

ICS 171 — Quiz #5 — TWENTY (20) minutes

1. (5 pts) NAME AND EMAIL ADDRESS: _____

YOUR ID: _____ ID TO RIGHT: _____ ROW: _____ NO. FROM RIGHT: _____

2. (2.5 pt each, 15 pts total) Reasoning, logic.

Label the following with the types of reasoning they describe.

2.A. Abduction You make an assumption which, if true, together with your general knowledge, would explain the facts.

2.B. Induction You generalize from many instances to a general rule for all instances.

2.C. Deduction You reason from facts and general principles to other facts.

2.D. Analogy You reason that if one thing is similar to another in some ways, they are also similar in other ways.

2.E. Which of the forms of reasoning above are sound?

Deduction _____ (C is OK.)

2.F. Which of the forms of reasoning above are unsound?

Abduction Induction Analogy _____ (A, B, D is OK.)

3. (5 pts each, 40 pts total) Let $PKF(x, y)$ mean “Person x Knows Fact y ”.

For each English sentence on the left below, write the letter of the logic sentence on the right that best expresses it, or N (= None of the above). Here, “ \neg ” means “not.” If you need to convert $\neg\forall$ or $\neg\exists$ to simpler form, show your work. The first one is done for you.

<u>A</u>	Every person knows every fact.	A. $\forall x\forall y PKF(x, y)$.
<u>F</u>	Every person knows at least one fact.	B. $\forall x\forall y \neg PKF(x, y)$.
<u>H</u>	There is a person who knows at least one fact.	C. $\exists y\neg\exists x PKF(x, y)$.
<u>E</u>	There is a person who knows every fact.	D. $\exists y\forall x PKF(x, y)$.
<u>I</u>	No person knows every fact.	E. $\exists x\forall y PKF(x, y)$.
<u>G</u>	There is a person who knows no fact.	F. $\forall x\exists y PKF(x, y)$.
<u>B</u>	No person knows any fact.	G. $\exists x\forall y \neg PKF(x, y)$.
<u>D</u>	There is a fact that is known by every person.	H. $\exists x\exists y PKF(x, y)$.
<u>C</u>	There is a fact that no person knows.	I. $\neg\exists x\forall y PKF(x, y)$.

4. (5 pts each, 30 pts total) Mark the following reasoning patterns as S (= sound, carries true premises to true conclusions) or U (= unsound, may carry true premises to false conclusions). Premises are shown above the line, conclusions below the line. Here, “ \rightarrow ” means “implies” and “ \neg ” means “not.” The first one is done for you.

- | | |
|--|--|
| <p>A. <u> S </u> $P \rightarrow Q$
 P
 \hline
 Q</p> | <p>E. <u> S </u> $P \rightarrow \neg Q$
 Q
 \hline
 $\neg P$</p> |
| <p>B. <u> S </u> $P \rightarrow Q$
 $\neg Q$
 \hline
 $\neg P$</p> | <p>F. <u> S </u> $P \rightarrow Q$
 $\neg P$ or Q</p> |
| <p>C. <u> U </u> $P \rightarrow Q$
 Q
 \hline
 P</p> | <p>G. <u> U </u> $P \rightarrow Q$
 P or $\neg Q$</p> |
| <p>D. <u> U </u> $\neg P \rightarrow Q$
 P
 \hline
 $\neg Q$</p> | |

4. (5 points) Write down a logical sentence such that every world in which it is true contains exactly one object.

$$\exists x \forall y, x = y$$

5. (5 points) Let $P(x)$ mean x is a politician, and let $F(x, y, t)$ mean x fools y at time t . Write down a logical sentence for this English sentence.

“Politicians can fool some of the people all of the time, and they can fool all of the people some of the time, but they can’t fool all of the people all of the time.”

English is ambiguous! Either is correct:

$$\forall x, P(x) \rightarrow [\exists y \forall t, F(x, y, t)] \tag{1}$$

$$\& [\forall y \exists t, F(x, y, t)] \tag{2}$$

$$\& \neg [\forall y \forall t, F(x, y, t)] \tag{3}$$

$$\forall x, P(x) \rightarrow [\forall t \exists y, F(x, y, t)] \tag{4}$$

$$\& [\exists t \forall y, F(x, y, t)] \tag{5}$$

$$\& \neg [\forall y \forall t, F(x, y, t)] \tag{6}$$