

Chapter 7: Hints and Selected Solutions

Section 7.2 (page 183)

- 7.2 The truth table for this Exercise is shown below. Since all the entries in the main columns for each sentence are the same, row by row, the sentences are tautologically equivalent.

Table 7.2									
$\wedge \vee \neg \rightarrow \leftrightarrow \perp$ $a \ b \ c \ d \ e \ f$ $\forall \exists = \neq ()$ $x \ y \ z \ u \ v \ w$				Tet Cube Dodec SameSize		Sme Medi Lar Back		Delete Column Verify Row Build Ref Cols Verify Table Fill Ref Cols Verify Assess	
Correct? <input checked="" type="checkbox"/>		Complete? <input checked="" type="checkbox"/>		Assessment <input checked="" type="checkbox"/>		Tautologically Equivalent			
		=1=	=2=	(1)		(2)			
		A	B	$\neg(A \rightarrow B)$		$A \wedge \neg B$			
		T	T	F	T	FF			
		T	F	T	F	TT			
		F	T	F	T	FF			
		F	F	F	T	FT			
				(1)		(2)			

- 7.5 The truth table for this Exercise is shown below. The entries in the main columns for each sentence are not the same. They each have one False and the rest Trues, but the Falses come in different rows. Hence the sentences are not tautologically equivalent.

Table 7.5										
∧	∨	¬	→	↔	⊥	Tet	Small	Delete Column	Verify Row	
a	b	c	d	e	f	Cube	Medium	Build Ref Cols	Verify Table	
∀	∃	=	≠	()	Dodec	Large	Fill Ref Cols	Verify Assess	
x	y	z	u	v	w	SameSize	Back			
Correct? <input checked="" type="checkbox"/>		Complete? <input checked="" type="checkbox"/>		Assessment <input checked="" type="checkbox"/>		Not Tautologically Equivalent				
=1=			=2=		=3=		(1)		(2)	
A			B		C		$(A \wedge B) \rightarrow C$		$A \rightarrow (B \vee C)$	
T	T	T	T	T	T	T	T	T	T	
T	T	F	T	T	F	T	F	T	T	
T	F	T	T	F	T	F	T	T	T	
T	F	F	T	F	F	F	T	F	F	
F	T	T	F	T	T	F	T	T	T	
F	T	F	F	T	F	F	T	T	T	
F	F	T	F	F	T	F	T	T	T	
F	F	F	F	F	F	F	T	T	F	
						(1)		(2)		

- 7.12
1. $\text{Tet}(a) \rightarrow \text{FrontOf}(a, d)$
 4. $\text{Small}(c) \rightarrow \text{RightOf}(c, a)$
 7. $\text{Tet}(e) \rightarrow (\neg \text{FrontOf}(b, d) \rightarrow \neg \text{BackOf}(b, d))$
 10. $\text{Cube}(a) \vee \text{Cube}(c) \vee \text{Cube}(e)$
 13. $\text{Larger}(a, c) \wedge \text{Larger}(e, c) \wedge \neg(\text{Large}(a) \vee \text{Large}(e))$
 16. $\neg \text{Tet}(c) \rightarrow \text{Cube}(b)$
 19. $\text{Large}(a) \leftrightarrow \text{Small}(d)$

7.16 Hint: All of the sentences are important, but probably the biggest clue comes from the sentence $\text{FrontOf}(a, b) \rightarrow (\text{FrontOf}(b, c) \vee \text{FrontOf}(c, b))$.

Section 7.4 (page 194)

- 7.25
2. $\neg(\neg \text{Tet}(a) \vee \neg \text{Small}(a))$

$$6. \neg(\neg\text{Tet}(a) \vee \neg\text{Small}(a)) \vee \neg(\text{Tet}(a) \vee \text{Small}(a))$$

7.29 We can express $\neg P$ using the Sheffer stroke as $P | P$. Examination of the truth table for $|$ shows that $P | P$ is false when P is true and true when P is false.