UCB CS70: DIS 0A

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1.Propositional Practice

- **(a)** F (The correct answer is T. For example, π is an irrational number.)

  $\exists x \in \mathbb{R} \ (x \notin \mathbb{Q})$

- **(b)** T

  $\forall x \in \mathbb{Z}(((x \in \mathbb{N}) \vee (x < 0)) \wedge \neg((x \in \mathbb{N}) \wedge (x < 0)))$

- **(c)** T

  $(\forall x \in \mathbb{N})((6 \mid x) \implies ((2 \mid x) \vee (3 \mid x)))$

- **(d)** T

  All integers are rational numbers.

- **(e)** F

  If a integers is divisable by 2 or is divisable by 3,then it's divisable by 6.

- **(f)** T

  If a natural number x is larger than 7, then it's can be a sum of two natural numbers.

2.Truth table

- **(a)** $P \wedge (Q \vee P) \equiv P \wedge Q$ is not equivalent.

P	Q	$P \wedge (Q \vee P)$	$P \wedge Q$
T	T	T	T
T	F	T	F
F	T	F	F
F	F	F	F

- **(b)** $(P \vee Q) \wedge R \equiv (P \wedge R) \vee (Q \wedge R)$ is equivalent.

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

- **(c)** $(P \wedge Q) \vee R \equiv (P \vee R) \wedge (Q \vee R)$ is equivalent.

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

3.Implication

- **(a)** $\forall x \forall y P(x, y) \implies \forall y \forall x P(x, y)$ T

- **(b)** $\forall x \exists y P(x, y) \implies \exists y \forall y P(x, y)$ F

  eg.P(x,y) is that y > x.

- **(c)** $\exists x \forall y P(x, y) \implies \forall y \exists x P(x, y)$ T