Logic, First Course, Winter 2020. Week 4, Section Meeting. Back to course website

Connecting multiple properties with some and all

Quantifiers are very good at capturing the truth-conditions of statements about "some" and "all" that connect two properties.

- Translation schemas
- More practice
- More than two properties
- More practice with more than two properties

Translation schemas

Here are some common translation schemas connecting two properties:

Schema	Translation	Schema Negated	Translation of Negation
Some <i>F</i> are <i>G</i>	$\exists x (Fx \land Gx)$	No F are G	$\neg (\exists x (Fx \land Gx))$
Some <i>F</i> are not <i>G</i>	$\exists x (Fx \land \neg Gx)$	No <i>F</i> are not <i>G</i>	$\neg (\exists x (Fx \land \neg Gx))$
All F are G	$\forall \ x \ (Fx \to Gx)$	Not all <i>F</i> are <i>G</i>	$\neg (\forall x (Fx \to Gx))$
All F are not G	$\forall \ x \ (Fx \to \neg Gx)$	Not all <i>F</i> are <i>G</i>	$\neg (\forall x (Fx \to Gx))$

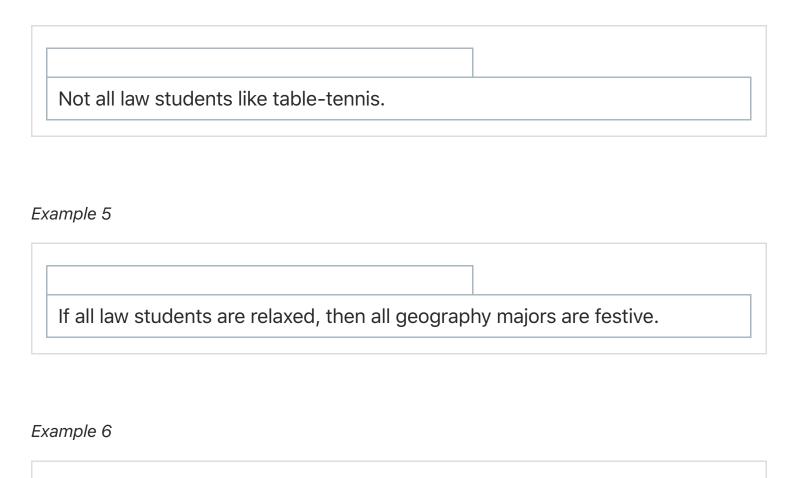
Note that in these schemas the "some"-statements are translated with an existential quantifier together with a conjunction, while the "all"-statements are translated with a universal quantifier together with an arrow statement.

Let us practice further with these translation schemas with respect to the following examples:

F = "is festive"
G = "is a geography major"
L = "is a law student"
R = "is relaxed"
T = "likes table-tennis"
Example 1
Every law student is cheerful and some geography majors are cheerful.
Example 2
n the following, remember that "but" would just be translated by "and":
Some geography majors are relaxed but no law students are relaxed.
Example 3
Some geography majors are not festive, but no law students are not festive.

Example 4

C = "is cheerful"



More practice

Let us practice with these translation schemas with respect to the following examples:

If all law students are cheerful, then some law students are festive.

C = "is clever"

F = "is fearful"

H = "is a hobbit"

L ="is an elf"

T = "is tall"

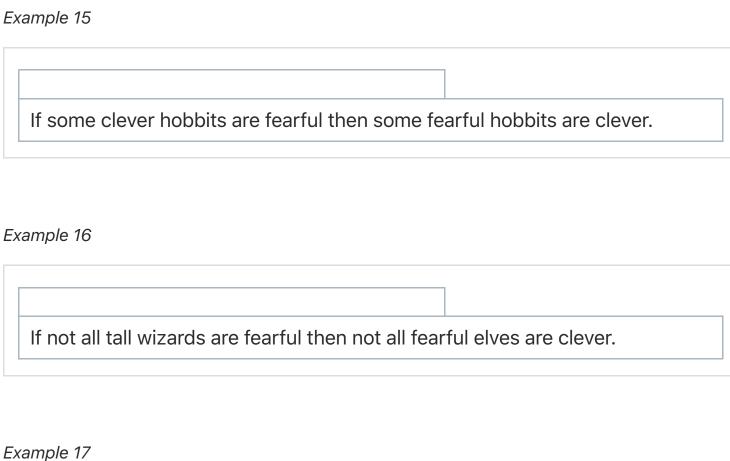
W = "is a wizard"

Example 7

Some hobbits are fearful and no elves are fearful.
Example 8
All elves are clever and not all wizards are clever.
Example 9
On this one, be sure to use parentheses to separate the two conjunctions.
All elves are tall and some wizards are tall and no hobbits are tall.
Example 10
If all elves are not fearful then some hobbit is not fearful.
<u>'</u>

Example 11

	Not all wizerds are tall and not all habbits are fearful
	Not all wizards are tall and not all hobbits are fearful.
	<i>a</i>
\	Nore than two properties
ار ۷	Te can slightly expand on this by considering how to translate statements like "tall wizard" and slever hobbit". Since to say that someone is a tall wizard is to say that they both tall and a izard, it should not be too surprising that we translate this with a conjunction. We continue to see the same key as the previous section.
Ξχ	rample 12
	All tall wizards are clever.
=)	cample 13
	Not all clever wizards are tall.
Ξχ	cample 14
	Some clever hobbits are fearful.
	Some ciever modbits are real ful.



If some clever elves are wizards, then not all clever elves are not tall.

More practice with more than two properties

Let us continue practicing with more than two properties using the key from the first section:

C = "is cheerful"

F = "is festive"

G = "is a geography major"

L = "is a law student"

R = "is relaxed"

T = "likes table-tennis"

Every cheerful law student is relaxed.			
Example 19			
If some festive law student likes table-tennis, then some festive law student is relaxed.			
Example 20			
Not all relaxed geography majors like table-tennis.			
These are section notes written for this course. ¹			
1. It is run on the Carnap software, which is←			
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