Section 1.1

Arguments:

I'm American or Brazilian
I'm Brazilian or bad at soccer
I'm not Brazilian

Therefore, I am American and bad at soccer

The argument is valid, as if the premises are true, the conclusion is *necessarily* true.

I'm American or Brazilian
I'm Brazilian or bad at soccer
I'm not American

Therefore, I am Brazilian and good at soccer

The argument is NOT valid, as if I am a Brazilian bad at soccer, then the premises are true, but the conclusion is false.

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Statement: A sentence that is either true or false. (The "elements" of formal logic.)

Variables: We can use variables to represent statements. For instance, $P =$ I'm American.

Logical Operations/Connective Symbols:

- **and** (conjunction): $\wedge$
- **or** (disjunction): $\vee$
- **not** (negation): $\neg$

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Analyzing Logical Forms: Translate to logical symbols.

Problem 1.1.2: "Either John and Bill are both telling the truth, or neither is."

Let

$$P = \text{John is telling the truth}$$
$$Q = \text{Bill is telling the truth}$$

Then:

$$(P \wedge Q) \vee ((\neg P) \wedge (\neg Q)).$$

Careful with parenthesis!

Also, from symbols to English (e.g., Example 1.1.3).

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Careful:

- Logical operations connect *statements*. (Not as in "you and I".)
- "but" can mean "and": "I'm Brazilian but bad at soccer" means "I'm Brazilian and I'm bad at soccer".
- "and" can mean "or": "you and I are the only ones who can win the race" means "either I will win the race or you will".
- "or" is not *exclusive*: the sentence "I'm Brazilian or I'm male" is true (for me).
- Your symbolic expression should always be *well-formed*.

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Goals: By the end of this section you should:

- be able to determine if an argument is valid or not;
- know the symbols and use of "and", "or" and "not";
- be able to translate statements from English to logical symbols and vice-versa;
- be able to determine if a logical expression is well-formed.