1. **Which of these sentences are propositions? What are the truth values of those that are propositions?**
2. Male’ is the capital of Maldives.

Male’ IS the capital of Maldives. | True

1. There are no fishes in Maldives.

There are NO fishes in Maldives. | False

1. 2 + 3 = 5.

2 + 3 = 5. | True

1. 5 + 7 = 10.

5 + 7 = 10 | False

1. x + 2 = 11.

Not a proposition.

1. 2*n* ≥ 100**.**

Not a proposition.

1. What time is it?

Not a proposition.

1. Answer this question

Not a proposition.

1. **For each of these sentences, determine whether an inclusive or, or an exclusive or, is intended.**
   1. Coffee or tea comes with dinner.

Inclusive Or

* 1. A password must have at least three digits or be at least eight characters long.

Inclusive Or

* 1. The prerequisite for the course is a course in number theory or a course in cryptography**.**

Exclusive Or

* 1. You can pay using U.S. dollars or MVR.

Exclusive Or

* 1. Dinner for two includes two items from column A or three items from column B.

Exclusive Or

1. **Let p and q be the propositions “The election is decided” and “The votes have been counted,” respectively. Express each of these compound propositions as an English sentence.**
   1. ￢p

Candidate p did not win the elections.

* 1. p ∨ q

Candidate p won or candidate q lost the elections or both of the candidate will draw.

* 1. ￢p ∧ q

Both candidate p & q loses.

* 1. q → p

If candidate q loses candidate p will win the election or If candidate p loses candidate q will win the election.

* 1. ￢q →￢p

If candidate q loses and candidate p loses both wins.

* 1. ￢p →￢q

If candidate p loses and candidate q loses both wins.

* 1. p ↔ q

Candidate p won and candidate q also won OR Both candidate q and p lost.

1. **Given the following propositions**

P: 2 + 2 equals 4 | TRUE

Q: 2 x 3 equals 7 | FALSE

R: 4 is greater than or equal to 3 (4 **≥** 3) | TRUE

State the truth values of the following compound propositions:

* 1. P∨R | TRUE
  2. P⊕R | FALSE
  3. Q∧R | FALSE
  4. P→Q | FALSE
  5. Q→R | TRUE
  6. Q↔R | FALSE
  7. P→(Q⊕R) | TRUE

h) (R⊕R)⊕ R | TRUE

i) P↔(P⊕(¬ P)) | FALSE

1. **Construct a truth table for each of the following compound propositions:**
   1. P→(¬P)

|  |  |  |
| --- | --- | --- |
| **p** | **¬p** | **p→(¬p)** |
| FALSE | TRUE | TRUE |
| TRUE | FALSE | FALSE |

* 1. (P ∧ Q) →(P ∨ Q)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **p∧q** | **p∨q** | **(p∧q)→(p∨q)** |
| FALSE | FALSE | FALSE | FALSE | TRUE |
| FALSE | TRUE | FALSE | TRUE | TRUE |
| TRUE | FALSE | FALSE | TRUE | TRUE |
| TRUE | TRUE | TRUE | TRUE | TRUE |

* 1. (Q → (¬P )) ↔(P ↔ Q)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **q** | **p** | **¬p** | **p↔q** | **q→(¬p)** | **(q→(¬p))↔(p↔q)** |
| FALSE | FALSE | TRUE | TRUE | TRUE | TRUE |
| FALSE | TRUE | FALSE | FALSE | TRUE | FALSE |
| TRUE | FALSE | TRUE | FALSE | TRUE | FALSE |
| TRUE | TRUE | FALSE | TRUE | FALSE | FALSE |

1. **Which of the following expressions are (well-formed) formulae in propositional logic.**

a) (P→ (Q ∨ R)) | Well formed

b) (P →((Q ∨ R)) | Not Well formed

c) (P →(Q ⊕ True)) | Well formed

d) (False → True) | Well formed

e) ((¬ P) → (¬)) | Well formed

f) ((¬ True)=False) | Not well formed

d) ( P ↔ Q ) ⊕ ((¬P ) ↔ ( ¬R ) ) | Well formed