

Problem Set 1
Phil 1068 Elementary Logic
2nd Term 2013
Due 7 February 2013

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Submit your problem set to Ms. Loletta Li in Room 10.13, 10/F, Run Run Shaw Tower, Centennial Campus

Make sure your problem set is timestamped.

Do not submit assignments by email.

Late penalty: 10% for each day late.

Answer the questions on the problem set itself. Write neatly.

If the grader cannot read your handwriting, you will not receive credit.

Be sure that all pages of the assignment are securely stapled together.

Check the course bulletin board for announcements about the assignment.

Do your own work.

If you copy your problem set, or permit others to copy, you may fail the course.

1. (15 Marks)

True or False? Circle 'T' if the statement is true. Circle 'F' if the statement is false.

a.

T Logic is not the study of how people reason.

b.

T Precisely specified rules that tell us how to construct grammatical sentences are called *syntactic rules*.

c.

F Every expression of SL is a WFF of SL.

- d.
F The premises and conclusion of a sound argument can all be false.
- e.
T You can have an invalidating counterexample to an argument that has true premises and a true conclusion.
- f.
F Some arguments are invalid and sound.
- g.
F Any true argument with a valid conclusion is sound.
- h.
F Any argument that follows the invalid argument pattern Affirming the Consequent is invalid.
- i.
F There are invalidating counterexamples to arguments that fit the pattern Reductio ad Absurdum.
- j.
T This is a valid argument pattern: If Q then P . Not- P . Therefore, not- Q .
- k.
T “ $((P \ \& \ Q) \rightarrow (\sim(Q \vee S) \leftrightarrow R))$ ” is a conditional.
- l.
T Any WFF of SL containing “(” contains at least five symbols.
- m.
T If $(\phi \rightarrow \psi)$ is a WFF of SL, then ϕ and ψ are WFFs of SL.
- n.
F “ $((P \ \& \ Q) \rightarrow (R \vee S))$ ” has three main connectives.

o.

F If “ $(P \vee Q)$ ” is true and “ P ” is true, then “ Q ” is false.

2. (10 marks) Which of the following is a valid argument?

Circle “**Yes**” if it is a valid argument. Circle “**No**” if it is not a valid argument.

a.

Yes (Premise) C.Y. Leung is a television.
 (Premise) All televisions have 8 legs.
 (Conclusion) Therefore, C.Y. Leung has 8 legs.

b.

Yes (Premise) If all triangles have three sides, then snow is purple.
 (Premise) Snow is purple.
 (Conclusion) All triangles have three sides.

c.

Yes (Premise) There’s a rugby match between the Dragons and the Cherry Blossoms.
 (Premise) Either the Dragons will win the match, or the Cherry Blossoms will win.
 (Premise) The Dragons won’t win.
 (Conclusion) Therefore, the Cherry blossoms will win.

d.

Yes (Premise) Everyone can lift 500 kg.
 (Premise) No one can lift 500 kg.
 (Conclusion) Therefore, everyone can lift 500 kg.

e.

No (Premise) To get a good grade in class, you must study hard.
 (Conclusion) Therefore, you must study hard.

3. (5 marks) Which of the following five expressions are not WFFs of SL?
Circle all that are not WFFs.

a. (P & Q & R)

b. (P → (Q → R))

c. ~(~(~P))

d. ((P → (Q → R))

e. ~~~~~~(~~~P & R)

4. (15 Marks)

Fill in the blanks with an SL WFF to make correct truth tables.

a.

P	Q	Example Answer: (P & Q)
T	T	T
T	F	F
F	T	F
F	F	F

b.

P	Q	R	Example Answer: ((P & (Q → R)) v (~P & (Q ↔ R)))
T	T	T	T
T	T	F	F
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	F
F	F	F	T

c.

P	Q	Example Answer: (P ↔ Q)
T	T	T
T	F	F
F	T	F
F	F	T

d.

P	Q	R	Example Answer: ((~P & ~Q) & R)
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	F
F	F	T	T
F	F	F	F

e.

P	Q	Example Answer: (P & ~P)
T	T	F
T	F	F
F	T	F
F	F	F

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5. (15 marks) Make a correct truth table for each of the following WFFs of SL.

a. $\sim(P \rightarrow \sim Q)$

P	Q	$\sim(P \rightarrow \sim Q)$
T	T	T
T	F	F
F	T	F
F	F	F

b. $((P \vee \sim Q) \& \sim S)$

P	Q	S	$((P \vee \sim Q) \& \sim S)$
T	T	T	F
T	T	F	T
T	F	T	F
T	F	F	T
F	T	T	F
F	T	F	F
F	F	T	F
F	F	F	T

c. $((P \vee Q) \leftrightarrow (P \& \sim Q))$

P	Q	$((P \vee Q) \leftrightarrow (P \& \sim Q))$
T	T	F
T	F	T
F	T	F
F	F	T

d. $\sim(\sim Q \rightarrow \sim(R \vee S))$

Q	R	S	$\sim(\sim Q \rightarrow \sim(R \vee S))$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	F

e. $((P \rightarrow Q) \rightarrow P) \rightarrow P$

P	Q	$((P \rightarrow Q) \rightarrow P) \rightarrow P$
T	T	T
T	F	T
F	T	T
F	F	T