

C: ANSWERS TO SELECTED PROBLEMS

Chapter 1.1, Simple and Compound Statements

1. [a], [b], [d], [e].
3. None of the sentences can be assigned a truth value because [a] is a command, [b] is a command, [c] is a question, and [d] contains an unknown variable.
5. [a] Inga has two aces in her card hand and she has a full house. [c] Inga does not have a full house.
7. Because the president could be from a third party.
9. 16 combinations.
11. [a] is a true statement, [b] is not a statement, [c] is not a statement, [d] is a false statement.
13. [a] is False, [b] is False, [c] is False, [d] is False, [e] is False, [f] is False.
15. [a] is True, [b] is False, [c] is False, [d] is False, [e] is True, [f] is True.
17. The compound statements are equivalent (produce the same truth values under identical conditions).
19. [a] $p \vee q$, [b] $p \wedge \neg q$, [c] $\neg(p \vee q)$, [d] $\neg(p \wedge q)$.
21. [a]

p	q	r	$p \vee q \vee r$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	F

[c]

p	q	r	$p \vee (q \wedge r)$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	F
F	F	T	F
F	F	F	F

[b] and [c] are not logically equivalent.

23. Yes.
25. There are many possible answers of which $\neg(p \wedge q)$ is one such answer.
27. Not logically equivalent.

Chapter 1.2, Truth Tables and Tautologies

1. [a] $(p \vee q) \rightarrow r$, [b] $p \leftrightarrow s$, [c] $\neg q \rightarrow \neg r$, [d] $p \wedge \neg r$.
3. [a]

p	q	r	$(p \vee q) \rightarrow r$
T	T	T	T
T	T	F	F
T	F	T	T
T	F	F	F
F	T	T	T
F	T	F	F
F	F	T	T
F	F	F	T

[c]

q	r	$\neg q \rightarrow \neg r$
T	T	T
T	F	T
F	T	F
F	F	T

5. $p \rightarrow q$ and $\neg q \rightarrow \neg p$ are logically equivalent, so are $q \rightarrow p$ and $\neg p \rightarrow \neg q$.
7. [a] If $2+3$ doesn't equal 10, then Indianapolis is the capital of Indiana.
[b] If $2+3=10$, then Indianapolis is not the capital of Indiana.
[c] If Indianapolis is the capital of Indiana, then $2+3$ doesn't equal 10.
9. [a] neither, [b] contradiction, [c] tautology, [d] tautology, [e] tautology, [f] tautology.
11. [a] neither, [b] tautology, [c] neither.
13. Two statements are logically equivalent.
15. Not a valid argument.
17. [a] If I cannot play hockey, then I did not finish my homework.

- [b] If I play hockey, then I finished my homework.
 [c] If I do not finish my homework, then I cannot play hockey.
19. Not logically equivalent. Placement of the parentheses is important.
 21. Valid argument.
 23. Valid argument.
 25. Statement is a tautology.
 27. Not a valid argument.
 29. Not a valid argument.
 31. [a] It snowed and practice was not cancelled.
 [b] We swim if and only if the lifeguard is not present. or
 We don't swim if and only if the lifeguard is present.

Chapter 1.4, Chapter Review

Mastery Quiz

1. [a], 2. [b], 3. [c], 4. [d], 5. [b], 6. [c], 7. [a], 8. [a], 9. [b], 10. [a]

Review

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|-----------------------------------------------------------------|---------------------------------------------|
| 1. Both signatures are required. | 3. [a] is true, [c] is true. |
| 5. [a] $\neg p \wedge q \wedge r$, [c] $q \leftrightarrow p$. | 7. [a] is true. |
| 9. [a] is a tautology, [c] is a tautology. | 11. [a] is a tautology, [c] is a tautology. |
| 13. Yes. | 15. Yes. |
| 17. Is not a valid argument. | 19. Is not a valid argument. |
| 21. $\neg p \leftrightarrow q$. | 23. If it pours, it rains. |
| 25. Is not a valid argument. | 27. Is a valid argument. |