Propositional Logic

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score
Question 1	5 / 5
Question 2	20 / 20
Total	**25 / 25 (100%)**

Congratulations, you passed this quiz with a sufficient score. You may include this attempt as part of your self-assessment evidence.

Make sure that you click on "Print this results summary" and save to pdf, so that everything can be read clearly. Do not navigate away from this page before you have saved your result.

Performance Summary

Exam Name:	Propositional Logic
Session ID:	0122420960
Exam Start:	Sun Mar 24 2024 15:05:58
Exam Stop:	Sun Mar 24 2024 15:22:02
Time Spent:	0:16:03

Question 1

Truth Table

Instructions

Please enter a truth table for the expression $(p \wedge q) \vee (q \wedge p)$.

Filling the table

- In the top row, enter boolean expressions. You can copy/paste from the following expression: (p ∧ q) ∨ (q ∧ p) or from the table below.
- In the remaining rows, enter boolean values (true or false). Please enter them as 1 (for true) and 0 (for false), for the system to check it.
- Enter *all* intermediate expressions (ie, columns) in the table, not just the final column.
- Make sure that the columns are entered in the order the table is constructed: the input for each column should be found on the left of that column (so, for example, for constructing a table for $\neg p \vee q$ we should already have a column for $\neg p$).

Entering expressions

You can enter expressions either by copy-pasting the expression below (or is sub-expressions), or typing the expression with English words - for example: "p or (q and not p)".

You can copy the sub-expressions from here: (p ∧ q) ∨ (q ∧ p)

Rows: 5 Columns: 5

p	q	p ∧ q	q ∧ p	(p ∧ q) ∨ (q ∧ p)
0	0	0	0	0
0	1	0	0	0
1	0	0	0	0
1	1	1	1	1

✔

Your answer is correct. You were awarded **5** marks. ✔

You scored **5** marks for this part.

Score: 5/5 ✔

Advice

In order to construct the truth table we need to start from finding all the sub-expressions of $(p \wedge q) \vee (q \wedge p)$.

The list of sub-expressions is p, q, $p \wedge q$, $q \wedge p$, $(p \wedge q) \vee (q \wedge p)$.

Then we build each column, starting by listing all the possible combinations of values from the atoms [p, q]. Then we build the table by building each column using the previous columns.

The correct truth table is

p	q	$p \wedge q$	$q \wedge p$	$(p \wedge q) \vee (q \wedge p)$
T	T	T	T	T
F	T	F	F	F
T	F	F	F	F
F	F	F	F	F

.

Question 2

Show that $\neg(p \vee (q \wedge p)) \wedge \neg q \equiv \neg(p \vee q)$.

Instructions to fill the gaps

- Apply **one and only one** law per step.
- **Start from the left hand side, in the first gap**, and **finish with the right hand side**.

You will lose marks if you do not, as the system will conclude that you did not include all steps of the proof.

- You can add additional steps, and **any blank step at the end will signal the end of your work** (so don't skip a line).
- The system will automatically interpret your entry and display a formula. *If no formula appears, it means that the system cannot parse your entry. Check the syntax.* Note that

the displayed formula does not show all brackets, because it applies bodmas, which can be confusing at first. Unfortunately this is hardcoded and cannot be changed.

- You can enter formulas using either the operations ¬,∧,∨, or English words not, and, or. So, the input "p and (q or not p)" is the same as "p ∧ (q ∨ ¬ p)".
- The easiest way to enter a step is either type it with the plain words ("not p or (not q and p)") or to copy-paste the previous formula and modify it appropriately.
- At the bottom of this question you will find a table with the list of operations, and the keywords to use. You can copy/paste from there.

Entering your solution

You are strongly encouraged to work out your proof on paper before entering it into the system. It will save you time, and give you an opportunity to review your work and take notes if you made a mistake.
Please note that the system should accept any correct proof. You can only apply **one law per step**, not more (in particular you cannot apply the same law twice in one go - it has to be done in two steps: it is one law per step, not one type of law per step).
The system checks your proof and returns whether it is correct.

Logical Proof

Select the number of steps you need: 4

LHS		
≡	¬(p ∨ (q ∧ p)) ∧ ¬q	
≡	`not ( p or (p and q) ) and not q` $\neg\left(p \vee p \wedge q\right) \wedge \neg q$	Commutative Law ✔
≡	`not ( p ) and not q` $\neg p \wedge \neg q$	Absorption Law ✔
≡	`not (p or q)` $\neg\left(p \vee q\right)$	De Morgan's Law ✔
≡	RHS	

You may enter the operations by copying from the following table. Either versions are fine.

Operation/Value	True	False	negation	conjunction	inclusive disjunction	exclus disjunc
ascii version	true	false	not	and	or	xor
symbol version			¬	∧	∨	

Step 1

This part was marked using your answers to previous parts.

You were awarded **1** mark. ✔

Step 2

This part was marked using your answers to previous parts.

You were awarded **1** mark. ✔

Step 3

This part was marked using your answers to previous parts.

You were awarded **1** mark. ✔

Scaling the grade on the number of steps to solution. You were awarded **17** marks. ✔

Proof completed with RHS. ✔

You scored **20** marks for this part.

Score: 20/20 ✔