

Logic Homework Exercises #2 (Conditional/Biconditional Statements)

SUMMER 2017 - SOLUTIONS

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Name _____

Instructions. In exercises 1-7 let p be the statement “It is raining.” and let q be the statement: “I will play golf.” Write each statement in symbolic form.

1. $\underbrace{\text{I will play golf}}_q \underbrace{\text{only if}}_{\text{only if}} \underbrace{\text{it is raining}}_p$

Answer: $q \rightarrow p$

2. $\underbrace{\text{If}}_{\text{If}} \underbrace{\text{it is raining}}_p \underbrace{\text{then}}_{\text{then}} \underbrace{\text{I will play golf}}_q$

Answer: $p \rightarrow q$

3. $\underbrace{\text{It will be raining}}_p \underbrace{\text{if}}_{\text{if}} \underbrace{\text{I play golf}}_q$

Answer: $q \rightarrow p$

4. $\underbrace{\text{Rain will be}}_p \underbrace{\text{a necessary and sufficient condition for}}_{\text{necessary and sufficient for}} \underbrace{\text{me not to play golf.}}_{\neg q}$

5. $\underbrace{\text{Rain will be}}_p \underbrace{\text{is sufficient for}}_{\text{is sufficient for}} \underbrace{\text{me not to play golf.}}_{\neg q}$

Answer: $p \rightarrow (\neg q)$

6. $\underbrace{\text{It will not rain}}_{\neg p} \underbrace{\text{if and only if}}_{\text{if and only if}} \underbrace{\text{I play golf.}}_q$

Answer: $(\neg p) \leftrightarrow q$

7. $\underbrace{\text{My playing golf will be}}_q \underbrace{\text{a necessary and sufficient condition for}}_{\text{necessary and sufficient for}} \underbrace{\text{it to rain.}}_p$

Answer: $q \leftrightarrow p$

In exercises 8-11 construct a truth table for the statement given.

8. $(p \leftrightarrow q) \vee r$

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

9. $p \longleftrightarrow (q \vee r)$

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

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

p	q	r	$\neg p$	$\neg p \rightarrow q$	$(\neg p \rightarrow q) \wedge r$
T	T	T	F	T	T
T	T	F	F	T	F
T	F	T	F	T	T
T	F	F	F	T	F
F	T	T	T	T	T
F	T	F	T	T	F
F	F	T	T	F	F
F	F	F	T	F	F

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

p	q	r	$\neg p$	$\neg r$	$(q \wedge \neg r)$	$\neg p \rightarrow (q \wedge \neg r)$
T	T	T	F	F	F	T
T	T	F	F	T	T	T
T	F	T	F	F	F	T
T	F	F	F	T	F	T
F	T	T	T	F	F	F
F	T	F	T	T	T	T
F	F	T	T	F	F	F
F	F	F	T	T	F	F