1. P = computer science is easy

Q = AI will rule the universe

P ∨ A

1. A = Alice will study hard

B = Bob will study hard

P = Alice will pass COMP9020

Q = Bob will pass COMP9020

A ∧ B → P ∧ Q

1. This is an invalid argument

With the following truth table, where all the premises given are true, i.e those values highlighted in green, the conclusion is false.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| p | q | r | ~p | ~r | ~q | p -> ~p | ~q ∨ r |
| TRUE | TRUE | TRUE | FALSE | FALSE | FALSE | FALSE | TRUE |
| TRUE | TRUE | FALSE | FALSE | TRUE | FALSE | FALSE | FALSE |
| TRUE | FALSE | TRUE | FALSE | FALSE | TRUE | FALSE | TRUE |
| TRUE | FALSE | FALSE | FALSE | TRUE | TRUE | FALSE | TRUE |
| FALSE | TRUE | TRUE | TRUE | FALSE | FALSE | TRUE | TRUE |
| FALSE | TRUE | FALSE | TRUE | TRUE | FALSE | TRUE | FALSE |
| FALSE | FALSE | TRUE | TRUE | FALSE | TRUE | TRUE | TRUE |
| FALSE | FALSE | FALSE | TRUE | TRUE | TRUE | TRUE | TRUE |

* All software is free of vulnerabilities
* Log4j is a piece of software
* Log4j was exploited and found vulnerable in CVE-2021-44228

The premise is that log4j is a piece of software and should be free of vulnerabilities, however it was found to have a zero day exploit. This either means that log4j is not a piece of software or all software is not free of vulnerabilities, or log4j should have no vulnerabilities.

P = All software is free of vulnerabilities

Q = Log4j is software

~p ∨ ~q

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | ~P | ~Q | ~P ∨ ~Q |
| T | T | F | F | F |
| T | F | F | T | T |
| F | T | T | F | T |
| F | F | T | T | T |

1. My thinking….
   1. Assume the negation~( ∼ p ∨ r) is true
   2. By De Morgan’s law ~~p ∧ ~r is also true
   3. Double negative p ∧ ~r is true
   4. Through specialisation p is true and ~r is true
   5. Through modus ponens p q, q is also true, then ~q is false
   6. If ~r is true, then r is false
   7. Coming back to the original conclusion false ∨ false results in false

Actual Formatted Answer

1. p → q (Premise)

2. ∼q ∨ r (Premise)

Proof by contradiction:

3. Assume ~(∼p ∨ r) (Negation of the conclusion)

4. Then by De Morgan: ~(∼p ∨ r) ≡ ~~p ∧ ~r

5. Apply double negation: ~~p ≡ p

6. So: p ∧ ~r (From 4 and 5)

7. Therefore, p is true and ~r is true ⇒ r is false

8. From 1 and 7: q is true (Modus Ponens from p → q and p)

9. So ~q is false

10. Evaluate 2: ∼q ∨ r

- ∼q is false (from 9)

- r is false (from 7)

- So ∼q ∨ r = false

11. But line 2 is a premise and must be true ⇒ Contradiction

Conclusion:

The assumption leads to a contradiction. (From 3)

Therefore, ~(∼p ∨ r) is false.

So, ∼p ∨ r is true.