

# Introduction to Logic

## Practice Exam for Unit/Exam 1:

---

### A. Validity and Soundness

---

**True and False.** For each question, answer "True" or "False".

1. Every argument with a false conclusion is unsound.
2. Every argument that is valid and has a true conclusion is sound.
3. Every valid argument has at least one true premise.
4. Every argument with all true premises and a false conclusion is invalid.

For each of the following, answer the following three questions.

- (a) Is the argument valid or invalid?
  - (b) Is the argument factually correct or not factually correct?
  - (c) Is the argument sound or unsound?
- (You **may** use the counterexample method, but are not required to.)

5. All kangaroos live in the sea.  
Some dogs are kangaroos.  
Therefore, some dogs live in the sea.
6. No diamonds are gems.  
All sapphires are diamonds.  
Therefore, all gems are sapphires.
7. All residents of Boston are residents of the US.  
All residents of Massachusetts are residents of the US.  
Therefore, all residents of Boston are residents of Massachusetts.

---

### B. Truth Tables

---

Construct a complete truth table to determine whether each of these is a *tautology*, a *contradiction* or a *contingent* statement.

8.  $P \ \& \ \sim(Q \rightarrow P)$
9.  $(A \vee \sim B) \leftrightarrow \sim(B \rightarrow A)$
10.  $(P \rightarrow Q) \leftrightarrow (P \vee \sim Q)$
11.  $(M \rightarrow \sim N) \vee [(N \ \& \ O) \rightarrow M]$

For the following arguments, construct a complete truth table to determine whether it is *valid* or *invalid*. The premises are separated from one another by ";", and from the conclusion by the sign "/".

12.  $X \vee Y ; Y \rightarrow X / X$
13.  $(P \vee Q) \rightarrow P / \sim(P \ \& \ \sim Q)$
14.  $(A \vee B) \vee C ; \sim B / \sim C \rightarrow A$
15.  $F \rightarrow (G \rightarrow H) ; F \rightarrow G / \sim H \rightarrow \sim F$

---

### C. Translations

---

Translate each of the following English statements into the language of sentential logic. Use the first letters of the capitalized words in your translations.

16. Neither NISHITEN nor MARGARET are enrolled in this course.
17. Although FRANCE and GERMANY have signed the accords, SWITZERLAND has not.
18. If either BRITNEY or CHRISTINA wins a grammy, then I'll THROW a party.
19. If his POD-RACER gets a new energy pack, ANAKIN will win the race unless SEBULBA cheats.
20. JOEY will be happy only if ROSS and Rachel do not get back together.
21. The BANDERSNATCH'S being slithy is a necessary and sufficient condition for the JABBERWOCK'S being frumious.
22. I will PAY my taxes only if my paying my taxes is a necessary condition for my not going to JAIL.
23. If it is not the case that GOD exists if and only if we are BOUND by morality, then moral codes are either SELF-IMPOSED or CULTURALLY constructed.

---

### D. Combined Methods

---

For each of the following English arguments, first translate the argument into the language of sentential logic, and then construct a truth table to determine whether the argument is *valid* or *invalid*. You must draw a complete truth table for each.

24. The DEATH penalty should be adopted only if it PREVENTS murder. However, the death penalty does not prevent murder unless murderers UNDERSTAND the consequences of their actions before acting. Murderers do not understand the consequences of their actions before acting. Therefore, the death penalty should not be adopted.
25. Unless social security will be PRIVATIZED, the nation's social security resources will not GROW at the rate of inflation. Thus, either there will be a BUDGET deficit or social security will be privatized, because if there will be a budget deficit, then the nation's social security resources will not grow at the rate of inflation.