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Homework Assignment #1

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**SECTION 1.1**:

2.

a) Not a proposition

b) Not a proposition

c) T, F

d) Not a proposition

e) T, F

f) Not a proposition

3.

a) Mei does not have an MP3 player

b) There is pollution in New Jersey

c) 2 + 1 does not equal 3

d) The summer in Main is not hot and not sunny

4.

a) Jennifer and Teja are not friends

b) There are not 13 items in a baker’s dozen

c) Abby did not send more than 100 text messages every day

d) 121 is not a perfect square

5.

a) Steve has less than 100 GB free disk space on his laptop

b) Zach doesn’t block e-mails and texts from Jennifer

c) 7 \* 11 \* 13 does not equal 999

d) Diane did not ride her bicycle 100 miles on Sunday

8.

a) I did not buy a lottery ticket this week

b) I bought a lottery ticket this week **OR** Win the million-dollar jackpot

c) I bought a lottery ticket this week **IMPLIES** I won the million-dollar jackpot

d) I bought a lottery ticket this week **AND** I won the million-dollar jackpot

e) I bought a lottery ticket this week **IF AND ONLY IF** I win the million-dollar jackpot

f) I did not buy a lottery ticket this week **IMPLIES** I did not win the million-dollar jackpot

g) I did not buy a lottery ticket this week **AND** I didn’t win the million-dollar jackpot

h) I did not buy a lottery ticket this week **OR** I did not buy a lottery ticket this week **AND** win the million-dollar jackpot

12.

a) You have the flu **IMPLIES** You miss the final exam

b) You don’t miss the final **IF AND ONLY IF** You want to pass

c) You missing the final **IMPLIES** You do not pass

d) You may: Have the flu **OR** Miss the Final **OR** Pass the class

e) You having the flu **IMPLIES** you won’t pass **OR** You missing the final **IMPLIES** you won’t pass

f) You have the flu **AND** Miss the final **OR** Not miss the final **AND** pass

28.

a)

Converse: If I stay home then it will snow tonight

Contrapositive: If I don’t stay home then it will not snow tonight

Inverse: If it doesn’t snow tonight, then I will not stay home

b)

**q whenever, p.**

**p -> q = It is a sunny summer day, implies I go to the beach**

Converse: If I go to the beach it implies, it is a sunny summer day

Contrapositive: If I don’t go to the beach implies, it is not a sunny summer day

Inverse: It is not a sunny summer day, implies I don’t go to the beach

c)

**q is necessary for p**.

**p -> q = When I sleep until noon implies, I stayed up late**

Converse: If I stay up late implies, I sleep until noon

Contrapositive: If I don’t stay up late implies, I won’t sleep until noon

Inverse: I won’t sleep until noon implies, I didn’t stay up late

34.

a) P XOR P

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | P | P or P | P and P | P xor P |
| 0  0  1  1 | **0**  **0**  **1**  **1** | **0**  **0**  **1**  **1** | **0**  **0**  **1**  **1** | **0**  **0**  **0**  **0** |

b) P XOR notP

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | -P | P or -P | P and -P | P xor -P |
| 0  0  1  1 | **1**  **1**  **0**  **0** | **1**  **1**  **1**  **1** | **0**  **0**  **0**  **0** | **1**  **1**  **1**  **1** |

c) P XOR notQ

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | -Q | P or –Q | P and –Q | P xor -Q |
| 0  0  1  1 | **0**  **1**  **0**  **1** | **1**  **0**  **1**  **0** | **1**  **0**  **1**  **1** | **0**  **0**  **1**  **0** | **1**  **0**  **0**  **1** |

d) notP XOR notQ

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | Q | -P | -Q | -P or –Q | -P and –Q | -P xor -Q |
| 0  0  1  1 | **0**  **1**  **0**  **1** | **1**  **1**  **0**  **0** | **1**  **0**  **1**  **0** | **1**  **1**  **1**  **0** | **1**  **0**  **0**  **0** | **0**  **1**  **1**  **0** |

e) (p xor q) OR (p xor –q)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | -Q | P or Q | P or –Q | P and Q | P and -Q | P xor Q | P xor -Q | (P x Q) OR (P x –Q) |
| 0  0  1  1 | **0**  **1**  **0**  **1** | **1**  **0**  **1**  **0** | **0**  **1**  **1**  **1** | **1**  **0**  **1**  **1** | **0**  **0**  **0**  **1** | **0**  **0**  **1**  **0** | **0**  **1**  **1**  **0** | **1**  **0**  **0**  **1** | **1**  **1**  **1**  **1** |

f) (p xor q) AND (p xor –q)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | -Q | P or Q | P or –Q | P and Q | P and -Q | P xor Q | P xor -Q | (P x Q) AND (P x –Q) |
| 0  0  1  1 | **0**  **1**  **0**  **1** | **1**  **0**  **1**  **0** | **0**  **1**  **1**  **1** | **1**  **0**  **1**  **1** | **0**  **0**  **0**  **1** | **0**  **0**  **1**  **0** | **0**  **1**  **1**  **0** | **1**  **0**  **0**  **1** | **0**  **0**  **0**  **0** |

**SECTION 1.3**:

16.

Show that p iff q === (p^q) V (-p^-q)

**EQUIVALENT**

|  |  |  |  |
| --- | --- | --- | --- |
| P and Q | -(P or Q) | P1 or P2 | P iff Q |
| 0  0  0  1 | **1**  **0**  **0**  **0** | **1**  **0**  **0**  **1** | **1**  **0**  **0**  **1** |

18.

Show that p -> q === -q -> -p

**EQUIVALENT**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | Q | -P | P -> Q | Q V -P |
| 1  1  0  0 | **1**  **0**  **1**  **0** | **0**  **0**  **1**  **1** | **1**  **0**  **1**  **1** | **1**  **0**  **1**  **1** |

20.

Show that not(p xor q) === p iff q

(P xor Q) from problem 34.e. (P iff Q) from problem 16

**EQUIVALENT**

|  |  |  |
| --- | --- | --- |
| P xor Q | -(P xor Q) | P iff Q |
| 0  1  1  0 | **1**  **0**  **0**  **1** | **1**  **0**  **0**  **1** |

**SECTION 1.4**:

11.

a) True

b) True

c) True

d) False

e) True

f) False

12.

a) True

b) True

c) False

d) True

e) False

f) True

g) False

42.

a) AxP(x)

b) AxP(x) -> Q(x)

c) P(x) -> Q(x)

d) ExP(x) -> Q(100<x<500) AND R(x)­

**SECTION 1.5**:

10.

a) ∀x F(x,Fred)

b) ∃y F(Evelyn,y)

c) ∀x∃y F(x,y)

d) ¬∃x∀y F(x,y)

e) ∃x ∀y F(x,y)

f) –∃x F(x, Fred **AND** Jerry)

g) ∃y∃z F((Nancy, y != z **AND** F(y) **AND** F(z)) **AND** (∀a(F(a) -> (a = y **OR** a = y))

h) ∀y F(1,y)

i) –∃x F(x, himself **OR** herself)

j) ∃x F(x, y) ↔ y != (himself **OR** herself)

**SECTION 1.6:**

16.

a) True, if everybody has lived and Mia doesn’t, she doesn’t attend university

b) False, statement is too specific to determine whether Isaac’s car is fun

c) False, Eight Men Out isn’t necessarily an action movie

d) True, Hamilton is a lobsterman, therefore he must have set a dozen traps

• A detective is tasked with determining whether proposition A is true or false. Given three other propositions B, C, D, the detective determines that B =⇒ A ∨ C is true, and that B xor D is true, and D ⇐⇒ C is true. If the detective determines that D is true, what can she conclude about A? If the detective determines that D is false, what can she conclude about A?

**If D is false then C is false, Since B is true: A must be true, also B xor D is true (no conflict).**

**If D is true then C is true, Since B is true and D is true, there is a conflict with B xor D being true.**

• Can you generate possible meanings for A, B, C, D in the previous problem that make sense in context?

**A is getting a head nod**

**C is getting a hand shake**

**B is saying a greeting**

**D is reaching out your hand**

• Play a few rounds of minesweeper, as carefully and as thoughtfully as you can. Try to identify at least different three clue configurations that let you reason about whether a square is mined or safe, and identify the logical structure of the inference rule you used.

1.

If there is a number, n on a block near you there must be an adjacent or diagonal mine to that block which could include that block itself.

**There exists a mine, for all blocks adjacent to the number, including the block itself**

**∃x ∀y M(x,y): Domain Blocks adjacent to Numbered Block**

2.

**When there exists no mines on the map, you win minesweeper**

-**∃x∀y M(x,y): Domain is All Blocks**

3.

**The first square you open will never contain a bomb**

**-∃x -∀y M(x,y): Domain is first block**