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Subject :

KS.

જ્ઞાનમંજરી સેકન્ડરી એન્ડ હાયર સેકન્ડરી સ્કૂલ - ભાવનગર

... અહીંથી લખવાનું શરૂ કરો ...

- ① Anyone passing his history exams & winning the lottery is happy. But anyone who studies or is lucky can pass all his exams. John did not study but he is lucky. Anyone who is lucky wins the lottery. Is John happy?

⇒ Convert - FOL

- ① Anyone passing his history exams & winning the lottery is happy.

$$\forall x: \text{pass}(x, \text{history}) \wedge \text{win}(x, \text{lottery}) \rightarrow \text{happy}(x).$$

- ② Anyone who studies or is lucky can pass all his exams.

$$\forall x \forall y \text{ Study}(x) \vee \text{lucky}(x) \rightarrow \text{pass}(x, y)$$

- ③ John didn't study but he is lucky.

$$\neg \text{Study}(\text{John}) \wedge \text{lucky}(\text{John})$$

- ④ Anyone who is lucky wins the lottery

$$\forall x: \text{lucky}(x) \rightarrow \text{win}(x, \text{lottery})$$

- ⑤ Is John happy?

— As it is question ask & yet to find the answer so, assuming John is happy.

$$\therefore \text{happy}(\text{John})$$

\Rightarrow Convert FOL into CNF

① Remove Implication.

- (i) $\forall x \neg (\text{pass}(x, \text{history}) \wedge \text{win}(x, \text{lottery})) \vee \text{happy}(x)$
- (ii) $\forall x \forall y: \neg (\text{Study}(x) \vee \text{lucky}(x)) \wedge \text{pass}(x, y)$
- (iii) $\neg \text{Study}(\text{John}) \wedge \text{lucky}(\text{John})$
- (iv) $\forall x \neg \text{lucky}(x) \vee \text{win}(x, \text{lottery})$
- (v) $\text{happy}(\text{John})$

② Applying Negation

- (i) $\forall x: \neg \text{pass}(x, \text{history}) \vee \neg \text{win}(x, \text{lottery}) \vee \text{happy}(x)$
- (ii) $\forall x \forall y \neg \text{Study}(x) \wedge \neg \text{lucky}(x) \vee \text{pass}(x, y)$
- (iii) $\neg \text{Study}(\text{John}) \wedge \text{lucky}(\text{John})$
- (iv) $\forall x \neg \text{lucky}(x) \vee \text{win}(x, \text{lottery})$

③ Renaming Variable

- (i) $\forall x \neg \text{pass}(x, \text{history}) \vee \neg \text{win}(x, \text{lottery}) \vee \text{happy}(x)$
- (ii) $\forall y \forall z \neg \text{Study}(y) \wedge \neg \text{lucky}(y) \vee \text{pass}(y, z)$
- (iii) $\neg \text{Study}(\text{John}) \wedge \text{lucky}(\text{John})$
- (iv) $\forall w \neg \text{lucky}(w) \vee \text{win}(w, \text{lottery})$

④ Universal Quantifiers

(i) $\neg \text{pass}(x, \text{history}) \vee \neg \text{win}(x, \text{lottery}) \vee \text{happy}(x)$

(ii) $\neg \text{Study}(y) \vee \text{pass}(y, 2) \mid \text{lucky}(y) \vee \text{pass}(y, 2)$

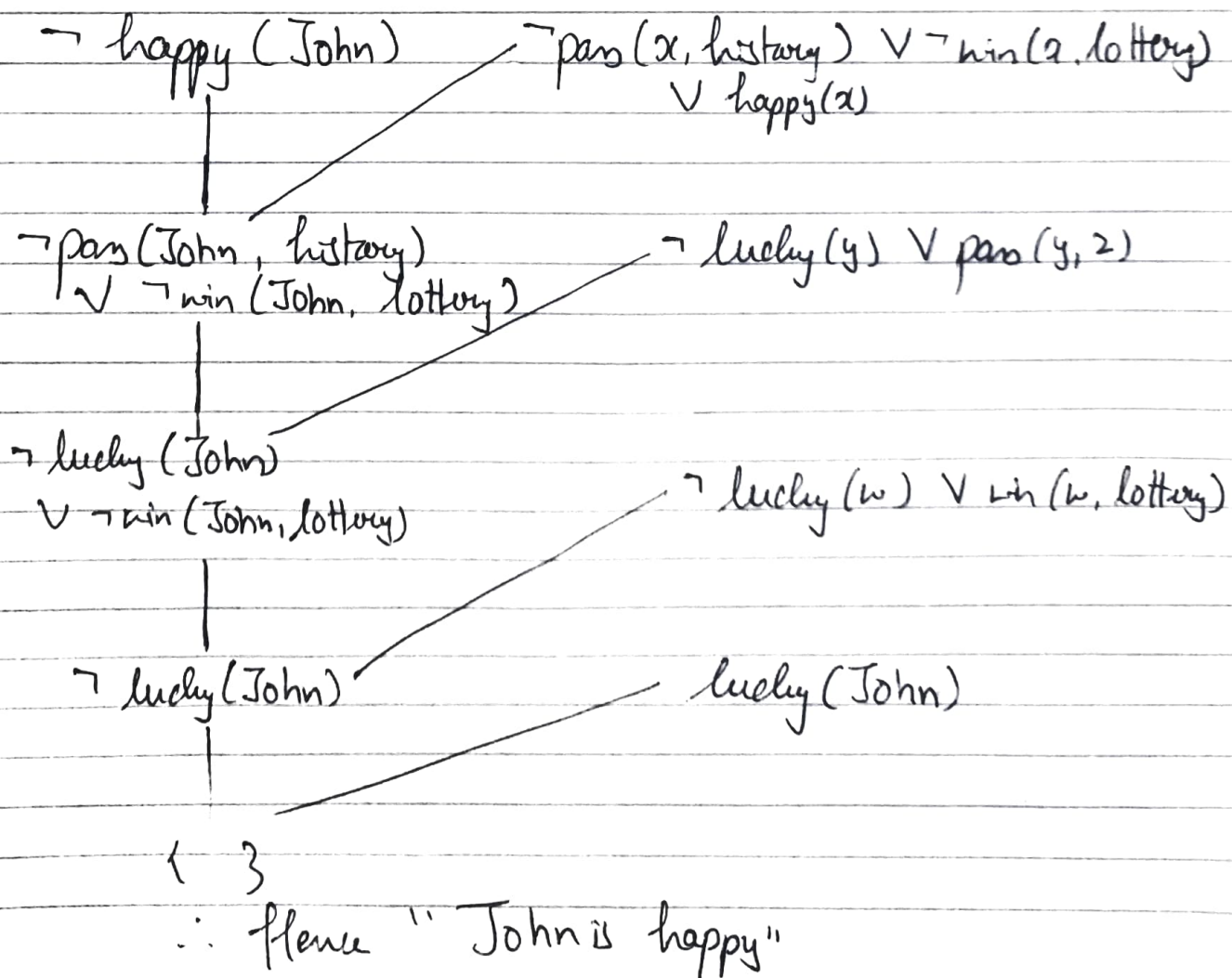
(iii) $\neg \text{Study}(\text{John}) \text{ lucky}(\text{John})$

(iv) $\neg \text{lucky}(w) \vee \text{win}(w, \text{lottery})$

\Rightarrow Negation of statement to prove.

$\text{happy}(\text{John}) \Rightarrow \neg \text{happy}(\text{John})$.

\Rightarrow Resolution graph:-



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... અહીંથી લખવાનું શરૂ કરો ...

- ② All people who are not poor & are smart are happy. Those people who read are not stupid. John can read & is wealthy. Happy people have exciting lives. Can anyone be found with exciting life?

⇒ Convert - For

- ① All people who are not poor & are smart are happy.

$$\forall x: \neg \text{poor}(x) \wedge \text{smart}(x) \rightarrow \text{happy}(x)$$

- ② Those people who read are not stupid.

$$\forall x: \text{read}(x) \rightarrow \neg \text{stupid}(x)$$

- ③ John can read & is wealthy.

$$\text{read}(\text{John}) \wedge \text{wealthy}(\text{John})$$

- ④ Happy people have exciting lives.

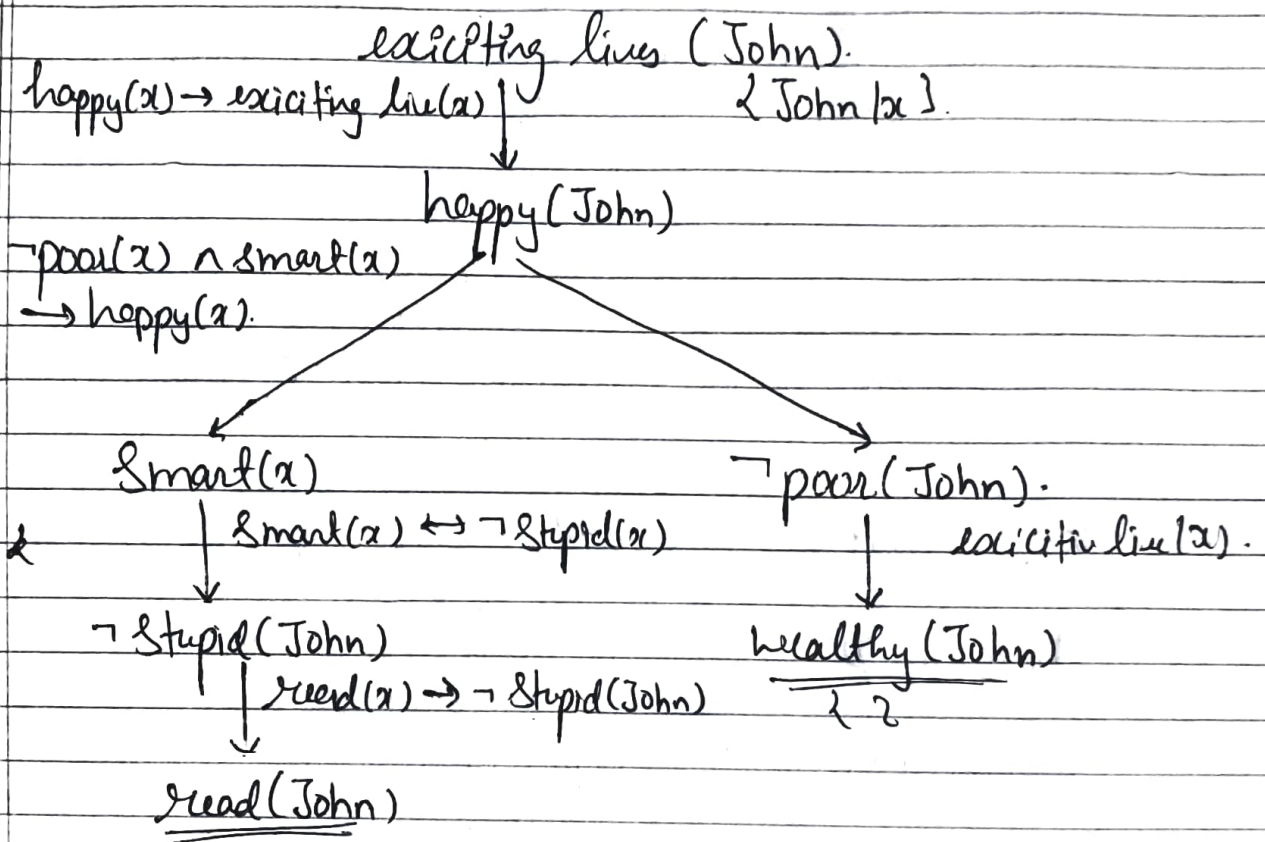
$$\forall x: \text{happy}(x) \rightarrow \text{exciting lives}(x)$$

- ⑤ Can anyone be found with exciting life?

$$\exists x \text{ exciting lives}(x)$$

⇒ Backward Chaining.

⇒ Suppose, that John have exciting lives.



Hence, Our assumption is True.