Philosophy 12, Problem Set 1

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1 What is Prop. Logic?

1.1 Q1.0

- If you are taking this class, then you are a Berkeley student.
- It is not the case that you are taking this class.
- Therefore it is not the case that you are a Berkeley student.

This is not a good argument since there are a lot of Berkeley students who are not in this class.

1.2 Q1.1

- It is more likely that I go running than that I do my homework.
- I am at least as likely to do my homework than it is that it rains tomorrow.
- Therefore it is more likely that I go running than it is that it rains..

This is a good argument, the conclusion logically follows from the premise ($p > q \geq r$, so $p > r$).

2 Truth-Functional Connectives

2.1 Q2

p	Pete heard that p
TRUE	Maybe (didn't hear it)
FALSE	Maybe (false rumors)

As we can see, the truth table cannot be written because the truth value of "Pete heard that p" does not only depend on p

2.2 Q3

Kate in library	Kate in gym	Kate in neither library nor gym
TRUE	TRUE	FALSE
TRUE	FALSE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	TRUE

The truth table is written above. The connective's value depends only on the operand's. Therefore it is truth functional.

3 The Truth-Functional Conditional

3.1 Q4

Statement 1: If I am not playing tennis, then I am watching tennis.
Statement 2: If it is not the case that I am watching tennis, then I am reading about tennis. Since we can only do one activity at a time, we have the following truth table.

Playing Tennis	Watching Tennis	Reading about Tennis
TRUE	FALSE	FALSE
FALSE	TRUE	FALSE
FALSE	FALSE	TRUE

The first line is invalid since he is not watching tennis AND not reading about tennis, contradicting Statement 2.
The second line is valid since it satisfies both statements.
The thrid line is invalid since he is not watching tennis AND not watching tennis, contradicting Statement 1.

3.2 Q5

Person is actually a knight	Statement is True	Is there Gold
TRUE	TRUE	TRUE
FALSE	FALSE	?

The trivial part is if we have already met a knight, then he tells us the truth and there is gold on the island.
The knave's case is more interesting, he lies and this statement is false. Therefore the predicate must be true and the conclusion false. However the only way for the predicate to be true is if he is a knight, which is a

contradiction. Therefore this case is not possible.
Since the knave's case is not logically possible, we must have met a knight and there is gold on the island.

4 Valid Forms of Argument I

4.1 Q6.1

Let p be "rabbits are fish."
Let q be "mice are fish."
Let r be "unicors exist."

- $p \implies q$
- $q \implies r$
- $p \implies r$

The argument is valid but unsound. When p is true, q is also true, and thus r is always true. However it is not sound since p is always false.

4.2 Q6.2

Let p be "rabbits are fish."
Let q be "mice are fish."
Let r be "unicorns exist."

- $p \vee q$
- $p \vee r$
- $p \wedge (q \vee r)$

We can distribute the and operator to get $(p \wedge q) \vee (p \wedge r)$, which is not equal to both our premises $((p \vee q) \wedge (p \vee r))$. Therefore it invalid and unsound.

5 Valid Forms of Argument II

5.1 Q7.1

q	$\neg q$	$q \vee \neg q$	r	p	$\neg r \implies \neg p$
FALSE	TRUE	TRUE	TRUE	TRUE	FALSE $\implies$ FALSE

FALSE $\implies$ FALSE is true since false implying anything is true. Thus here we have all the premises true, but the conclusion q is false. Thus the argument is invalid.

5.2 Q7.2

p	q	$\neg p$	$p \wedge \neg p$	Statement 1 $\implies$ q
TRUE	TRUE	FALSE	FALSE	TRUE
TRUE	FALSE	FALSE	FALSE	TRUE
FALSE	TRUE	TRUE	FALSE	TRUE
FALSE	FALSE	TRUE	FALSE	TRUE

Every row evavluates to true, and the conclusion is true.

6 Validity and Soundness

6.1 Q8

6.1.1 Part i

If I am in Berkeley, and if Berkeley is on Mars, then I am on Mars.

6.1.2 Part ii

If I am in Berkeley, and if New York City is on Mars, then I am on Earth.

6.1.3 Parat iii

This is not possible since sound arguments are valid and their premises are true. Therefore there conclusion must be true.

7 Syntax of the Prop. Language I

7.1 Q9

7.1.1 Part i

Let p be I will go to school.
Let q be I get a cookie now.
Then we have $p \iff q$

7.1.2 Part ii

Let p be John is running.
Let q be Mary is running.
Then we have pq

7.1.3 Part i

Let p be a foreign national is entitled to social security.
Let q be he has legal employment.
Let r be he has had legal employment less than three years ago.
Let t be he is currently also employed abroad.
Then we have $((q \vee r) \wedge \neg t) \implies p$

7.2 Q10

7.2.1 Part f

Let p be Shamik goes to work by car.
Let q be Shamik goes to work by bike.
Let r be Shamik goes to work by train.
Then we have $p \vee (q \wedge r)$

7.2.2 Part g

Let p be the party is on.
Let q be the weather is bad.
Let r be too many are sick.
Then we have $(q \wedge r) \implies \neg p$

7.2.3 h

Let p be Jasmine is going to school.
Let q be it is raning.
Let r be Seth is going to school.
Then we have $p \land (q \implies r)$

7.2.4 i

Let p be it isn't summer.
Let q be it is damp or cold.
Let r be it is evening or night.
Then we have $p \land (q \implies r)$

7.2.5 j

Let p be you do not help me.
Let q be I need you.
Let r be I will not help you.
Let s be you need me.
Then we have $(q \implies p) \implies (s \implies r)$

7.2.6 k

Let p you stay with me.
Let q be I won't drink anymore.
Then we have $(q \implies p) \implies q$

7.3 l

Let p be we are going.
Let q be it is raining.
Then we have $q \implies \neg p$

7.4 m

Let p be you do mean it.
Let q be I don't believe you.
Then we have $\neg p \land (p \implies q)$

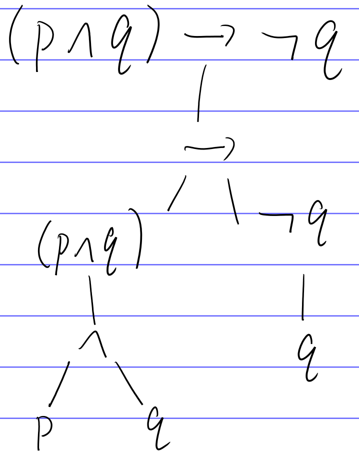
11. $(p \to q) \vee (q \to p)$

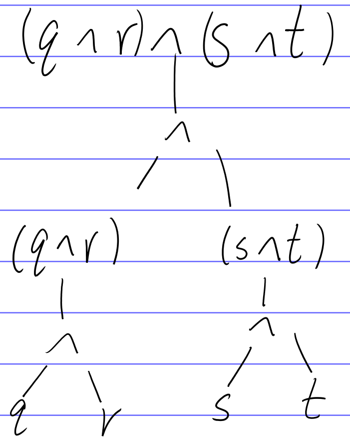
$\langle p,\ q,\ p \to q,\ q \to p,\ (p \to q) \vee (q \to p) \rangle$

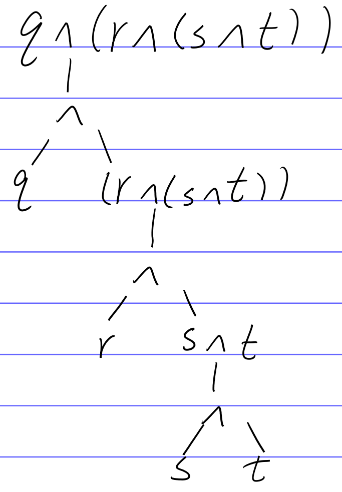
$\neg\neg(p \vee \neg p)$

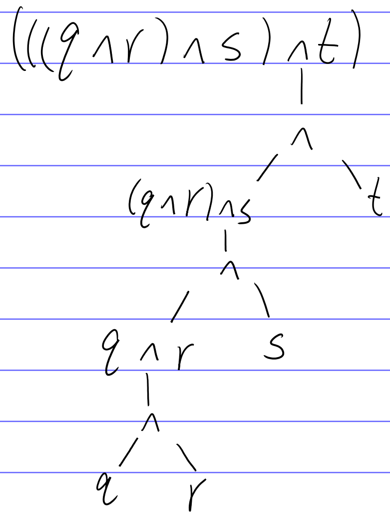
$\langle p,\ \neg p,\ p \vee \neg p,\ \neg(p \vee \neg p),\ \neg\neg(p \vee \neg p) \rangle$

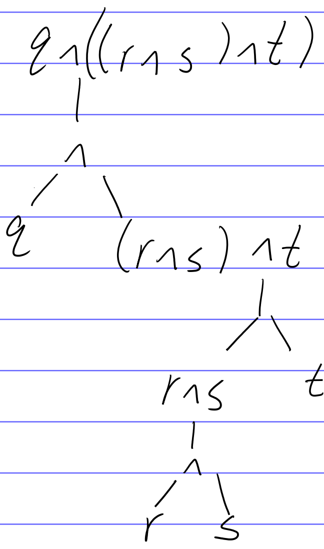
12.

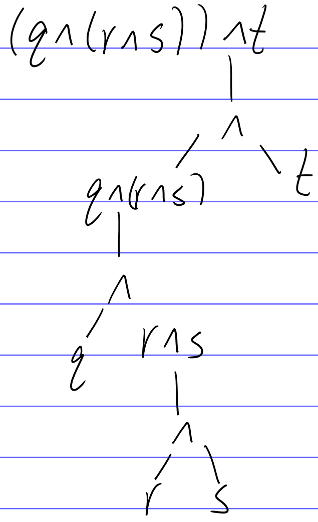












This ambiguity is OK. The truth value of this expr is the same in all these cases.
It makes sense because A and B and C and D is true IFF all of them are true. The order in this case doesn't matter.