

# Conditionals & Biconditionals

## 1. Conditionals:

1) If  $P$  then  $Q$  ( $P \rightarrow Q$ )

① A sentence of the form  $P \rightarrow Q$  is a Conditional.  $P$  is the Antecedent and  $Q$  is Consequent.

$P$	$Q$	$P \rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

e.g.

- |    |                |                           |       |
|----|----------------|---------------------------|-------|
| 1. | Lights are on  | Electricity is working    | True  |
| 2. | Lights are on  | Electricity isn't working | False |
| 3. | Lights are off | Electricity is working    | True  |
| 4. | Lights are off | Electricity isn't working | True  |

2)  $P$  only if  $Q$ .

①  $\sim Q \rightarrow \sim P$ ;  $P \rightarrow Q$ . (stylistic variants)

$P$	$Q$	$\sim Q$	$\sim P$	$\sim Q \rightarrow \sim P$	$P \rightarrow Q$
T	T	F	F	T	T
T	F	T	F	F	F
F	T	F	T	T	T
F	F	T	T	T	T

Hence.  $\sim Q \rightarrow \sim P$ ;  $P \rightarrow Q$ . are equi-

valent.

e.g.

Steve is a Canadian citizen only if Steve can vote  $P$  only if  $Q$ .  
in federal Canadian elections.

3)  $P$  unless  $Q$ .

①  $\sim Q \rightarrow P$ ;  $P \vee Q$

$P$	$Q$	$\sim Q$	$\sim Q \rightarrow P$	$P \vee Q$
T	T	F	T	T
T	F	T	T	T
F	T	F	T	T
F	F	T	F	F

e.g.  $P$ : Steve was on time

$Q$ : Steve missed the bus.

4) Summary.

① If  $P$  then  $Q$ .

$P \rightarrow Q$

②  $P$  if  $Q$ .

$Q \rightarrow P$

③ Assuming that  $P$ ,  $Q$ .

$P \rightarrow Q$

④  $P$  assuming that  $Q$ .

$Q \rightarrow P$

⑤ Given that  $P$ ,  $Q$ .

$P \rightarrow Q$

⑥  $P$  given that  $Q$

$Q \rightarrow P$

⑦ On the condition that  $P$ ,  $Q$

$P \rightarrow Q$

⑧  $P$  on the condition that  $Q$ .

$Q \rightarrow P$

⑨ If  $P$  then  $Q$ .

$P \rightarrow Q$

⑩ If  $Q$  then  $P$ .

$Q \rightarrow P$

stylistic  
variants

①  $P$  if  $Q$ .

$Q \rightarrow P$

②  $P$  only if  $Q$ .

$P \rightarrow Q$ .

## 2. Biconditionals

↳ ..... if and only if .....

①  $P \leftrightarrow Q$ ; abbreviated English as 'iff'

↳ right and left. constituents

$P$	$Q$	$P \rightarrow Q$	$Q \rightarrow P$	$P \leftrightarrow Q$
T	T	T	T	T
T	F	F	T	F
F	T	T	F	F
F	F	T	T	T

## 2) Summary (stylistic variants)

①  $P$  if and only if  $Q$

$P \leftrightarrow Q$

②  $P$  just in case  $Q$

$P \leftrightarrow Q$

③  $P$  exactly on condition that  $Q$ .  $P \leftrightarrow Q$

④  $P$  iff  $Q$ .

$P \leftrightarrow Q$ .



