Logical Form

David Sanson — 112 — 2020-01-15

1 Nuts and Bolts

- Trouble enrolling in carnap.io? trouble completing or submitting problems?

2 Validity

Remember, an argument is **deductively valid** if and only if it is impossible that the premises all be true but the conclusion false. Which of these arguments are deductively valid, and which not? Explain your answers.

1. 1. If the moon shines brightly, then the werewolves howl.
   2. The moon shines brightly.
   3. So, the werewolves howl.
2. 1. If the moon shines brightly, then the werewolves howl.
   2. The moon does not shine brightly.
   3. So, the werewolves don't how.
3. 1. If the moon shines brightly, then the werewolves howl.
   2. The werewolves howl.
   3. So, the moon shines brightly.
4. 1. If the moon shines brightly, then the werewolves howl.
   2. The werewolves don't howl.
   3. So, the moon does not shine brightly.
5. 1. If the moon shines brightly, then the werewolves howl.
   2. If the moon shines brightly and the werewolves howl, then the villagers are afraid.
   3. The forest is dark unless the moon shines brightly.
   4. So, if the forest is not dark, then the villagers are afraid.

3 Ambiguity

Use parentheses to disambiguate:

6. Time flies like an arrow; fruit flies like a banana.
7. Students cook and serve grandparents.
8. Squad helps dog bite victim.
9. I am unhappy or I am happy and I clap my hands.
10. It is not the case that the pot will boil if you watch it.
11. If you hate me if I am beautiful I forgive you.

4 Symbols

Suppose P stands for Peacocksarepurple and Q stands for Quailarequirky. Rewrite the logical parts of these sentences in English:

12. $(P \wedge Q)$
13. $(P \rightarrow Q)$
14. $(P \vee Q)$
15. $\neg P$
16. $(P \leftrightarrow Q)$
17. $(\neg P \rightarrow Q)$
18. $\neg(P \rightarrow Q)$

Rewrite these sentences in symbols:

19. Peacocks are purple and quail are quirky.
20. Either peacocks are purple or quail are quirky.
21. Quail are not quirky.
22. If quail are not quirky, peacocks are not purple.
23. Quail are quirky if and only peacocks are purple.
24. If peacocks are purple, then peacocks are purple.
25. If peacocks are purple and quail are quirky, then quail are quirky and peacocks are purple.

5 Syntax

Parse these sentences into syntactic trees:

26. $\neg(P \rightarrow Q)$
27. $(\neg P \rightarrow Q)$
28. $(\neg P \wedge \neg Q)$
29. $((P \vee Q) \wedge R)$
30. $(P \vee (Q \wedge R))$
31. $((((P \vee Q) \wedge \neg(R \vee S)) \rightarrow T) \leftrightarrow P)$

Explain why thees sentences are not well-formed:

32. $(A \wedge B)$
33. (PQ)
34. $(P\neg Q)$
35. $(\rightarrow PQ)$
36. $P \rightarrow Q)$

Are these sentences well-formed or not? Parse the ones that are into syntactic trees. For the ones that aren't explain why they aren't.

37. $(P \rightarrow Q \rightarrow R \rightarrow S)$
38. $(P \rightarrow (Q \rightarrow R) \rightarrow S)$
39. $(P \rightarrow (Q \rightarrow (R \rightarrow S)))$
40. $(P \rightarrow ((Q \rightarrow R) \rightarrow S))$
41. $(P \vee ((A \vee R) \vee S))$
42. $(((P \rightarrow Q) \rightarrow R) \rightarrow S)$
43. $\neg\neg\neg\neg\neg\neg P$
44. $((P \wedge \neg Q) \leftrightarrow (P \vee \neg Q))$
45. $(PP \rightarrow QQ)$