler statement that $(P \vee \neg Q) \wedge (\neg P)$ is logically equivalent to?

2. In general, how many rows are needed for a truth table with n rows?

3. Make a truth table to verify that $\neg(P \wedge Q \wedge R)$ is logically equivalent to $(\neg P) \vee (\neg Q) \vee (\neg R)$.

4. Identify the missing headings of this truth table.

P	Q				
T	T	T	T	T	F
T	F	T	T	F	T
F	T	T	F	T	T
F	F	F	T	T	T

5. Identify the missing headings of this truth table.

A	B	C			
T	T	T	T	T	T
T	T	F	T	F	T
T	F	T	T	F	T
T	F	F	F	F	F
F	T	T	T	F	T
F	T	F	T	F	F
F	F	T	T	F	T
F	F	F	F	F	F

6. In **binary arithmetic**, we work only with 0 and 1, and $1+1=0$. If we identify 0 with false and 1 with true, we can think of and/or/not as operations in binary arithmetic. For example, the two truth tables below illustrate how the logic operation $P \wedge Q$ is equivalent to $P \times Q$ when translated to binary arithmetic.

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

P	Q	$P \times Q$
1	1	1
1	0	0
0	1	0
0	0	0

(a) What logical operation corresponds to binary addition? Make truth tables to justify your answer.

(b) What binary arithmetic operation corresponds to $P \vee Q$? Make truth tables to justify your answer.

(c) What binary arithmetic operation corresponds to negation? That is, what operation in binary arithmetic on a single variable P corresponds to transforming P into $\neg P$?

7. Suppose we have two input variables P and Q, and we make a truth table with three columns as below, where $f(P,Q)$ is some logical combination of P and Q. How many possible ways are there to fill in such a table? In other words, how many distinct operations on two logical variables exist?

P	Q	$f(P,Q)$
T	T	?
T	F	?
F	T	?
F	F	?