Symbolizing in Sentential Logic

Part II

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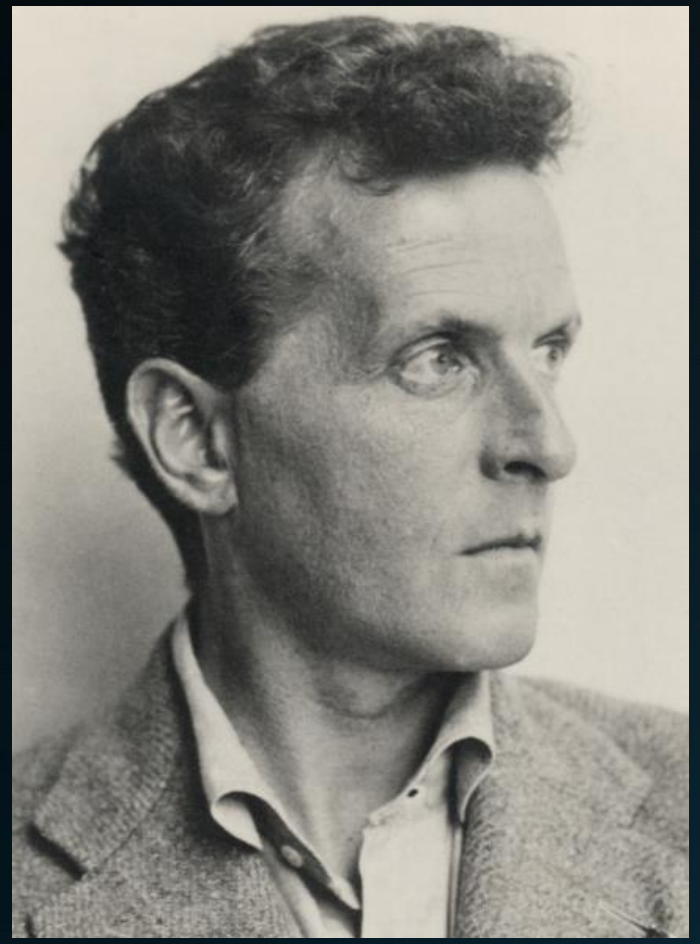

"Philosophy... neither explains
nor deduces anything."

P: Philosophy explains thing.

Q: Philosophy deduces things.

Neither P nor Q

$\sim P \vee \sim Q$

or

$\sim (P \vee Q)$

Neither P nor Q

P	Q	~P∨~Q	~(P∨Q)

Neither P nor Q

P	Q	~P∨~Q	~(P∨Q)
T	T	F	F
T	F	T	F
F	T	T	F
F	F	T	T

Neither P nor Q

P	Q	~P∨~Q	~(P∨Q)	~P∧~Q
T	T	F	F	F
T	F	T	F	F
F	T	T	F	F
F	F	T	T	T

Not both P and Q

$\sim P \wedge \sim Q$

or

$\sim (P \wedge Q)$

Not both P and Q

P	Q	~P∧~Q	~(P∧Q)

Not both P and Q

P	Q	~P∧~Q	~(P∧Q)
T	T	F	F
T	F	F	T
F	T	F	T
F	F	T	T

Not both P and Q

P	Q	~P∧~Q	~(P∧Q)	~P∨~Q
T	T	F	F	F
T	F	F	T	T
F	T	F	T	T
F	F	T	T	T

“You can have results or excuses, but not both.”

P Exclusive Or Q

$(P \vee Q) \wedge \sim(P \wedge Q)$

or

$\sim(P \leftrightarrow Q)$

“He’ll die unless we operate”

“He’ll die unless we operate”

Operate and he lives 

Operate and he dies 

Don’t operate and he lives 

Don’t operate and he dies 

P unless Q

If not P, then Q

If not Q, then P

P or Q

P unless Q

P	Q	~P→Q	~Q→P	PvQ
T	T	T	T	T
T	F	T	T	T
F	T	T	T	T
F	F	F	F	F

All of P, Q, and R

$P \wedge Q \wedge R$

None of P, Q, and R

$\sim P \wedge \sim Q \wedge \sim R$

$\sim (P \vee Q \vee R)$

At least one of P, Q, and R

$P \vee Q \vee R$

At least two of P, Q, and R

At least two of P, Q, and R

$(P \wedge Q)$

At least two of P, Q, and R

$(P \wedge Q) \vee (P \wedge R)$

At least two of P, Q, and R

$(P \wedge Q) \vee (P \wedge R) \vee (R \wedge Q)$

At least two of P, Q, and R

$(P \wedge Q) \vee (P \wedge R) \vee (R \wedge Q) \vee (P \wedge Q \wedge R)$

$(P \wedge Q) \vee (P \wedge R) \vee (R \wedge Q)$

Exactly one of P, Q, and R

Exactly P: $P \wedge \sim Q \wedge \sim R$

Exactly Q: $\sim P \wedge Q \wedge \sim R$

Exactly R: $\sim P \wedge \sim Q \wedge R$

Exactly one of P, Q, and R

$(P \wedge \sim Q \wedge \sim R) \vee (\sim P \wedge Q \wedge \sim R) \vee (\sim P \wedge \sim Q \wedge R)$

Exactly two of P, Q, and R

$(P \wedge Q \wedge \sim R) \vee (P \wedge \sim Q \wedge R) \vee (\sim P \wedge Q \wedge R)$

At most one of P, Q, and R

None of them

or

Exactly 1

At most one of P, Q, and R

$$(\sim P \wedge \sim Q \wedge \sim R)$$

$$\vee$$

$$((P \wedge \sim Q \wedge \sim R) \vee (\sim P \wedge Q \wedge \sim R) \vee (\sim P \wedge \sim Q \wedge R))$$

At most two of P, Q, and R

None of them
or
Exactly 1
or
Exactly 2

At most two of P, Q, and R

$$(\sim P \wedge \sim Q \wedge \sim R)$$

$$\vee$$

$$((P \wedge \sim Q \wedge \sim R) \vee (\sim P \wedge Q \wedge \sim R) \vee (\sim P \wedge \sim Q \wedge R))$$

$$\vee$$

$$((P \wedge Q \wedge \sim R) \vee (P \wedge \sim Q \wedge R) \vee (\sim P \wedge Q \wedge R))$$

Four cases for P, Q, and R

None
Exactly 1
Exactly 2
All three

At most 2

Four cases for P, Q, and R

None
Exactly 1
Exactly 2
All three

At most 2

$\sim(P \wedge Q \wedge R)$

Neither Peter nor Sarah walking to school is a sufficient condition for at least two of Peter, Sarah, and Rick not having their coffee.

P: Peter walks to school.
S: Sarah walks to school.
T: Peter has a coffee.
W: Rick has a coffee.
X: Sarah has a coffee.

Neither Peter nor Sarah walking to school is a sufficient condition for at least two of Peter, Sarah, and Rick not having their coffee.

P: Peter walks to school.
S: Sarah walks to school.
T: Peter has a coffee.
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Neither Peter nor Sarah walking to school is a sufficient condition for at least two of Peter, Sarah, and Rick not having their coffee.

P: Peter walks to school.
S: Sarah walks to school.
T: Peter has a coffee.
W: Rick has a coffee.
X: Sarah has a coffee.

$\sim(P \vee S)$

$\sim P \wedge \sim S$

Neither Peter nor Sarah walking to school is a sufficient condition for at least two of Peter, Sarah, and Rick not having their coffee.

P: Peter walks to school. S: Sarah walks to school.

T: Peter has a coffee. W: Rick has a coffee.

X: Sarah has a coffee.

$\sim(P \vee S)$

$\sim P \wedge \sim S$ $(\sim T \wedge \sim W) \vee (\sim T \wedge \sim X) \vee (\sim W \wedge \sim X)$

Neither Peter nor Sarah walking to school is a sufficient condition for at least two of Peter, Sarah, and Rick not having their coffee.

P: Peter walks to school. S: Sarah walks to school.

T: Peter has a coffee. W: Rick has a coffee.

X: Sarah has a coffee.

$\sim(P \vee S)$

$\sim P \wedge \sim S \quad \rightarrow (\sim T \wedge \sim W) \vee (\sim T \wedge \sim X) \vee (\sim W \wedge \sim X)$

$P \wedge Q$

P: Cats are scary. Q: Clowns are scary.

~~Cats are scary and clowns are scary~~

Cats and clowns are scary

~(PvQ)

P: Cats are friendly. Q: Bats are friendly

It is not the case that cats are friendly or bats are friendly

Neither cats nor bats are friendly

$$\sim(P \wedge Q) \rightarrow (X \wedge Y) \vee (X \wedge Z) \vee (Y \wedge Z)$$

P: Subway is delayed. Q: Streetcar is delayed.

X: Peter is on time. Y: John is on time. Z: Mary is on time.

$$\sim(P \wedge Q) \rightarrow (X \wedge Y) \vee (X \wedge Z) \vee (Y \wedge Z)$$

P: Subway is delayed. Q: Streetcar is delayed.

X: Peter is on time. Y: John is on time. Z: Mary is on time.

If not both, then at least two