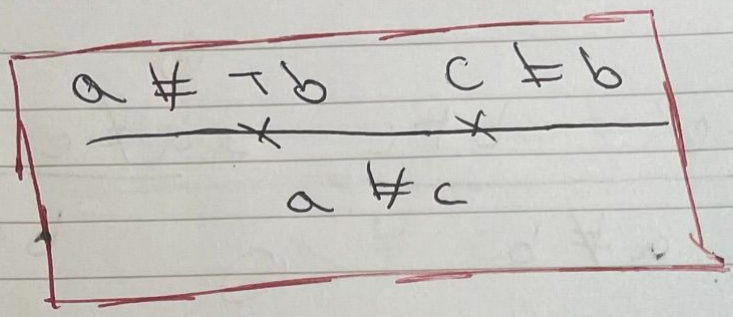
(21)

some a is b all c is b

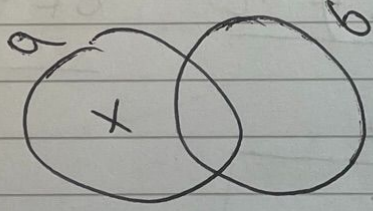
---

some a is not c

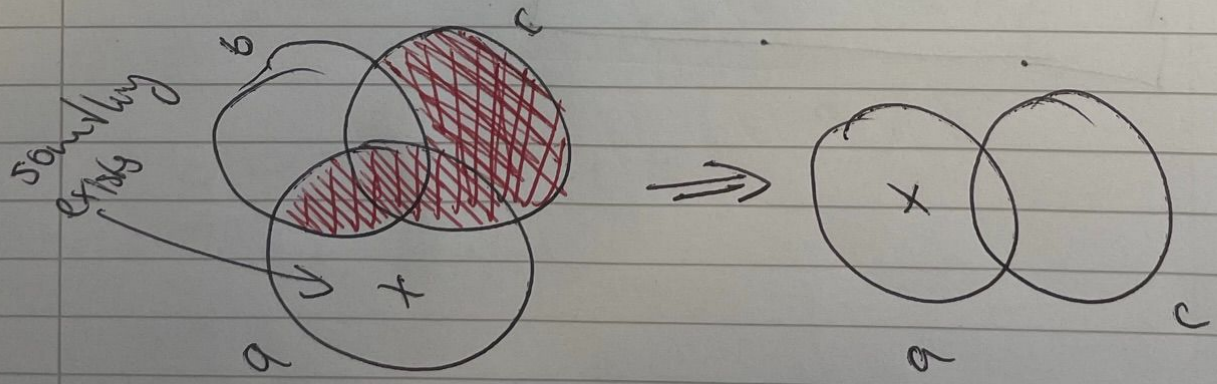


Following syllogism is not sound as shown by the Venn diagram

It is due to a fact that syllogism does not guarantee there exists "a which is not b"



If we use Existential Assumption the Venn diagram would look like:



Hence syllogism would become SOUND!

Q2

Barbara

$$\frac{a \neq b \qquad b \neq c}{a \neq c}$$

① $\frac{a \nneq c \qquad b \neq c}{a \nneq b}$ → ② $\frac{a \nneq c \qquad a \neq b}{b \nneq c}$

③ $\frac{b \neq c \qquad a \neq b}{a \neq c}$ → ④ $\frac{b \neq c \qquad a \nneq c}{a \nneq b}$

⑤ substitute $\neg c$ for c

$\frac{b \neq \neg c \qquad a \nneq \neg c}{a \nneq b}$

⑥ contrapositive

$\frac{b \neq \neg c \qquad \neg\neg c \nneq \neg a}{a \nneq b}$

⑦ double negation

$\frac{b \neq \neg c \qquad c \nneq \neg a}{a \nneq b}$

$\neg p, p$ ⇒ tautology

$\neg q, q$ ⇒ tautology

$$\frac{\dfrac{\dfrac{}{\vdash \neg p, p}\,I^{b} \qquad \dfrac{}{\vdash \neg p, \neg q, q}\,I^{a}}{\vdash (\neg p \wedge \neg q), p, q}\,\wedge R}{\vdash (\neg p \wedge \neg q), (p, q)}\,\vee R^{a,b}}{\vdash (\neg p \wedge \neg q) \vee (p, q)}\,\vee R$$

$(\neg q, q) = a \quad (p) = b$

$\vdash (\neg p \wedge \neg q) \vee (p \vee q)$

$p \to q$ $\qquad$ $q \lor \neg p$

$$\dfrac{\dfrac{\Gamma, q \vDash \Delta \qquad \neg p \vDash \Delta}{\Gamma, q \lor \neg p \vDash \Delta}}{\Gamma, p \to q \vDash \Delta}\ (\to L) \qquad \dfrac{\dfrac{\Gamma \vDash q, \neg p, \Delta}{\Gamma \vDash q \lor \neg p, \Delta}}{\Gamma \vDash p \to q, \Delta}\ (R \to)$$