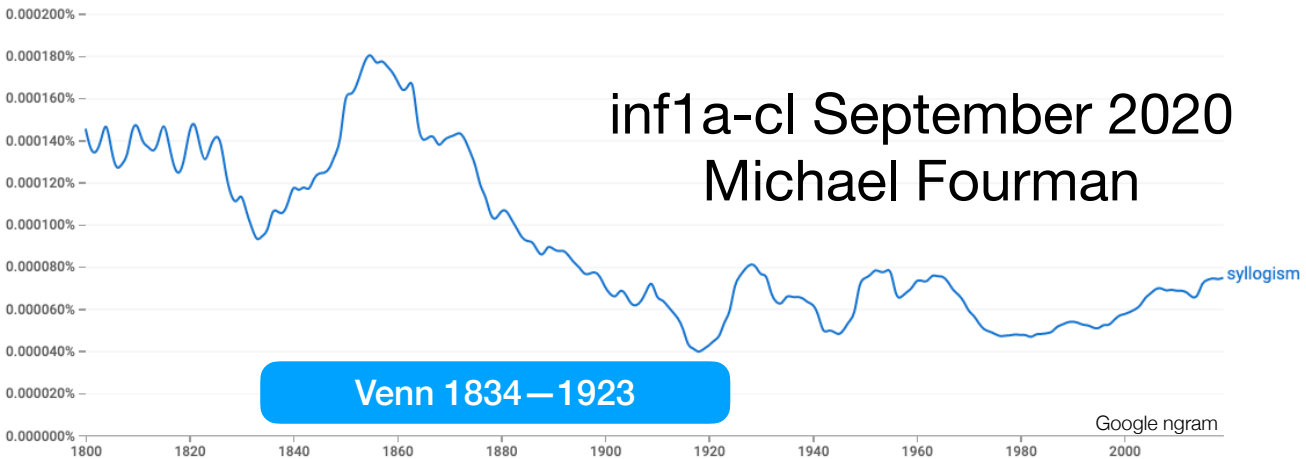


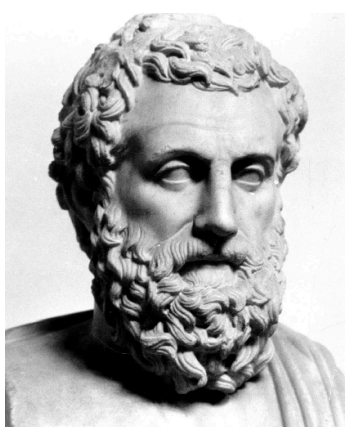
inf1a-cl September 2020
Michael Fourman

INF1A

Aristotle
to Venn

Aristotelian Syllogisms

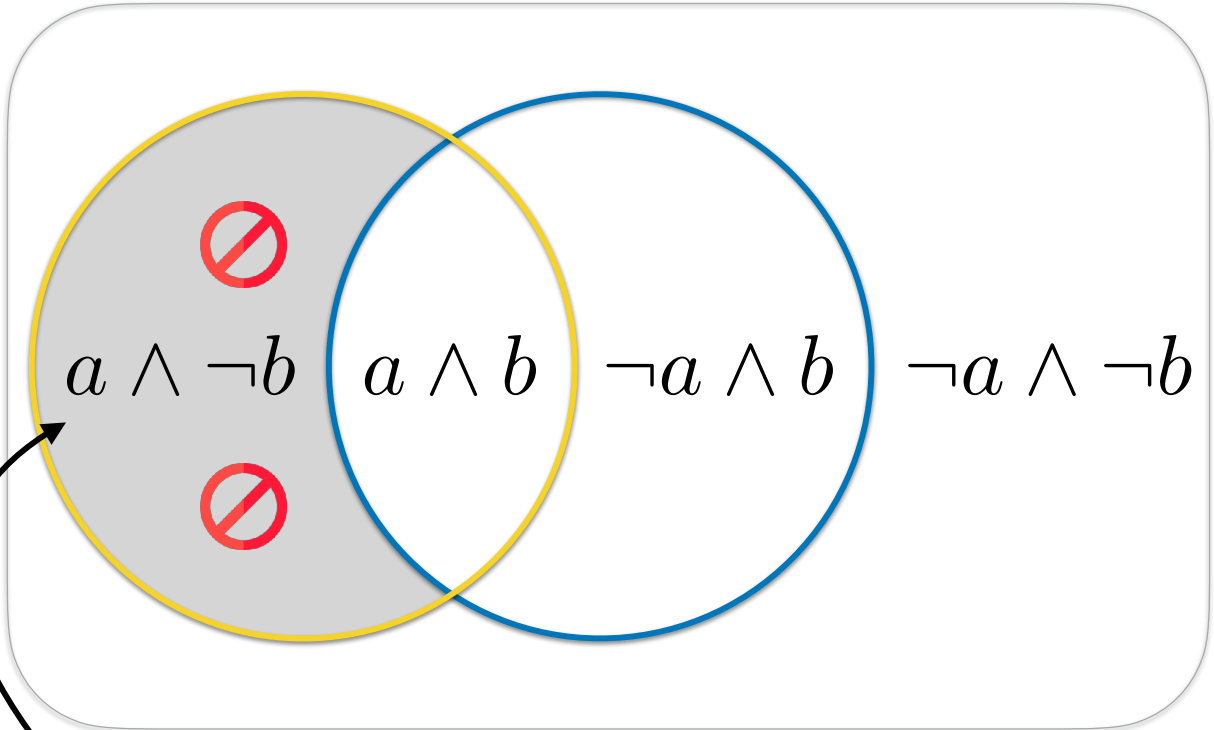
our first example



Aristotle
384-322 BC

$$\frac{a \models b \quad b \models c}{a \models c}$$

Socrates is a man
All men are mortal
∴ Socrates is mortal



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Venn interpretation

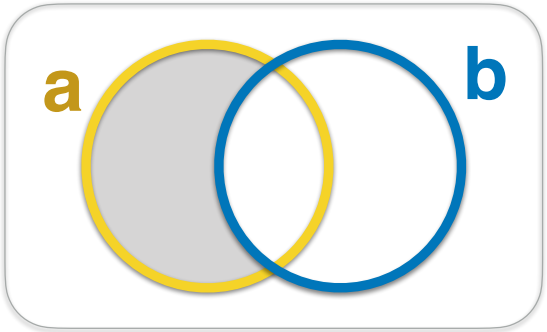
we use Venn diagrams to interpret Aristotle's propositions

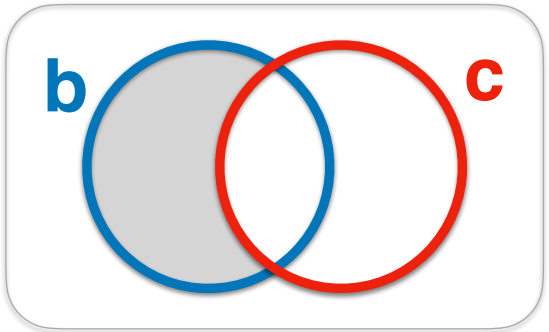
a and not **b**,
is empty:
no counterexample

$$a \models b \quad \text{iff every } a \text{ is } b$$

$$a \models b \quad \text{iff no } a \text{ is not } b$$

$$a \models b \quad \text{iff no individual is } a \text{ and not } b$$





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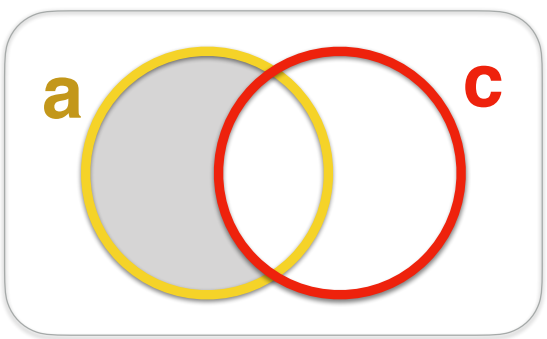
syllogism

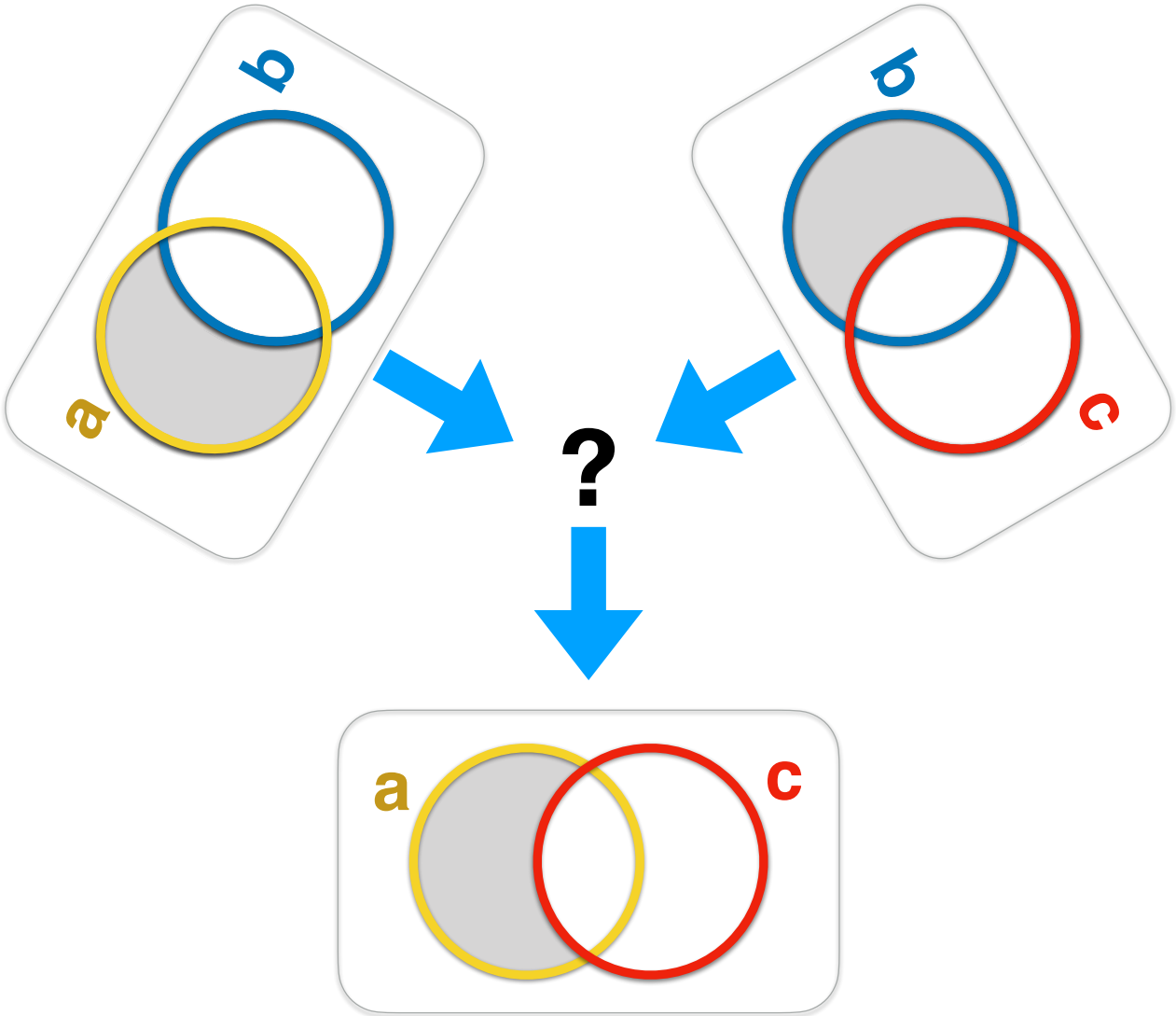
every **a** is **b** every **b** is **c**

---

every **a** is **c**



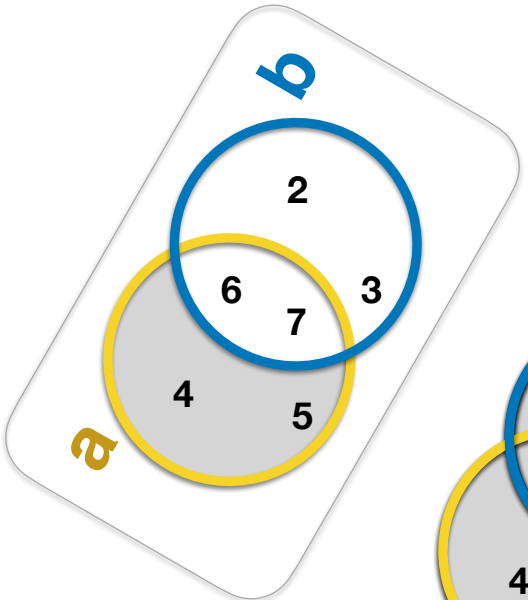
$$\frac{a \models b \quad b \models c}{a \models c}$$

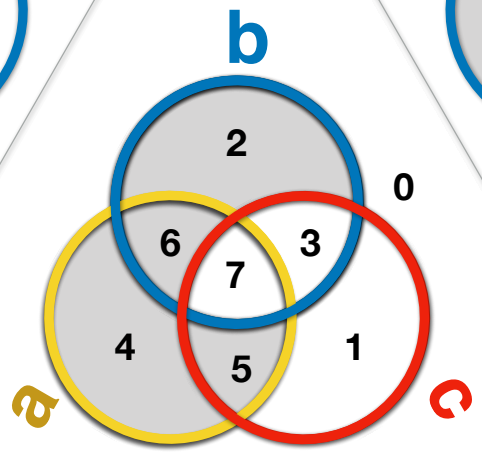


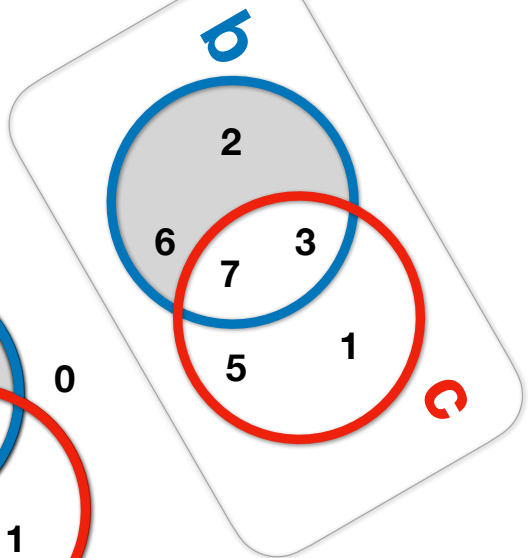
INF1A

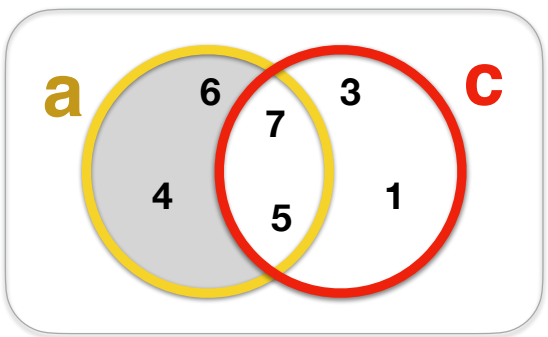
syllogism

$$\frac{a \models b \quad b \models c}{a \models c}$$









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syllogism

4,5 empty 2,6 empty

$$\frac{a \models b \quad b \models c}{a \models c}$$

4,6 empty

barbara $\dfrac{a \vDash b \quad b \vDash c}{a \vDash c}$

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soundness

We say this rule is ***sound*** - **which means:**

for ***any predicates,*** a b c, in ***any universe,***

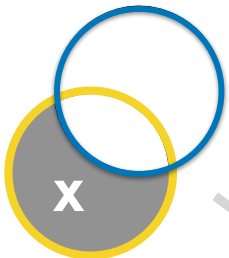
if the ***premises***, above the line, are **valid**

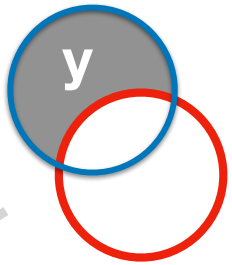
then the ***conclusion***, below the line, is ***valid***.

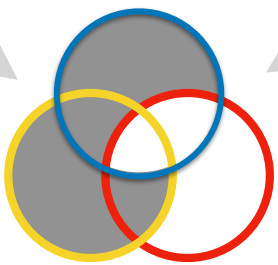
every **a** is **b**

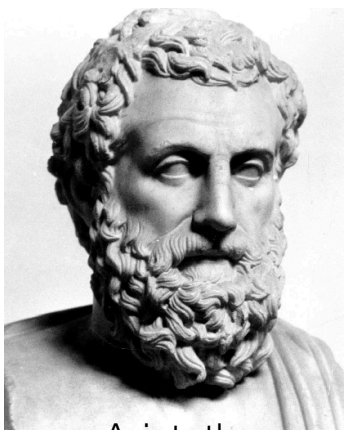
every **b** is **c**

syllogism
in barbara

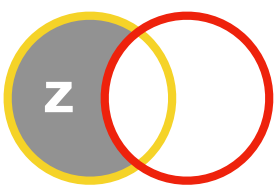








Aristotle
384-322 BC



every **a** is **c**

$$\mathbf{z} \subseteq \mathbf{x} \cup \mathbf{y}$$

$$\frac{a \models b \quad b \models c}{a \models c}$$

Socrates is a man
All men are mortal
∴ Socrates is mortal

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syllogism