

3.7 Practice Questions: Logical operators

1. Recreate the truth table for negation from memory.

P	¬P
T	F
F	T

2. Recreate the truth table for conjunction from memory.

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

3. Recreate the truth table for disjunction from memory.

P	Q	P ∨ Q
T	T	T
T	F	T
F	T	T
F	F	F

4. Recreate the truth table for implication statements from memory.

P	Q	P → Q
T	T	T
T	F	F
F	T	T
F	F	T

5. Recreate the truth table for biconditional statements from memory.

P	Q	$P \leftrightarrow Q$
T	T	T
T	F	F
F	T	F
F	F	T

Translate the following sentences into symbolic form. Add the appropriate logical operators to capture the logical relationship between the statements:

6. "Sam went to the park and saw Jeff there."

P = "Sam went to the park."

Q = "Sam saw Jeff at the park."

$P \& Q$

7. "Jessica and Susan went to the park together."

P = "Jessica and Susan went to the park."

(Note: this is a simple statement, not two conjoined simple statements.)

8. "If Phil didn't answer his door, then he must not be home."

P = "Phil answered his door."

Q = "Phil is at home."

$\neg P \rightarrow \neg Q$

(You may be tempted to represent this as $\neg P \& \neg Q$. While that captures some of the meaning here, $\neg Q$ seems to be inferred from $\neg P$, which an implication relation captures.)

9. "You can have cake or pie for dessert."

P = "You can have cake for dessert."

Q = "You can have pie for dessert."

$P \vee Q$

(Note: we had to use the pronoun "you" because we get no proper noun in this example. You may have inserted your own name to avoid the pronoun usage. If you did so, great job! Remember to avoid pronouns when possible.)

10. "A piece of furniture is a chair if and only if it is designed to be sat on."

P = "A piece of furniture is a chair."

Q = "A piece of furniture is designed to be sat on."

$P \leftrightarrow Q$

11. "Where there's smoke, there's fire."

P = "There is smoke."

Q = "There is fire."

$P \rightarrow Q$

12. "Ahmed can ride the rollercoaster, go on the bumper cars, or do both one after the other." P = "Ahmed can ride the rollercoaster."

Q = "Ahmed can ride the bumper cars."

$P \vee Q$