Syllogistics II

Distribution of Terms. A term is *distributed* if it stands for every member of its extension (the extension of 'dog' are all dogs), or if it refers to all the members of the class which it denotes. Universal propositions distribute the subject term; negative propositions distribute the predicate term:

	Subject term distributed		
Predicate term not distributed	*A*: All *S* are *P*	*E*: No *S* is *P*	Predicate term distributed
	I: Some *S* are *P*	*O*: Some *S* are not *P*	
	Subject term not distributed		

Examples. A-propositions distribute the *subject* but not the predicate: 'All whales are mammals' says something about *every* whale, so all elements of the class of whales are 'covered'; but there is no claim about the class of mammals, so 'mammals' is not distributed (cf. diagrams on Handout 8).

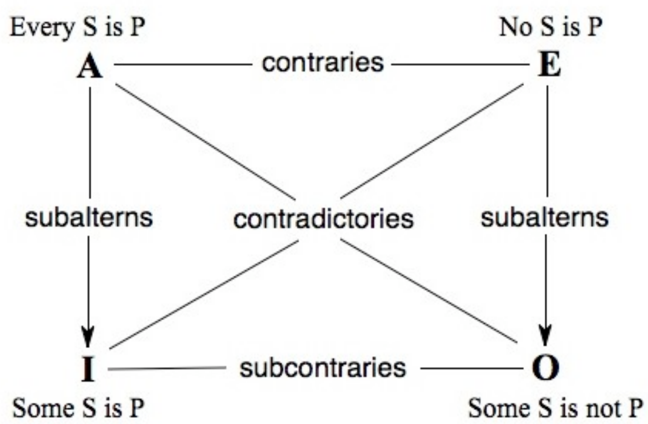
E-propositions distribute *both* subject and predicate: 'No spider is an insect' gives full 'coverage': *all* spiders are non-insects, and *all* insects are non-spiders. The class of spiders is *excluded* from the class of insects.

I-propositions distribute *neither* subject nor predicate: 'Some plants are edible' says that some plants are, and some are not, edible; and is silent about *all* edible things.

O-propositions distribute the *predicate* but not the subject: in 'Some dogs are not black', 'dogs' is not fully 'covered', but 'black' is: some dogs are excluded from the whole class of (i.e. all) black things.

Relevance. E.g., fallacy of the *Undistributed Middle*: 'Some humans are not honest. All politicians are human. Therefore, some politicians are not honest.' More later.

Square of Opposition.



Formal Equivalences:

$\sim(SaP) \dashv\vdash SoP$

$\sim(SiP) \dashv\vdash SeP$

$\sim(SeP) \dashv\vdash SiP$

$\sim(SoP) \dashv\vdash SaP$

One Step Arguments:

e.g., $\sim(SiP) \vdash SeP$, etc.

Aristotle: "I call an affirmation and a negation *contradictory* opposites, when what one signifies universally the other signifies not universally, e.g., 'every man is white' and 'not every man is white'; 'no man is white' and 'some man is white'. But I call the universal affirmation and the universal negation *contrary* opposites, e.g., 'every man is just' and 'no man is just'. So these cannot be true together, but their opposites may both be true with respect to the same thing, e.g., 'not every man is white' and 'some man is white'." (*De Interpretatione* 17b17–26)

Definitions	*In PL+*
Two propositions are *contradictory* iff they cannot both be true and they cannot both be false (never both true and never false either)	*P* or *Q* but not both or neither: *contravalence* ~(SaP ≡ SoP), ~(SiP ≡ SeP) distribution of truth values: FTTF
Two propositions are *contraries* iff they cannot both be true but could both be false	*P* or *Q* or neither but not both: *exclusion* ~(SaP & SeP) distribution of truth values: FTTT
Two propositions are *subcontraries* iff they cannot both be false but could both be true (at least one is true)	*P* or *Q* or both but not neither: *disjunction* SiP ∨ SoP distribution of truth values: TTTF
A proposition is a *subaltern* iff it must be true if its superaltern is true, and if it is false then its superaltern must be false too	If *P* then *Q*, and if ~*Q* then ~*P*: *implication* SaP ⊃ SiP, SeP ⊃ SoP, ~(SiP) ⊃ ~(SaP) (hence: SeP), ~(SoP) ⊃ ~(SeP) (hence: SiP) distribution of truth values: TFTT

More Direct Valid Arguments.

– *simple* conversion:	AiB	⊦	BiA
	AeB	⊦	BeA
– conversion by *change of quantity*:	AaB	⊦	AiB
	AeB	⊦	AoB
– conversion by *accident*: simple conversion *plus* change of quantity:	AaB	⊦	BiA
	AeB	⊦	BoA
– conversion by *obversion*: change of quality (affirmative to negative; negative to affirmative) *plus* negation of the predicate:	AaB	⊦	Ae(non-B)
	AiB	⊦	Ao(non-B)
	AeB	⊦	Aa(non-B)
	AoB	⊦	Ai(non-B)
– conversion by *contraposition*: obversion *plus* simple conversion *plus* another obversion:	AaB	⊦	(non-B)a(non-A)
	AoB	⊦	(non-B)o(non-A)

Examples. Conversio simplex: 'No politician votes' ⊦ 'No voter is a politician'. *Conversio per contrapositionem*: 'Some cats do not purr' ⊦ 'Some non-purrers are not non-cats'.