# Philosophy 240
## *Symbolic Logic*

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## Class 2: Arguments; Validity and Soundness
## (§6.1, §1.2)

# Gabriel García Márquez

## from "The Last Voyage of the Ghost Ship"

Now they're going to see who I am, he said to himself in his strong new man's voice, many years after had seen the huge ocean liner without lights and without any sound which passed by the village one night like a great uninhabitated palace, longer than the whole village and much taller than the steeple of the church, **and** it sailed by in the darkness toward the colonial city on the the other side of the bay that had been fortified against buccaneers, with its old slave port and the rotating light, whose gloomy beams transfigured the village into a lunar encampment of glowing houses and streets of volcanic deserts every fifteen seconds…

# I. Translate the following to propositional logic.

## Use A: You join me; B: I go to the movies.

1. If you join me, then I go to the movies.

2. You join me if I go to the movies.

3. You join me only if (only when) I go to the movies.

4. Your joining me is a necessary condition for my going.

5. Your joining me is a sufficient condition for my going.

6. A necessary condition of your joining me is my going.

7. A sufficient condition for your joining me is my going.

8. Your joining me entails (implies) that I go to the movies.

9. You join me given (provided, on the condition) that I go.

1. If A then B

2. If B then A

3. A only if (only when) B

4. A is necessary for B

5. A is sufficient for B

6. B is necessary for A

7. B is sufficient for A

8. A entails (implies) B

9. A given B

# Exercises

Use obvious letters to translate the following into propositional logic.

1. Alvin doesn't like sports.

2. Bert and Ernie are muppets.

3. Claudia wants to surf or snorkel.

4. Dogs bite just in case they are startled.

5. Everyone loves logic, or not.

6. If Flora wants candy, Geronimo will get her some.

7. Harold is generous unless his wife is listening.

8. Toyota opens a new plant only if Honda initiates an ad campaign.

# Formation rules for wffs

1. A single capital English letter is a wff.

2. If α is a wff, so is ~α.

3. If α and β are wffs, then so are:
   (α · β)
   (α ∨ β)
   (α ⊃ β)
   (α ≡ β)
   ‣ By convention, you may drop the outermost brackets.

4. These are the only ways to make wffs.

# Exercises

Are the following formulas wffs?
If so, which connective is the main connective?

1. (P ∨ Q) ⊃ ~R
2. ~X(Y ∨ Z)
3. (S ∨ T · U) ⊃ S
4. ~(G ⊃ H)
5. ~{(P ⊃ Q) · [P ≡ ~(Q ∨ R)]}
6. ~[A · (B ∨ C)] ≡ [(A · B) ∨ (A · C)]
7. [(D · E) ∨ F] · G

# Exercises

## Translate these sentences into propositional logic, using obvious letters

1. Ford introduces a new model and either Chrysler raises prices or General Motors changes colors.

2. Both Toyota does not open a new plant and Ford does not introduce a new model.

3. Honda initiates an ad campaign if and only if Chrysler raises prices.

4. Either Saab increases salaries and Toyota opens a new plant or Honda initiates an ad campaign and General Motors changes colors.

5. Toyota's opening a new plant is a necessary condition for General Motors' changing colors, and Ford's introducing a new model is a sufficient condition for Chrysler's raising prices.

6. If Saab increases salaries, then if Toyota opens a new plant, then Honda initiates an ad campaign.

7. Audi lays off workers; however, if Chrysler raises prices then either General Motors does not change colors or Ford does not introduce a new model.

# Translation from Logic to English

A: Bob owns an Audi
B: Bob owns a BMW
C: Bob owns a car
D: Bob drives
E: Ethel owns a BMW
F: Fred owns a BMW

B · ~(E ∨ F)

D ≡ C

# Exercises

A: Bob owns an Audi
B: Bob owns a BMW
C: Bob owns a car
D: Bob drives
E: Ethel owns a BMW
F: Fred owns a BMW

1. C ⊃ (A ∨ B)

2. E · ~F

3. ~A ⊃ (~D ∨ B)

4. ~ (A ∨ B) ⊃ ~C

5. ~(A · B) · C

6. (F · E) ≡ ~B