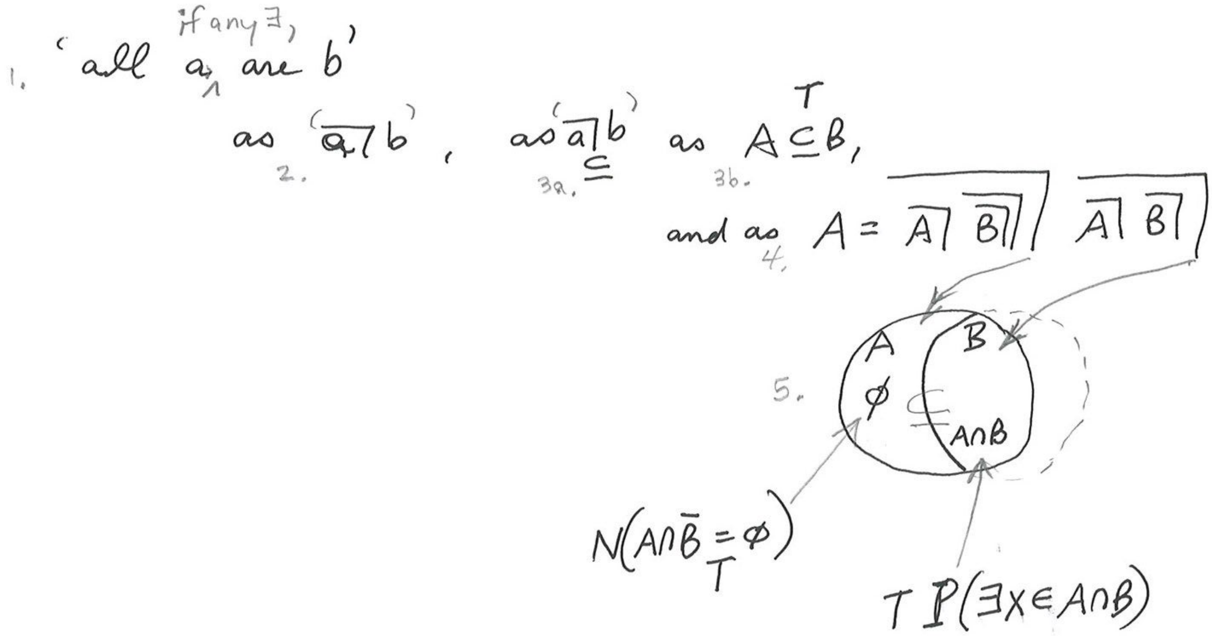
file: ‘Engstrom on 'all a are b' for LoF24’.MSWord.doc

for LoF24 Liverpool Aug.10th 2024.

Title:
'all a are b'=True in LoF.notation: separate Possible *vs*. Necessary conditions



The point of this-sequence-of-five is that I take the subset-relation A⊆B to show the “bedrock logical-matter” of 'all a are b', thereby *ignoring-for-now* G.Sp-B’s using ‘(x∈a)⊃(x∈b)’ for 'all a are b'.
I do not agree with G.Sp-B that “It is no use appealing to graphical forms such as Venn diagrams”.

I say that the universally.quantified-statement 'all a are b' has two distinct modes of “logical-matter”: one *N*ecessary and the other **P**ossible. They reside within set.A as relative-

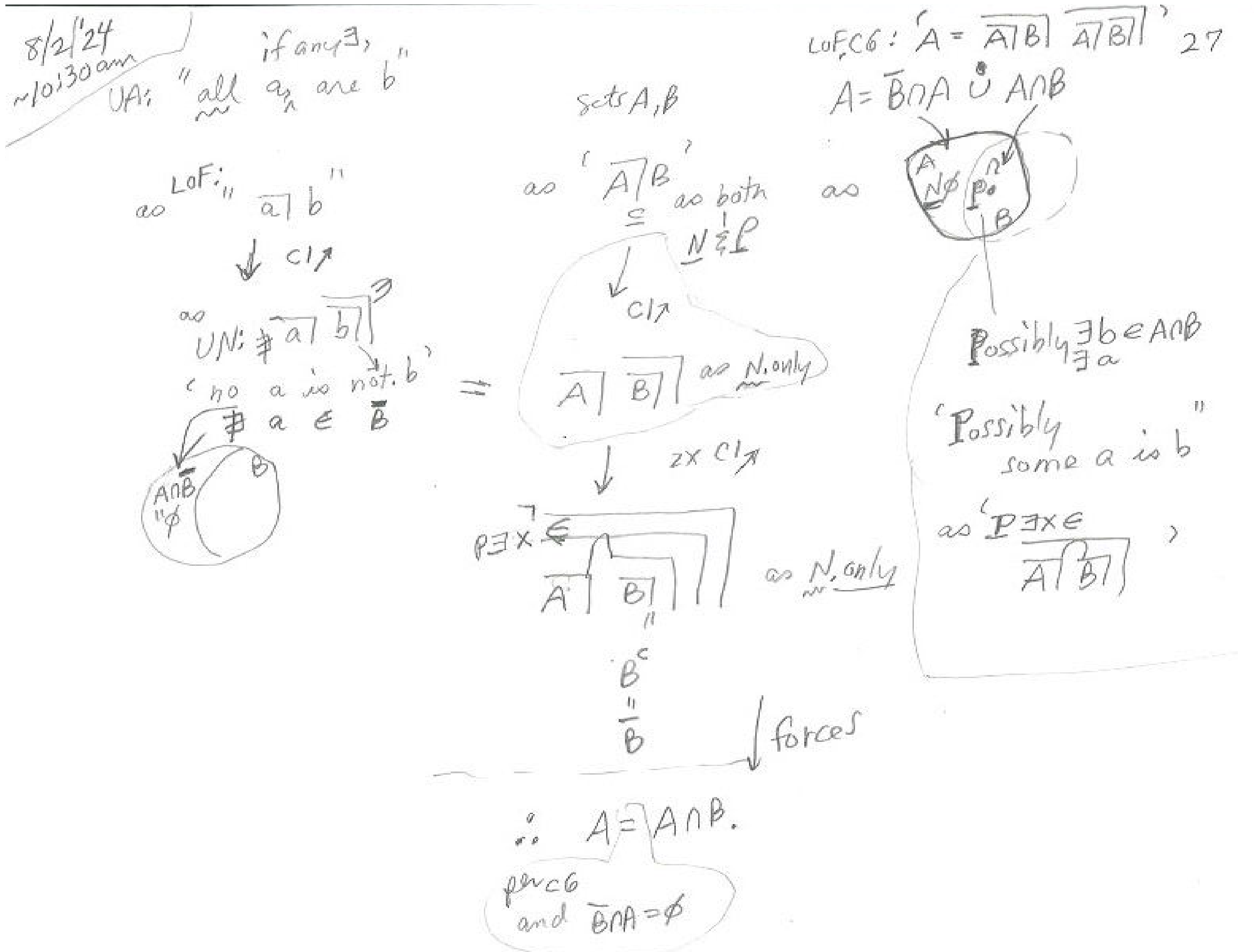
complements as presented in an "Euler diagram". I also represent the relative-complements by LoF.C6, interpreted as 'Set.A-bifurcated-by-set.B' = '(A–B).disjoint.union.(A.intersection.B)'.
I thus
identify 'the Two logical-matters of 'all a are b' within set.A
with the-relation 'set.A is a subset of set.B' = A⊆B.

My written.notation explicitly-states the modal-logic factors '<u>*N*</u>ecessarily' and '**P**ossibly',
and includes the symbols:

• T=true, F=false;
• sentences e.g. '<u>*s*</u>',
• subsets e.g. 'S', 'A', 'B'
• prefix 'n'=not=¬, which applies as negation and sometimes as complementation, e.g.
¬B=SetComplement.of.B. Also e.g. existence vs. nonexistence of a set.**member** in a subSet..
• 'ø'=empty.set
• prefix'**P**'=**P**ossible e.g. in the sentence '**P**(some.existence is member of Set S)'
• prefix'<u>*N*</u>'=<u>*Necessarily*</u>, e.g. '<u>*N*</u>(set.S=ø)'
…where '<u>*N*</u> dominates over recessive **P**=n<u>*N*</u>', i.e.: a premiss which states '<u>*N*</u>(S=ø)' ***dominates over*** another premiss which states '**P**(S=nø)'.

I assert that:
'A is a subset of B'
<u>means-that</u> (i.e. <u>is-equivalent-to</u>):
'set.A–B=A∩¬B is <u>*N*</u>*ecessarily* empty',
but 'A.intersection.B **P**ossibly-has some **member**(existence)'.
Thus, the truth of the relation 'set.A is a subset of set.B'
consists of: the hierarchy of the coupling of the TWO separate modal.truths:
'<u>*N*</u>(A∩¬B=ø =T)'
supplemented-by '**P**(some.existence is **member** of A.intersection.B) =T' .
See scan#1.

Below I will assign LoF.notation-forms to the logical matter.
In LoF Appendix2, G.Sp-B represents 'all a are b' as the LoF-expression 'a-cross b', whose LoF-graphic is shown in scan#1.
I use 'a-cross b' to denote BOTH Possible *vs*. Necessary conditions,
…but I use two LoF.C1-derived forms to denote ONLY-the.<u>*N*</u>ecessary.condition.of'all a are b'.
I show the two C1-derived LoF graphic.forms in scan#3: they are annotated with ¬,∃,∈,∩.



Stipulation: **P**.mode as initial-default:

C6: $A = \overline{\overline{A}\, B}\;\; \overline{\overline{A}\, \overline{B}}$

$\nearrow C1 \;\downarrow$

$A = \overline{\overline{A}\,\overline{B}}\;\; \overline{\overline{A}\,B}$

$A = A \cap \overline{B} \;\dot{\cup}\; A \cap B$

Now Default $\mathbb{P}$:

$\mathbb{P}\exists x \in A = \mathbb{P}\exists x \in \overline{\overline{A}\,\overline{B}} \;\dot{\cup}\; \mathbb{P}\exists x \in \overline{\overline{A}\,B}$

Now negate:

$\neg$ negate $\downarrow$

not $\overline{\mathbb{P}\exists x \in \overline{\overline{A}\,\overline{B}}}$

$\|$

$\neg \mathbb{P}\exists x \in A \cap \overline{B}$

$\|$

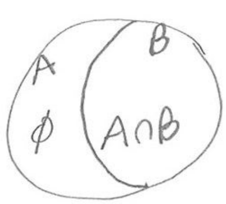
$\underset{\sim}{N} \neg\exists x \in A \cap \overline{B}$

$\|$

$A \cap \overline{B}$

$\|$

ϕ



$A = \phi \cup A \cap B$

$\downarrow$

$A = A \cap B$

For any minimal.subset 'mS, I allow, ***as initial-default***, the modal.condition '**P**(some.existence is member of mS)'.
i.e. when viewing the LoF.C6.set.expression for set.(A.intersection.B), we-need-not-state that it may have a member: this-possibility will be implicit, unless-negated.
I.e., the LoF.set.expression for set.(A.intersection.B) will-denote-that it may have a member.
I am thus using/co-opting G.Sp-B's interpretation as 'some a is b', modified to become '**P**ossibly some a is b'.

…But it will sometimes be.the.case.that this-initial.default.possibility-of-a member will become negated-by a second stipulation of no-member i.e. empty.subset.

The *Necessary*.modal.condition of the relation 'A is a subset of B' is the property: '*N*(A∩¬B=ø)'.

I represent it as a LoF.graphical.expression formed by enclosing the LoF.set.expression for A∩¬B in a cross: This is shown in scan#2.

This single cross-enclosure is interpreted as simultaneously negating at least two aspects of 'the statement: Possibly some a is not.b',
namely negating 'Possibly some a is not.b'
to: '*Necessarily* NO a is not.b' i.e. *N*(A∩¬B=emptyø).

Thus the single.cross simultaneously: negates mode **P** into *N*, negates existence of a subset.**member** into nonexistence of the subset.member, i.e. negating member to no-member, i.e. negates the cardinality of the subset from '>0' to '=0', …while preserving modal.Truth!

Summary: Using LoF.C6-interpreted-as-sets, I graphically-denote the.TwoModalConditions of 'set.A is a subset of set.B' (A⊆B) separately,
by:
• keeping the symmetrical.half as-is, interpreted as '**P**ossibly some a is b',
• BUT I modify the *a*symmetrical.half by enclosing it in a cross, interpreted as '*Necessarily* NO a is not.b', i.e. '*N*(A∩¬B=emptyø)'.

This is shown in scan#2.

We have thus articulated the logical-matter (logical-meaning) of 'all a are b' in three notations: written-symbolic-modal.sentences, Euler-diagram, and LoF-forms.

Conclusion:

I believe that much-more can be done to vindicate LoF.Appendix.2 by explicity-detailing the logical-matter that justifies Interpetive theorems 1 and 2.

Here I have merely focussed on my claim that 'all a are b' is true exactly-when A⊆B is true, which is when A∩¬B is *N*ecessarily-empty, and that existences are allowed(**P**ossible in a subset (e.g. in 'set.A-bifurcated-by-B') whenever the.subset is-not-necessarily-empty.

Thank You for your attention.

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