5.3 Practice Questions: Long Truth Table Method

1. In a formally valid deductive argument, the truth of the premises guarantees the truth of the conclusion. Stated differently: it is impossible for the conclusion of a formally valid deductive argument to be false when the premises are true.

2. A sound deductive argument is one whose structure is formally valid and whose premises are in fact true.

3. 1. P & Q
   2. P → R
   3. ∴ R

		Conclusion	***Premise 1***	***Premise 2***
P	**Q**	**R**	**P & Q**	**P → R**
T	T	T	T	T
T	T	F	T	F
T	F	T	F	T
T	F	F	F	F
F	T	T	F	T
F	T	F	F	T
F	F	T	F	T
F	F	F	F	T

This argument is valid, because in every row where the conclusion is false (rows 2, 4, 6, and 8), at least one premise is false as well.

4. 1. P v Q
   2. P → R
   3. ∴ R

			Conclusion	***Premise 1***	***Premise 2***
P	**Q**	**R**	**P v Q**	**P → R**
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	T
F	F	T	F	T
F	F	F	F	T

This argument is invalid. The conclusion is false in row 6 and both premises are true in that row.

5. 1. –P
   2. (P v Q)
   3. ∴ Q

	Premise 1	***Conclusion***	***Premise 2***
P	**–P**	**Q**	**P v Q**
T	F	T	T
T	F	F	T
F	T	T	T
F	F	F	F

This argument is valid. In every row where the conclusion is false (rows 2 and 4), at least one premise is false as well.

6. 1. –P
   2. (–P v Q)
   3. ∴ Q

	Premise 1	***Conclusion***	***Premise 2***
P	**–P**	**Q**	**–P v Q**
T	F	T	T
T	F	F	F
F	T	T	T
F	T	F	T

This argument is invalid. The conclusion is false in row 4 while both premises are true.

7. 1. P → Q
   2. (–Q & –R)
   3. ∴P

Conclusion					***Premise 1***	***Premise 2***
P	**Q**	**–Q**	**R**	**–R**	**P → Q**	**–Q & –R**
T	T	F	T	F	T	F
T	T	F	F	T	T	F
T	F	T	T	F	F	F
T	F	T	F	T	F	T
F	T	F	T	F	T	F
F	T	F	F	T	T	F
F	F	T	T	F	T	F
F	F	T	F	T	T	T

This argument is invalid. In the last row (row 8), the conclusion is false while both premises are true.

8. 1. (P v Q) & R
   2. R → –Q
   3. ∴ P

Conclusion ***Premise 1*** ***Premise 2***

P	**Q**	**R**	**–Q**	**P v Q**	**(P v Q) & R**	**R → –Q**
T	T	T	F	T	T	F
T	T	F	F	T	F	T
T	F	T	T	T	T	T
T	F	F	T	T	F	T
F	T	T	F	T	T	F
F	T	F	F	T	F	T
F	F	T	T	F	F	T
F	F	F	T	F	F	T

This argument is valid. In each row that the conclusion is false (rows 5–8), there is always at least one premise that is false.

9. 1. P → Q
   2. Q → R
   3. –P
   4. ∴ P → R

			Premise 3	***Premise 1***	***Premise 2***	***Conclusion***
P	**Q**	**R**	**–P**	**P → Q**	**Q → R**	**P → R**
T	T	T	F	T	T	T
T	T	F	F	T	F	F
T	F	T	F	F	T	T
T	F	F	F	F	T	F
F	T	T	T	T	T	T
F	T	F	T	T	F	T
F	F	T	T	T	T	T
F	F	F	T	T	T	T

This argument is valid. In each row where the conclusion is false (rows 2 and 4), at least one premise is false.

10. 1. P → (Q v R)
    2. P → –Q
    3. P
    4. ∴ R

Premise 3 ***Conclusion*** ***Premise 1*** ***Premise 2***

P		**Q**	**R**	**–Q**	**Q v R**	**P → (Q v R)**	**P → –Q**
T		T	T	F	T	T	F
T		T	F	F	T	T	F
T		F	T	T	T	T	T
T		F	F	T	F	F	T
F		T	T	F	T	T	T
F		T	F	F	T	T	T
F		F	T	T	T	T	T
F		F	F	T	F	T	T

This argument is valid. In each row where the conclusion is false (rows 2, 4, 6, and 8), at least one premise is false.

11. 1. –(P & Q) v R
    2. R → P
    3. ∴–Q

			Conclusion			***Premise 1***	***Premise 2***
P	**Q**	**R**	**–Q**	**P & Q**	**–(P & Q)**	**–(P & Q) v R**	**R → P**
T	T	T	F	T	F	T	T
T	T	F	F	T	F	F	T
T	F	T	T	F	T	T	T
T	F	F	T	F	T	T	F
F	T	T	F	F	T	T	T
F	T	F	F	F	T	T	T
F	F	T	T	F	T	T	F
F	F	F	T	F	T	T	T

This argument is invalid. In rows 1, 5, and 6 the conclusion is false while both premises are true.

12. 1. (P v –Q)
    2. R → Q
    3. –P
    4. ∴–R

			Premise 3		***Conclusion***	***Premise 1***	***Premise 2***
P	**Q**	**R**	**–P**	**–Q**	**–R**	**(P v –Q)**	**R → Q**
T	T	T	F	F	F	T	T
T	T	F	F	F	T	T	T
T	F	T	F	T	F	T	F
T	F	F	F	T	T	T	T
F	T	T	T	F	F	F	T
F	T	F	T	F	T	F	T
F	F	T	T	T	F	T	F
F	F	F	T	T	T	T	T

This argument is valid. In each row where the conclusion is false (rows 1, 3, 5, and 7), at least one premise is false as well.