What’s a UD?

The universe of discourse (UD) allows you to restrict the domain of your discourse; i.e., to not talk about EVERYTHING.

For example...

“Some people are students”

$(\exists x)(Px \ \& \ Sx)$

Or

UD: Set of all people

$(\exists x)(Sx)$

The universe of discourse (UD) allows you to restrict the domain of your discourse; i.e., to not talk about EVERYTHING.

For example...

"Someone knows someone."

$(\exists x)(Px \& (\exists y)(Py \& Kxy))$

Or

UD: Set of all people

$(\exists x)(\exists y)(Kxy)$

When do we use a different variable?

You use a different variable if you have overlapping scopes.

For example...

UD: Set of all people

$(\exists x)(\exists y)(Kxy)$

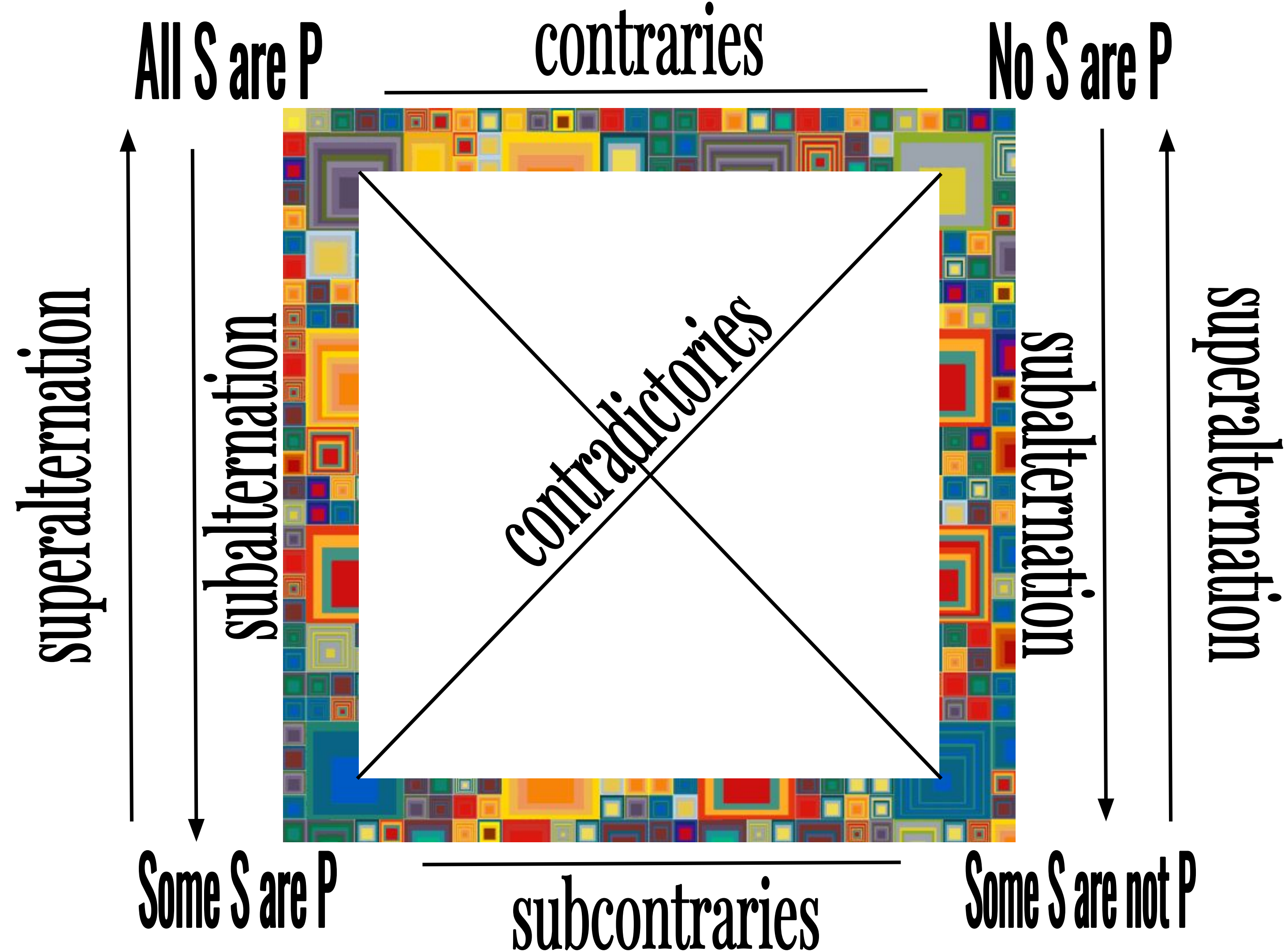
Compare with:

“Sam knows someone, and Alex knows someone.”

UD: Set of all people

$(\exists x)(Ksx) \& (\exists x)(Kax)$

What are we going to use the A-, E-, I-, and O-type sentences for?


All S are P
contraries
No S are P
superalternation
subalternation
contradictories
subalternation
superalternation
Some S are P
subcontraries
Some S are not P

The universal affirmative (A): $(\forall x)(Fx \supset Gx)$

The universal negative (E): $(\forall x)(Fx \supset \sim Gx)$

The particular affirmative (I): $(\exists x)(Fx \,\&\, Gx)$

The particular negative (O): $(\exists x)(Fx \,\&\, \sim Gx)$

Universal Affirmative

All _____ are _____.

1. Whales are mammals.
2. Any whale is a mammal.
3. A whale is a mammal.
4. Every whale is a mammal.

$$(\forall x)(Wx \supset Mx)$$

Universal Negative

No _____ are _____.

1. Whales are not reptiles.
2. A whale is not a reptile.
3. Every whale is a non-reptile.

$$(\forall x)(Wx \supset {\sim}Rx)$$

Some trees are poplars.

(∃x)(Tx & Px)

Question:

Why not (∃x)(Tx ⊃ Px)?

This reads: "There exists an x such that if x is a tree, then x is a poplar."

Existential Negative

Some _____ are not _____.

Some students are not Republicans.

$$(\exists x)(Sx \,\&\, {\sim}Rx)$$

The universal affirmative (A): $(\forall x)(Fx \supset Gx)$

The universal negative (E): $(\forall x)(Fx \supset \sim Gx)$

The particular affirmative (I): $(\exists x)(Fx \,\&\, Gx)$

The particular negative (O): $(\exists x)(Fx \,\&\, \sim Gx)$

"Everything is good" is logically equivalent to "There is nothing that is non-good."

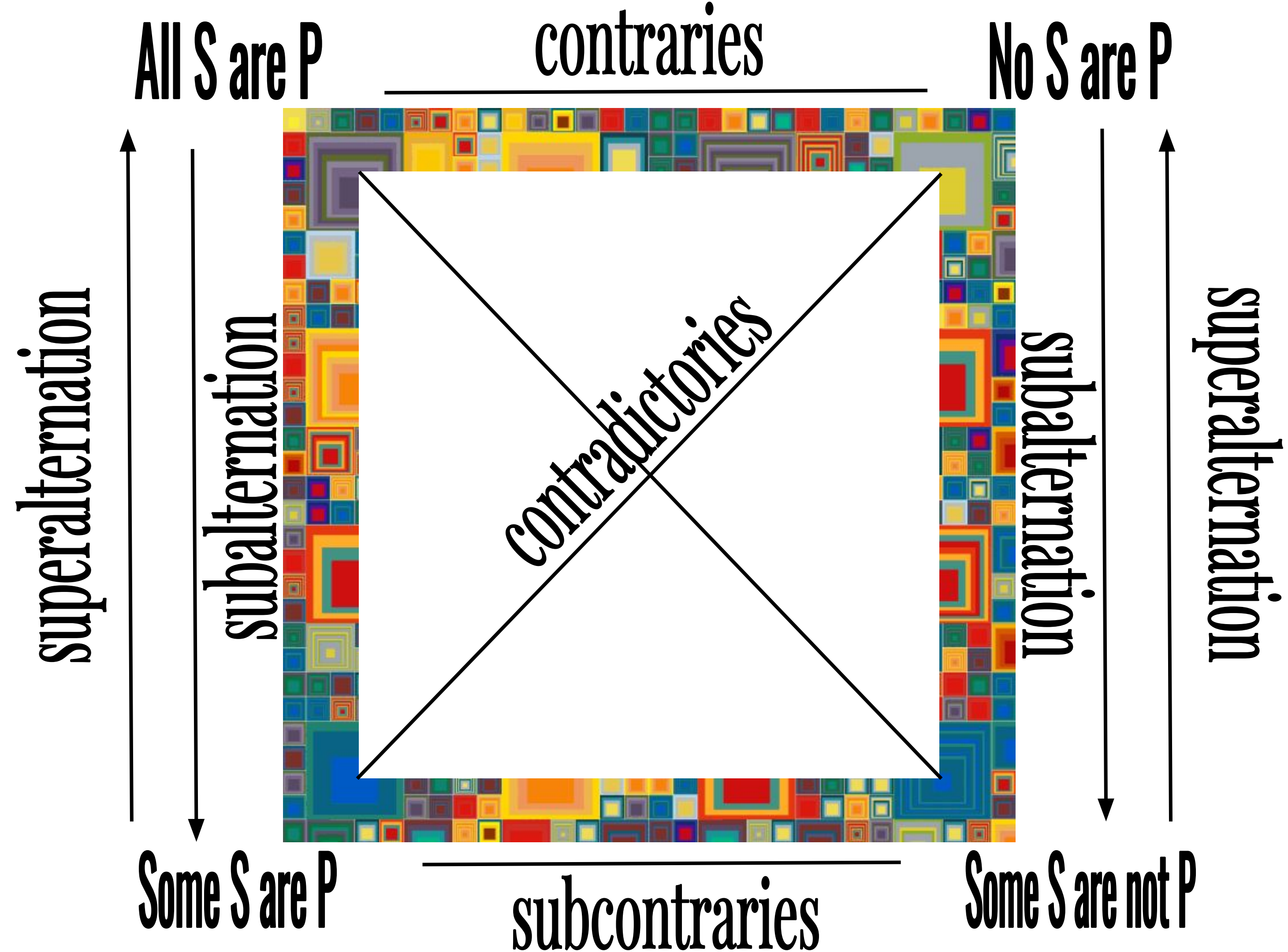
Hence, it can be symbolized in two ways:

true A-sentence

$$\forall(x)\ Gx$$

or

$$\sim\exists(x)\ \sim Gx$$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"Everything is good" is logically equivalent to "There is nothing that is non-good."

Hence, it can be symbolized in two ways:

true A-sentence

$$\forall (x)\ Gx$$

or

false O-sentence

$$\sim\exists (x)\ \sim Gx$$

Why do we sometimes translate “and” with a wedge?

Translate the following:
"Bats and rats are mammals"

$(\forall x)((Bx \vee Rx) \supset Mx)$

$(\forall x)((Bx \,\&\, Rx) \supset Mx)$

WRONG

Any trick questions?

Translate the following:
"Only teachers with certification were hired"

Paraphrase:
For all x, if x was hired, then x was a teacher and x had a certification.
$(\forall x)(Hx \supset (Tx \& Cx))$

Paraphrase:

For all x, if x was hired, then x was a teacher and x had a certification.

$(\forall x)((Tx \& Cx) \supset Hx)$

WRONG