

PHI 103 - Introduction
Lecture 4

A Brief Overview of
Induction and Deduction

The Two Branches of Logic

Argument - *at least two statements where one provides logical support for the other.*

- I. **Formal Logic: Deduction** - *a conclusion follows necessarily from the premise(s)*
 - A. **Aristotelian / Term Logic** - the logical relationships between categorical propositions and their terms
 - B. **Propositional / Sentential Logic** - the logical relationships between natural language propositions
 - C. **Predicate Logic** - the logical relationship between quantifiable variables ("existential" and "universal")
 - D. **Modal Logic** - the logical relationship between modally modified propositions ("contingent" and "necessary")

The Two Branches of Logic

II. **Informal: Induction** - *a conclusion follows with a degree of probability from the premise(s)*

A. Arguments from **Analogy**

B. Arguments from **Authority**

C. Arguments about **Causation**

D. Arguments about **Probability**

E. Arguments about **Generalization / Statistical**

F. Arguments from **Signs**

The Two Branches of Logic

III. **Evaluating Arguments** - what makes an argument **good** or **bad**?

A. **Deductive Arguments** - a conclusion follows *necessarily* from the premise(s)

1. **Valid** - the **form** of the argument is correct (*if the premises are assumed to be true, then the conclusion cannot be false*)

Valid Arguments

P1) All mammals have lungs.^T

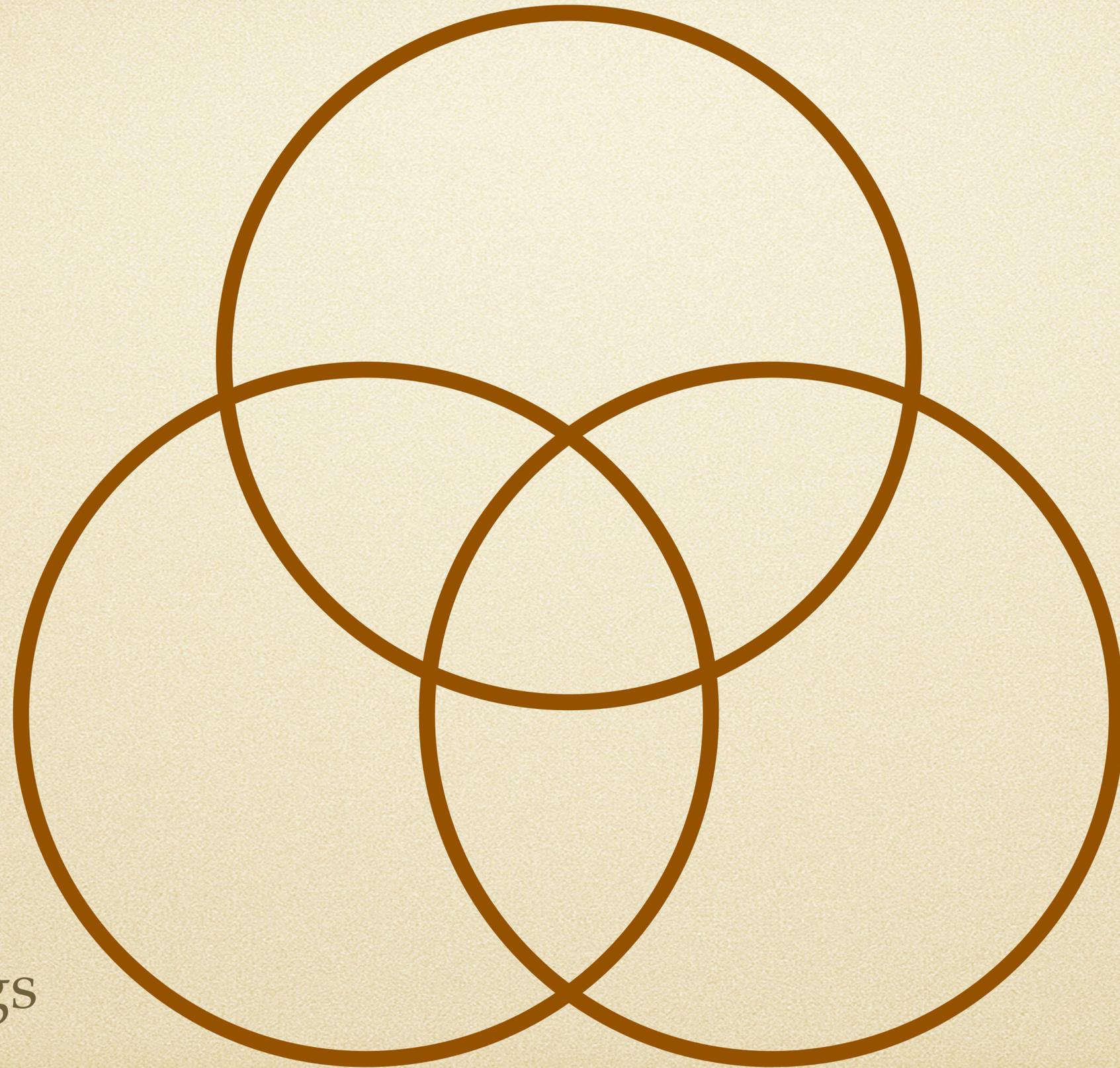
P2) All dogs are mammals.^T

C) *Therefore*, all dogs have lungs.^T

The conclusion follows *necessarily* from the premises.

If P1 and P2 are true, *then* C **must** be true (i.e., the conjunction of P1 and P2 is *sufficient* to bring about C).

mammals



dogs

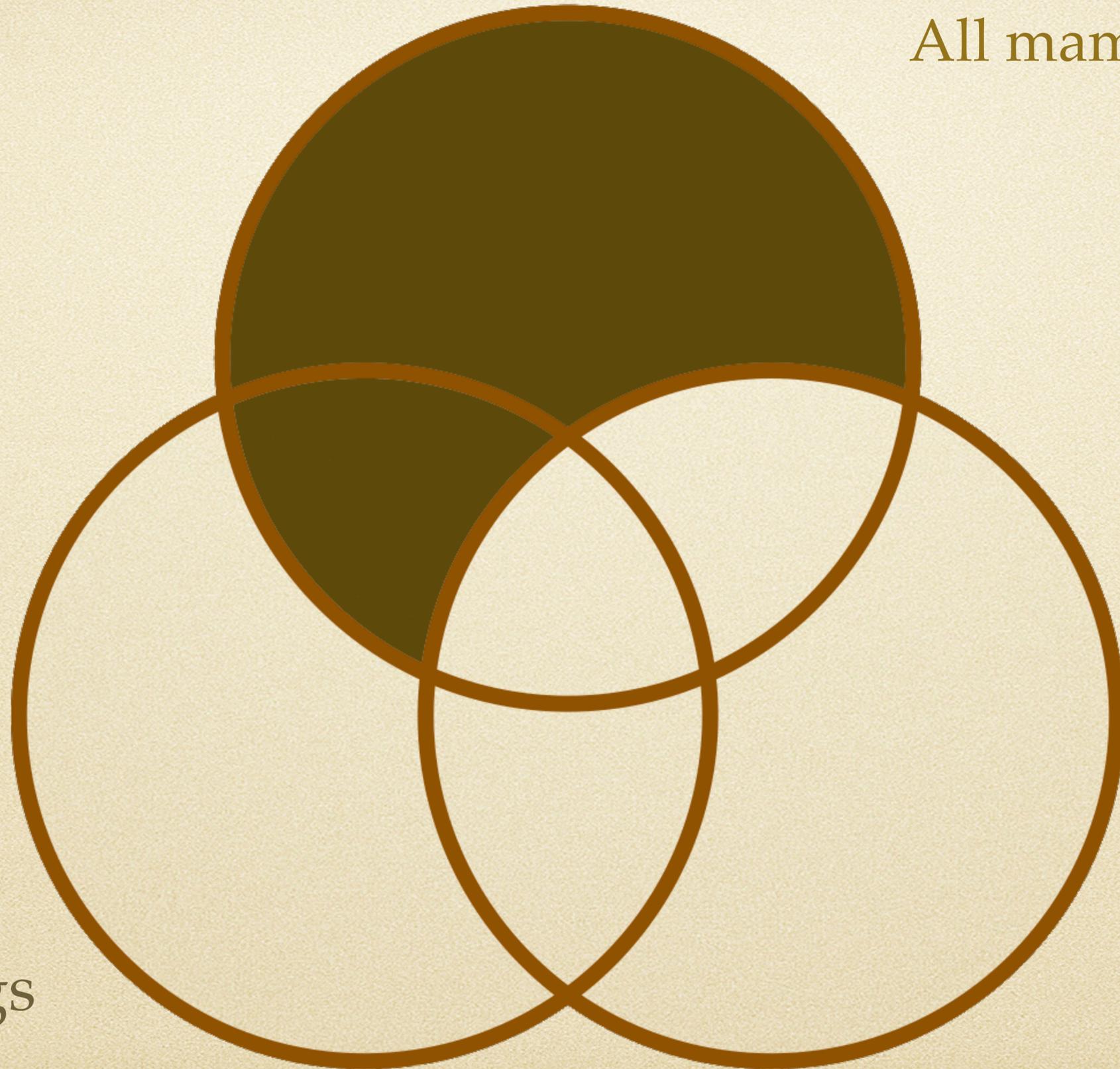
lunged things

mammals

All mammals have lungs. ✓

dogs

lunged things



mammals

All mammals have lungs. ✓
All dogs are mammals. ✓

dogs

lunged things

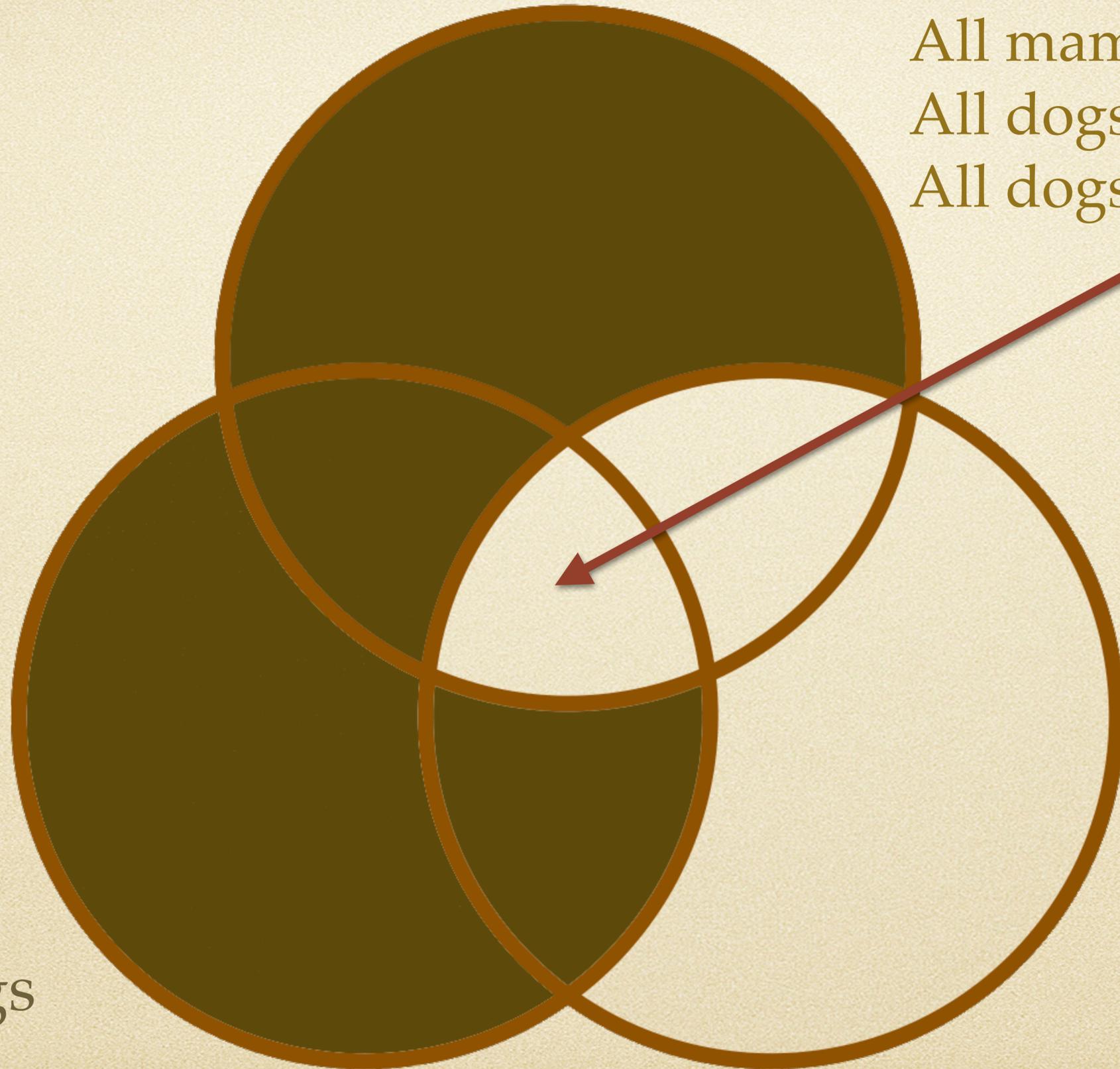


mammals

All mammals have lungs. ✓
All dogs are mammals. ✓
All dogs have lungs. ✓

dogs

lunged things



Valid Arguments

P1) All tailed animals have wings. **F**

P2) All dogs have tails. **F**

C) ?

Does anything follow from *false* premises???

Suppose we *assume* the premises were true.

Valid Arguments

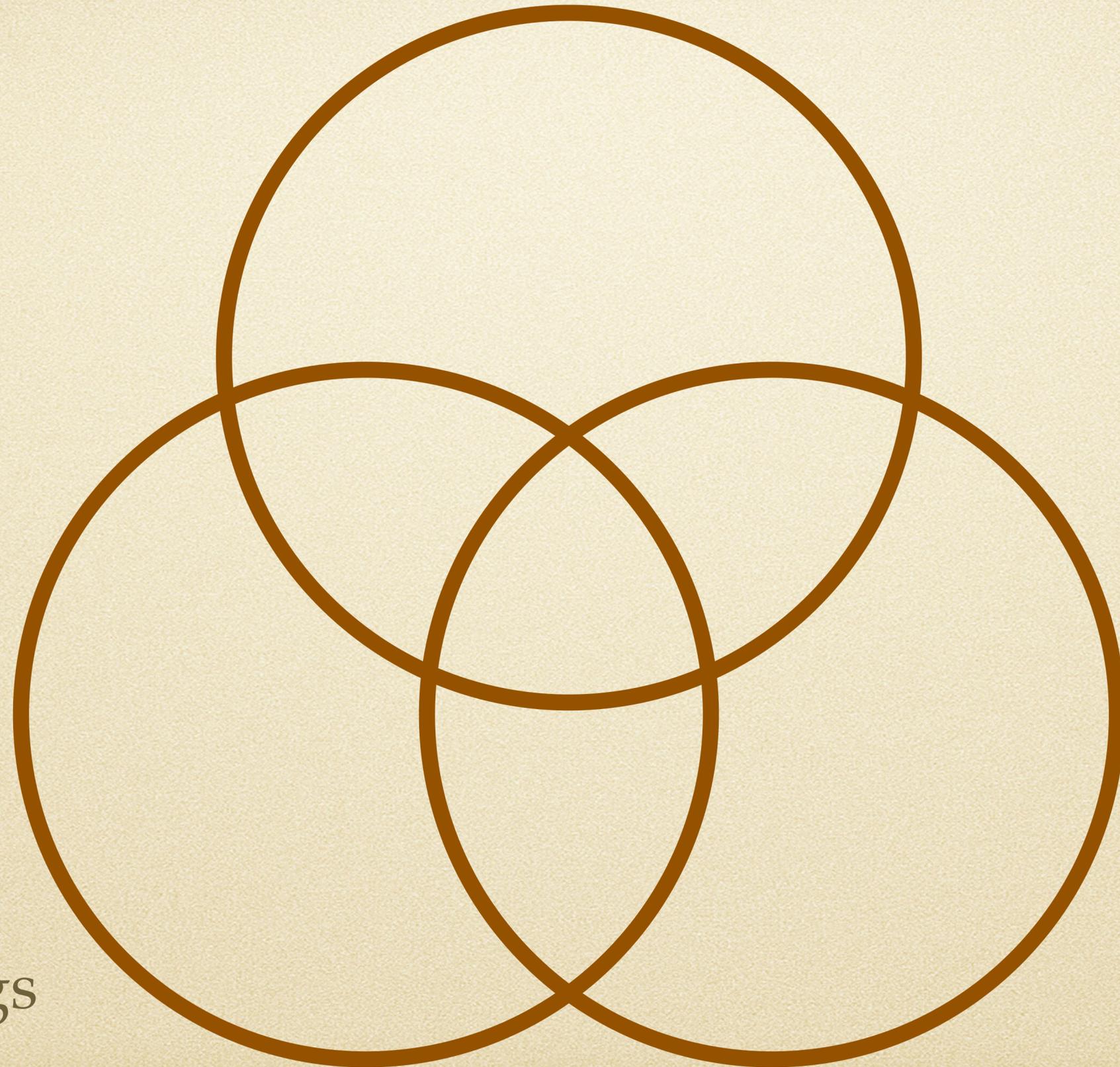
P1) All tailed animals have wings. (**T**)

P2) All dogs have tails. (**T**)

C) *Therefore*, all dogs have wings.

The conclusion *would* follow necessarily, ***if we assume*** the premises are true.

tailed animals



dogs

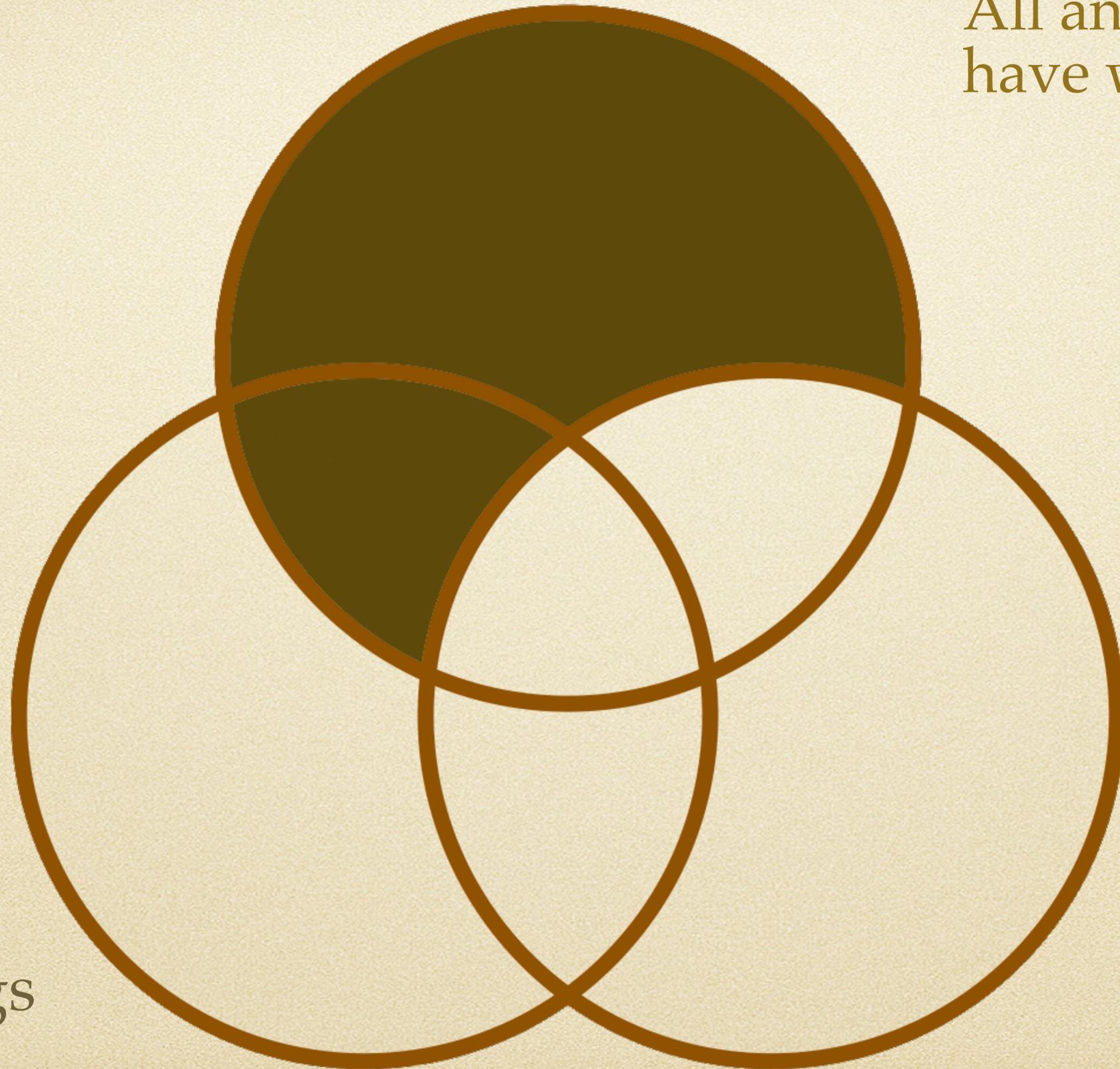
winged things

tailed animals

All animals with tales
have wings. ✓

dogs

winged things



tailed animals

All animals with tales
have wings. ✓

All dogs have tales. ✓

dogs

winged things



tailed animals

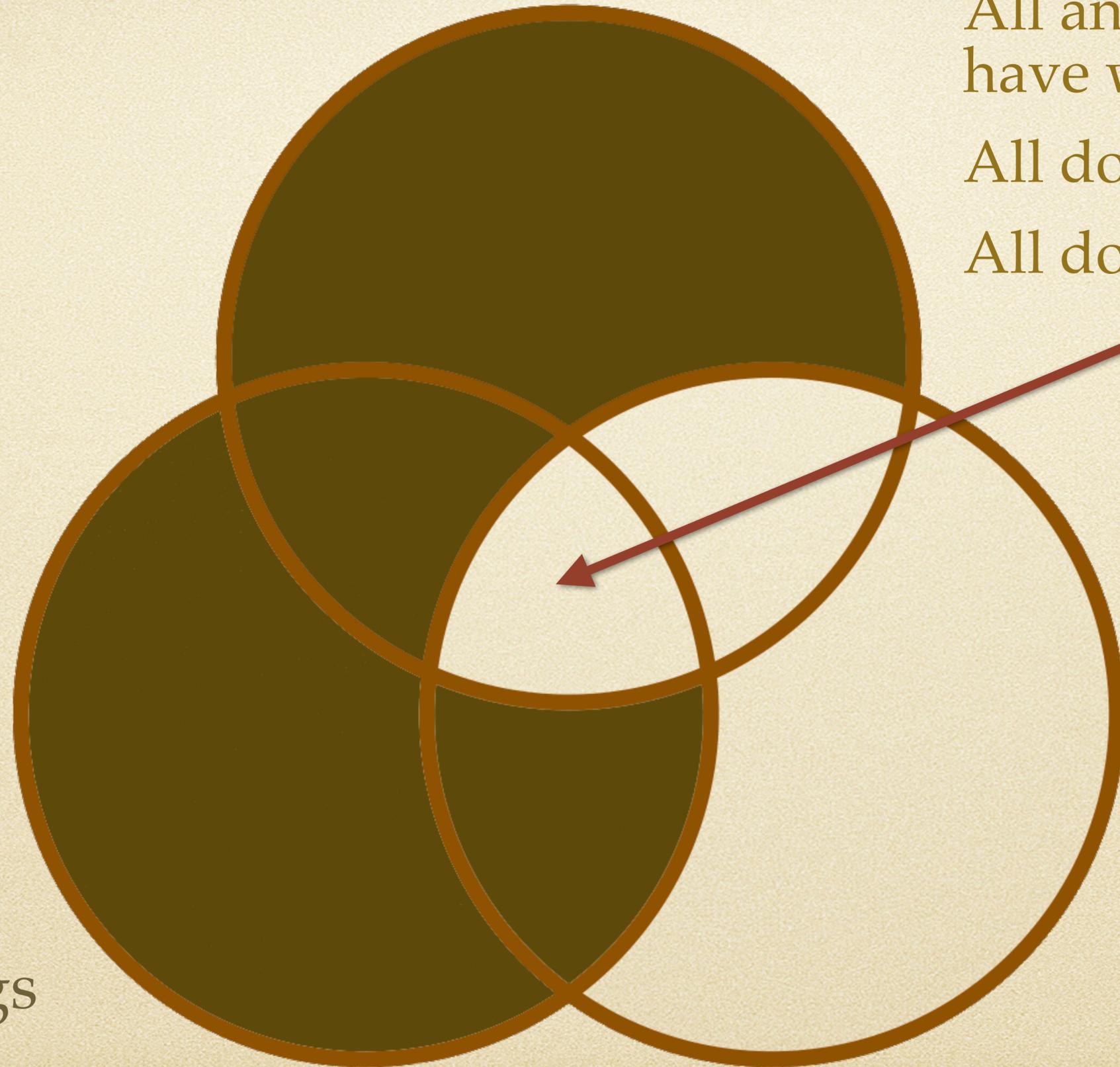
All animals with tales
have wings. ✓

All dogs have tales. ✓

All dogs have wings. ✓

dogs

winged things



Valid Arguments

P1) All dogs are mammals. ^T

P2) All cats are mammals. ^T

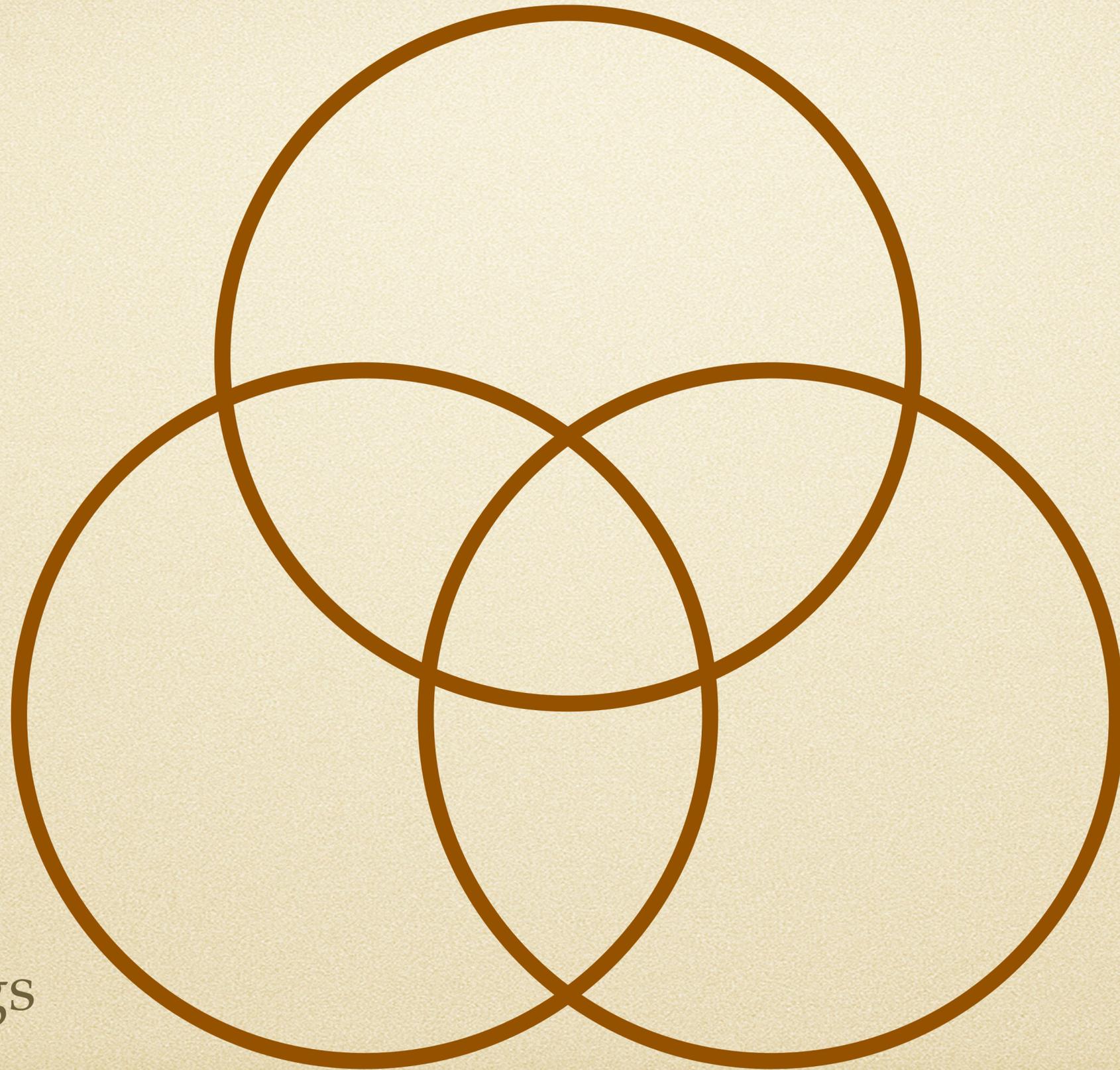
C) *Therefore*, all dogs are cats. ^F

This conclusion *does not follow* necessarily, *even though* the premises *are* true.

mammals

dogs

cats

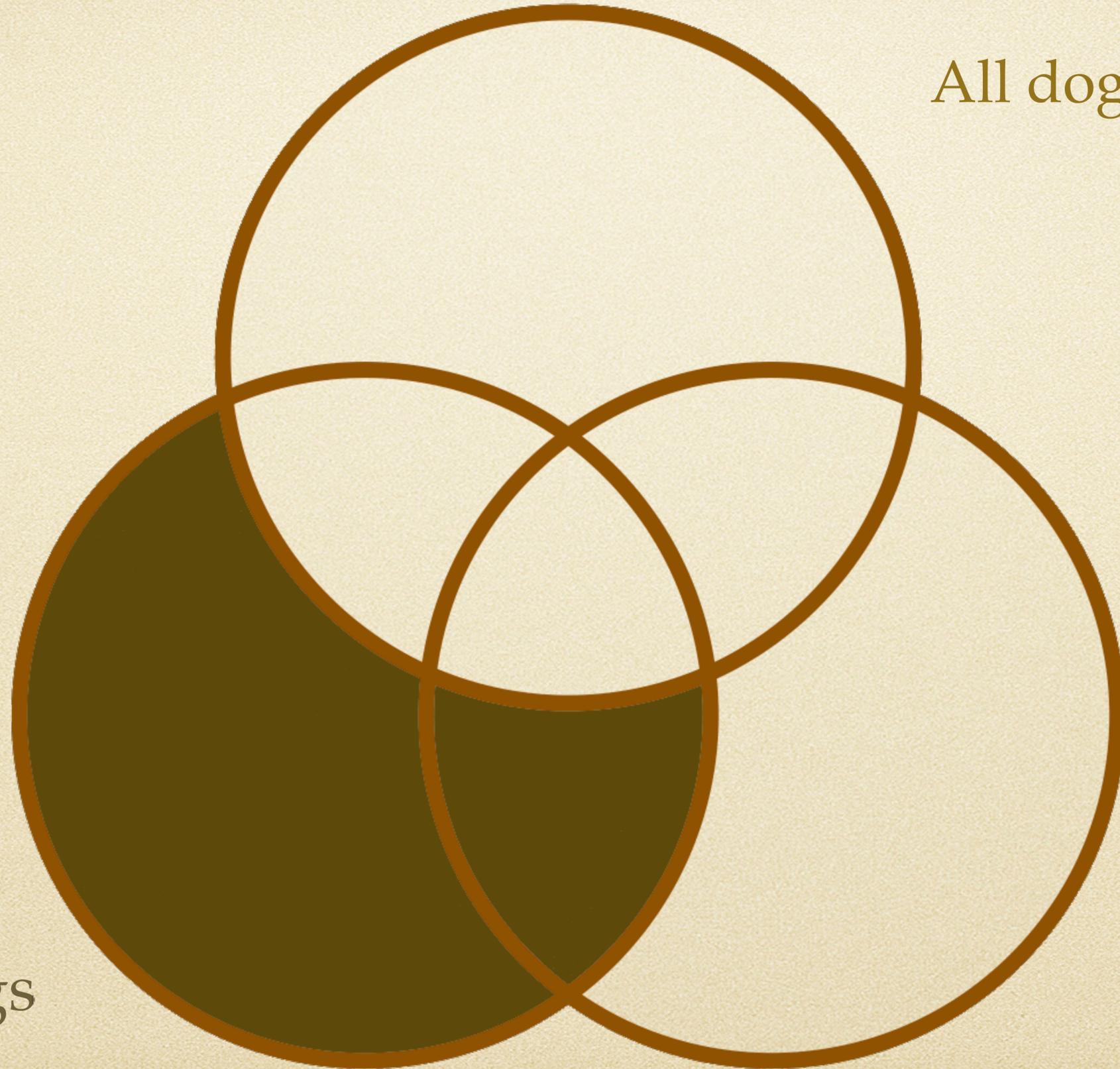


mammals

All dogs are mammals. ✓

dogs

cats

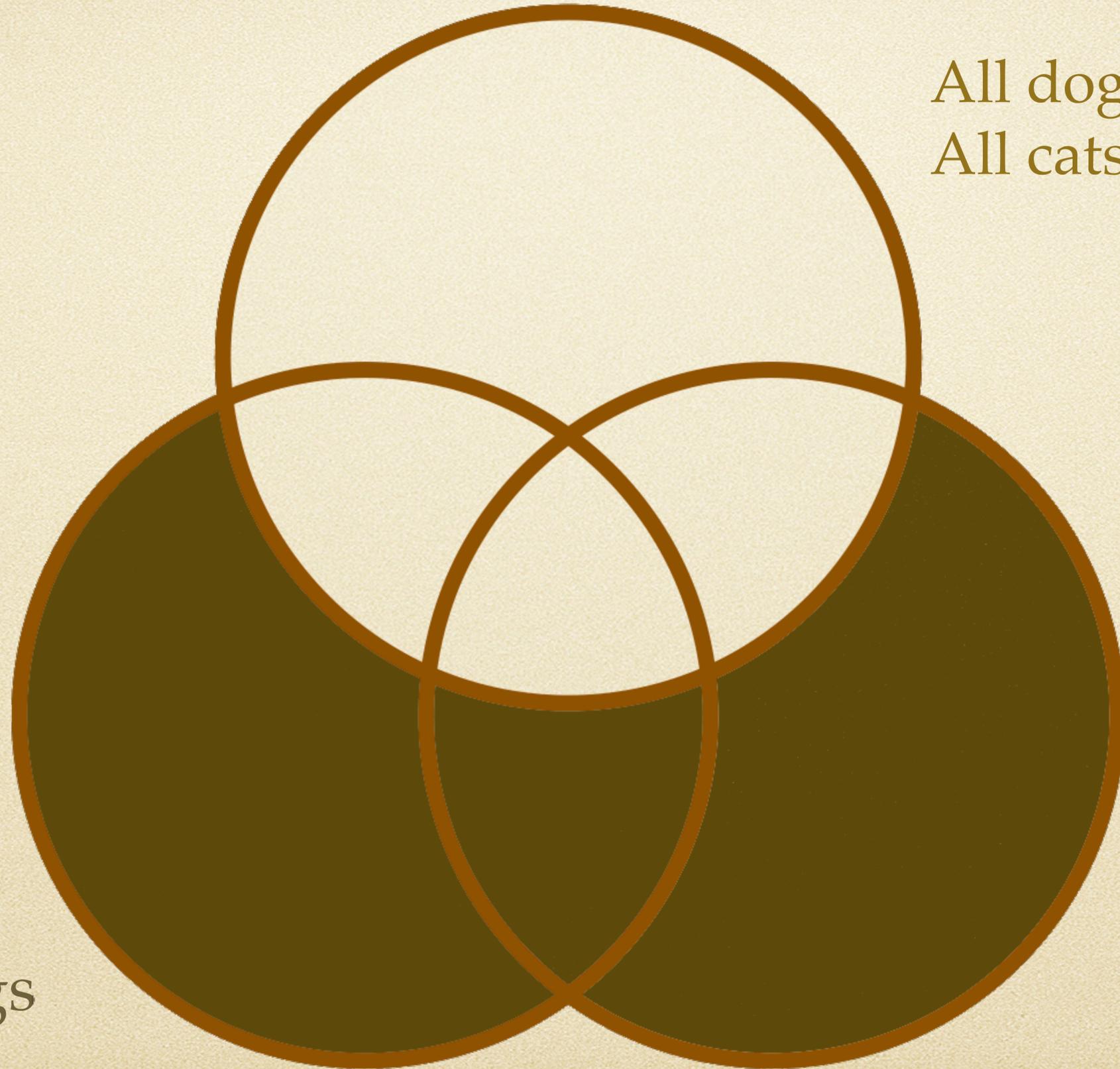


mammals

All dogs are mammals. ✓
All cats are mammals. ✓

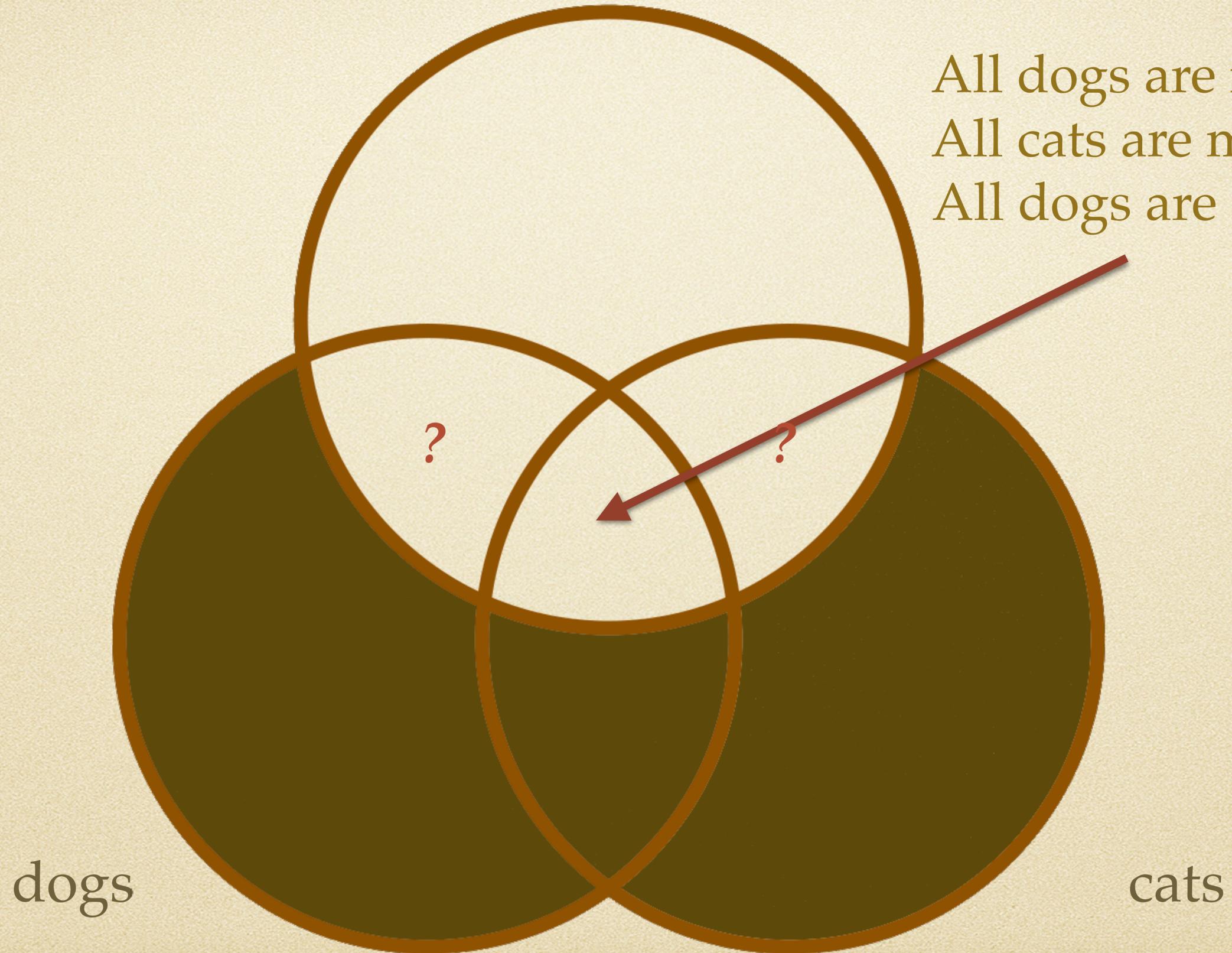
dogs

cats



mammals

All dogs are mammals. ✓
All cats are mammals. ✓
All dogs are cats?



* *Special Note:* We *know* that a deductive argument is **invalid** under only one circumstance: *when the premises are true and the conclusion is false.*

Premises	Conclusion	Validity
T	T	?
T	F	<i>INVALID</i>
F	T	?
F	F	?

* *Special Note:* We *know* that a deductive argument is **invalid** under only one circumstance: *when the premises are true and the conclusion is false.*

Premises	Conclusion	Validity
T	T	?
<i>T</i>	<i>F</i>	<i>INVALID</i>
F	T	?
F	F	?

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III. **Evaluating Arguments** - what makes arguments **good** or **bad**?

A. **Deductive Arguments** - a conclusion follows *necessarily* from the premise(s)

1. **Valid** - the **form** of the argument is correct (*if the premises are assumed to be true, then the conclusion cannot be false*)

2. **Sound** - the **form** is correct *and* the premises are true

B. **Inductive Arguments** - a conclusion follows with a degree of *probability* from the premise(s)

1. **Strong** - the premises are *sufficient* and *relevant* and *clear* enough to make the conclusion **more likely than not**

Strong Arguments

P1) Dogs are cute domestic mammals and make good pets.

P2) Cats are cute domestic mammals and make good pets.

P3) Pigs are cute domestic mammals and make good pets.

C) *Therefore*, cute domestic mammals make good pets.

This conclusion follows with a reasonable *degree of probability* from the premises.

Strong Arguments

P1) Kangaroos are marsupials and are cute.

P2) Opossums are marsupials and are cute.

P3) Koalas are marsupials and are cute.

C) *Therefore*, marsupials make good pets.

This conclusion *does not follow* with a reasonable degree of probability from the premises.

(The fact that marsupials are cute does not establish a connection with “good-pet-ness”.)

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1. **Valid** - the **form** of the argument is correct (*if the premises are assumed to be true, then the conclusion cannot be false*)

2. **Sound** - the **form** is correct *and* the premises are true

B. **Inductive Arguments** - a conclusion follows with a degree of *probability* from the premise(s)

1. **Strong** - the premises are *sufficient* and *relevant* and *clear* enough to make the conclusion more likely than not

2. **Cogent** - the premises are sufficient and relevant to make the conclusion likely *and* the premises are true

