

Solutions: §1.1. 2,4,6,7

2.

- a. Let J := John is telling the truth and B := Bill is telling the truth. Then the statement can be written: $(J \wedge B) \vee (\neg J \wedge \neg B)$
- b. Let F := I'll have the fish. Let C := I'll have the chicken and let M := I'll have the mashed potatoes. Then the statement can be written: $(F \vee C) \wedge \neg(F \wedge M)$.
- c. Let $D(x, y)$:= x divides y . Then the statement can be written: $D(3, 6) \wedge D(3, 9) \wedge D(3, 15)$.

4. a) and c) are well formed statements. b) is not because of the commas and d) is not because there is no connective between the two parantheses.

6. Please note, as I explained in class, there are many ways to express these logical statements in English.

- a. Either Steve is happy and George is unhappy, or George is happy and Steve is unhappy.
- b. Either Steve or George is happy or unhappy.
- c. Either Steve is happy or George is happy.

7.

a. Hypotheses:

- 1. Jane and Pete won't both win the math prize.
- 2. Pete will win either the math prize or the chemistry prize
- 3. Jane will win the math prize

Conclusions:

- 1. Pete will win the chemistry prize.

If we let J_M := Jane will win the math prize, P_M := Pete will win the math prize, J_C := Jane will win the chemistry prize, P_C := Pete will win the chemistry prize, then the argument looks like:

Hypotheses:

- 1. $\neg(J_M \wedge P_M)$
- 2. $P_M \vee P_C$
- 3. J_M

Conclusions:

- 1. P_C

The reasoning is, in fact, valid.

b. Hypotheses:

- 1. The main course will be either beef or fish

2. The vegetable will be either peas or corn.
3. We will not have both fish as a main course and corn as a vegetable

Conclusions:

1. We will not have both beef as a main course and peas as a vegetable.

If we let B :=The main course will be beef, F :=The main course will be fish, P :=The vegetable will be peas, C :=The vegetable will be corn, then the argument looks like:

Hypotheses:

1. $B \vee F$
2. $P \vee C$
3. $\neg(F \wedge C)$

Conclusions:

1. $\neg(B \wedge P)$

The reasoning is not valid.

c. Hypotheses:

1. Either John or Bill is telling the truth.
2. Either Sam or Bill is lying

Conclusions:

1. Either John is telling the truth or Sam is lying.

If we let J :=John is telling the truth, B :=Bill is telling the truth and S :=Sam is lying, then the argument looks like:

Hypotheses:

1. $J \vee B$
2. $\neg S \vee \neg B$

Conclusions:

1. $J \vee \neg S$

The reasoning is, in fact, valid.

d. Hypotheses:

1. Either sales will go up and the boss will be happy, or expenses will go up and the boss will be unhappy.

Conclusions:

1. Sales and expenses will not both go up.

If we let S := Sales will go up, E := Expenses will go up, and B := The boss will be happy, then the argument looks like:

Hypotheses:

1. $(S \wedge B) \vee (E \wedge \neg B)$

Conclusions:

1. $\neg(S \wedge E)$

The reasoning is not valid.