Solutions to Exercises 3 for *Introduction to Logic*

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Exercise 3.1

1. p.

2. $(p \wedge q)$.

3. $(p \wedge q)$.

4. p.

5. $(p \wedge q)$.

6. $\neg(p \wedge q)$.

7. $(p \rightarrow q)$.

8. p.

9. $(p \wedge (q \wedge r))$. ('p' represents that Thales was Ioanian, 'q' that he was a philosopher, and 'r' that he predicted the eclipse.)

11. p.

13. p.

14. p.

15. p.

16. $(p \rightarrow q)$

17. p. (Other candidates were $(p \wedge q)$ and $(p \rightarrow q)$—but these can't be right.)

18. p. (This is *not* a material conditional.)

19. $(p \wedge \neg q)$.

20. $(p \wedge (q \wedge \neg r))$.

21. $p \wedge (q \wedge r))$. (Look! The English 'or' sometimes does not get represented using '$\vee$'. $(p \vee (q \vee r))$ would be true even if only p, of the disjuncts, were true. Since all three lunch options are available, we need conjunction.)

22. p.

23. p.

24. $(p \wedge q)$. (Where 'p' represents that silver is shiny, and 'q' represents that gold is shinier than silver. Yet $(p \wedge (r \wedge q))$ would be acceptable, with 'r' representing that gold is shiny.)

25. The best answer is probably just: p. (But there could be debate.)

26. p.

27. $(p \wedge q)$.

28. p. (A tricky one. The alternative is obviously $(p \rightarrow q)$, but this is inadequate.)

29. $(p \rightarrow (q \wedge \neg r))$.

30. $((p \rightarrow (\neg q \rightarrow r)) \wedge (\neg p \rightarrow \neg s))$. ⌟

Exercise 3.2

1. $(p \to q), \neg q \therefore \neg p$
2. $(p \to q), p \therefore q$
3. $(p \to q), q \therefore p$
4. $(p \to q), q \therefore p$
5. $\therefore (p \vee \neg p)$
6. $(p \wedge q), (r \wedge s), (t \wedge u) \therefore v$