$P \wedge \sim P$ $\Leftrightarrow$ contradiction.

→ only true when the component statements are true

Q	$\neg Q$	$P \wedge \sim P$	$\neg Q \Rightarrow (P \wedge \sim P)$
T	F	F	T
F	T	F	F

$Q \equiv ((\neg Q) \Rightarrow (P \wedge \sim P))$

$\neg(\neg Q) \equiv Q$

$A = \{$ friends $\}$ F_1, F_2

$\exists x \in \{F_1, F_2\}$ s.t. x has misplaced their homework...

$\forall x \in \{F_1, F_2\}$ x has NOT misplaced their homework.

if $n \in \mathbb{Z}$, then $n^2 \in \mathbb{Z}$

$n^2 \in \mathbb{Z}$ only if $n \in \mathbb{Z}$

$S \Rightarrow \cdots (P \Rightarrow Q)$ T?

$\exists$ → T

(b) is true

$x \neq 7$ $x > 8$ $S = (-\infty, 7)$

$x \neq 7$ $x < 8$ $x \leq 7$ $x < 7$

→ $S = [8, \infty)$

$P(x)$ is false + $Q(x)$ is false

$x > 8$

$x \neq 7$ $P(x)$ is false + $Q(x)$ is true

$P(x)$ is true + $Q(x)$ is true

$S = \phi$

$x = 7$ $x \neq 7$

If I'm hungry, I eat an apple

If I eat breakfast, I do math

$P \Rightarrow Q$

$\neg(P \Rightarrow Q)$

$\neg P \wedge Q$

$\neg(P \Rightarrow Q) \equiv \neg P \vee Q$

$n \in \mathbb{Z} \Rightarrow n^2 \in \mathbb{Z}$

$n \notin \mathbb{Z}$ and $n^2 \in \mathbb{Z}$

$P \Rightarrow Q \qquad P \wedge \neg Q$

$n \in \mathbb{Z}$ and $n^2 \notin \mathbb{Z}$.

$n \in \mathbb{Z} \Rightarrow n^2 \in \mathbb{Z}$ // $P \Rightarrow Q$ //

$n \in \mathbb{Z}$ and $n^2 \notin \mathbb{Z}$ $\qquad P \wedge \neg Q$

$P \Rightarrow Q \equiv \neg(P \wedge \neg Q)$

$\neg P \vee \neg(\neg Q)$

$\neg P \vee Q$

if P, then Q

English statement ~~~ try writing as logical statements

$$P \Rightarrow Q$$

$$\neg(P \Rightarrow Q)$$

$$P \wedge \neg Q \quad (\text{NOT})$$

Sentence * sentence.

P Q

for every war, there's casualty

$$\forall P, Q \qquad \neg(\forall P, Q) \equiv \exists P, \neg Q$$

there exist a war where there's no casualty.