**2.6** Write in propositional logic:

* I will only go to school if I get a cookie now.
  + (*q* → *p*) ∧ (*p* → *q*)

*p* = “I get a cookie now”.

*q* = “I will go to school”.

* John and Mary are running.
  + *p* ∧ *q*

*p* = “John is running”.

*q* = “Mary is running”.

* A foreign national is entitled to social security if he has legal employment or if he has had such less than three years ago, unless he is currently also employed abroad.
  + (*p* ∨ *q*) ∧ ¬*r* → *s*

*p* = “A foreign national has legal employment”.

*q =* “A foreign national has legal employment less than three years ago”.

*r =* “A foreign national is currently also employed abroad”.

*s =* “A foreign national is entitled to social security”.

**2.7** Which of the following are formulas in propositional logic:

* *p* → ¬*q ✓*
* ¬¬ ∧ *q* ∨ *p* ✗
* *p*¬*q ✗*

**2.11** Construct truth tables for the following formulas:

* (*p* → *q*) ∨ (*q* → *p*),



* ((*p* ∨ ¬*q*) ∧ *r*) ↔ (¬(*p* ∧ *r*) ∨ *q*).



**2.22** Which of the following pairs are *logically equivalent*? Confirm your answer using truth tables:

1. *φ* → *ψ* and *ψ* → *φ* **(Not logically equivalent)**



1. *φ* → *ψ* and ¬*ψ* → ¬*φ* **(Logically equivalent)**



1. ¬(*φ* → *ψ*) and *φ* ∨ ¬*ψ* **(Not logically equivalent)**

**

1. ¬(*φ* → *ψ*) and *φ* ∧ ¬*ψ* **(Logically equivalent)**



1. ¬(*φ* ↔ *ψ*) and ¬*φ* ↔ ¬*ψ* **(Not logically equivalent)**



1. ¬(*φ* ↔ *ψ*) and ¬*φ* ↔ *ψ* **(Logically equivalent)**

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1. (*φ* ∧ *ψ*) ↔ (*φ* ∨ *ψ*) and *φ* ↔ *ψ* **(Logically equivalent)**

