1)

a) True

b) False

c) True

d) False

i) False

j) False

2)

a) Linda is older than Sanjay

b) Mei makes less money than Isabella

c) Moshe is shorter than Monica

d) Abby is poorer than Ricardo

e) Quincy is dumber than Venkat

f) Janice has less Facebook friends than Isabella

g) 2 + 1 != 3

h) The summer in Maine is cold and cloudy

i) Jennifer and Teja are enemies.

3)

a) True

b) False

c) False

d) False

4)

a) I did not buy a lottery ticket this week

b) I bought a lottery ticket this week and won the million dollar jackpot. - P AND Q

c) I won the million dollar jackpot because I bought a lottery ticket this week. – P CAUSES Q

d) I bought a lottery ticket this week or I won the million dollar jackpot. P OR Q

e) I bought a lottery ticket this week causing be to win the million dollar jackpot.

f) I did not win the million dollar jackpot because I did not buy a lottery ticket this week.

g) I did not buy a lottery ticket this week and I did not win the million dollar jackpot.

h) I did not buy a lottery ticket this week or I did buy a lottery ticket this week and won the million dollar jackpot.

5)

a) ¬p

b) p ∧ ¬q

c) p -> q

d) ¬p -> ¬q

e) lk

f) ¬p ∧ q

g) p <-> q

6)

a) r ∧ ¬p

b) ¬r∧p∧q

c) (r->q)∧p

d) ¬q∧¬p∧r

e) qV(¬rV¬p)

f) (p∧r)->¬p

7)

a) True

b) False

c) False

d) True

8)

a) False

b) False

c) False

d) False

9)

a) if you want to get promoted, then you must wash the boss’s car

b) if there is a wind from the south, then there is a spring thaw

c) if you bought the computer less than a year ago, then the warranty is good

d) if Willy cheats, then he will get caught

e) if you pay for the subscription fee, then you can access the website

f) if you know the right people, then you can get elected

g) if carol is on a boat, then she will get seasick

10) (0 – false, 1 – true)

a)

|  |  |
| --- | --- |
| p | p → ¬p |
| 0 | 1 |
| 1 | 0 |

b)

|  |  |
| --- | --- |
| p | p ↔ ¬p |
| 0 | 0 |
| 1 | 0 |

c)

|  |  |  |
| --- | --- | --- |
| p | q | p ⊕ (p ∨ q) |
| 0 | 0 | xor |
| 0 | 1 |  |
| 1 | 0 |  |
| 1 | 1 |  |

d)

|  |  |  |
| --- | --- | --- |
| p | q | (p ∨ q) → (p ∧ q) |
| 0 | 0 |  |
| 0 | 1 |  |
| 1 | 0 |  |
| 1 | 1 |  |

11)

a) OR: 111 1111 AND: 000 0000 XOR: 111 1111

b) OR: 1111 1010 AND: 0010 000 XOR: 1101 1010

c) OR: 10 0111 1001 AND: 00 0100 0000 XOR: 10 0011 1001

12)

a) 11000

b) 01010

13)

a)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| p | q | r | p V q | q V r | (p ∨ q) ∨ r | p ∨ (q ∨ r) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |

b)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| p | q | r | p ∧ q | q ∧ r | (p ∧ q) ∧ r | p ∧ (q ∧ r) |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 |

14)

a) Jan is not rich and happy

b) Carlos will not bicycle or run tomorrow

c) Mei does not walk or take the bus to class

d) Ibrahim is not smart and hard working.

15)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| p | q | r | p → q | q → r | (p → q) ∨ (p → r) | q ∨ r | p→ (q ∨ r) |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Construct Conductions in Python

1)

john = {"age":17, "money":20}

james = {"age":18, "money":16}

if john["age"] >= 18 and john["money"] >= 20:

    print("John can buy the £20 red wine")

else:

    print("John can not buy the £20 red wine")

if james["age"] >= 18 and james["money"] >= 18:

    print("James can buy the £18 red wine")

else:

    print("James can not buy the £18 red wine")

2)

john = {"age":17, "money":20}

james = {"age":18, "money":16}

if john["age"] >= 18 and john["money"] >= 20:

    print("John can buy the £20 red wine")

else:

    if not(john["age"] >= 18):

        print("John can not buy the £20 red wine since he is not old enough.")

    if not(john["money"] >= 20):

        print("John can not buy the £20 red wine since he is does not have enough money.")

if james["age"] >= 18 and james["money"] >= 18:

    print("James can buy the £18 red wine")

else:

    if not(james["age"] >= 18):

        print("James can not buy the £18 red wine since he is not old enough.")

    if not(james["money"] >= 18):

        print("James can not buy the £18 red wine since he is does not have enough money.")