Universal Affirmative and Negative

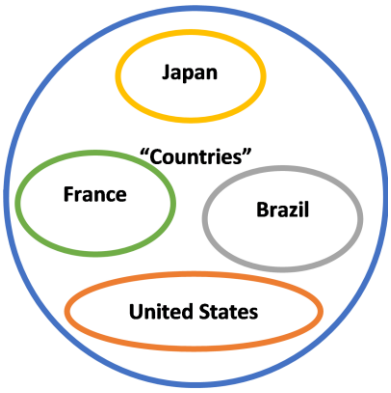
I. Lesson

The *Universal Affirmative* and *Universal Negative* are two of the four types of **categorical propositions** (see next lesson for the other two types). They are called "categorical" because they relate two *categories* of things. Because this notion is so *crucial*, we must once again briefly review what we mean by *categories*.

By *category*, we mean a collection of things that exclusively share some common property/properties. Terms refer to categories. So, we mean the same thing when we express these these five sentences:

1.) Apples are red.
2.) Things which have the *property* of being apples are red.
3.) Apples are things which have the *property* of being red.
4.) Things which have the *property* of being apples are *also* things which have the *property* of being red.
5.) Members of the *category* "apples" are *also* members of the *category* "red".

Categories can have many members, like the category "dogs," but they can also have only one member, like the category "Aristotle." "Aristotle" has only one member, namely Aristotle himself! Since he is the only thing that *is* Aristotle, he is the only member of such a category. We can represent categories like "countries" using circles:



As one can see, all of the smaller circles, representing the categories of specific countries, are members of the larger circle, representing the category "countries." This is because Japan, France, Brazil, and the United States are all countries. Note that if we had space, we would put *all* countries inside the circle. It is worth noting that there is no category "all dogs" or "all countries". There are the categories "dogs" (or "dog") and "country" (or "countries"). However, "*all*" is what's called a **quantifier**. A *quantifier* is an expression that indicates how many of the *members* of a certain category

are being talked about in a *proposition*. "No", "Some", and "Every" are some other quantifiers. Now that we understand what *categories* and *quantifiers* are, we can define some types of propositions:

- **Universal Affirmative (All A's are B's):** a proposition stating that *all* members of a given category (A) are *also* members of another category (B). These propositions are of the form "All *S* is *P*," where *S* is the Subject and *P* the Predicate. These are also sometimes referred to as *A Sentences*.
- **Universal Negative (No A's are B's):** a proposition stating that *no* members of a given category (A) are *also* members of another category (B). These propositions are of the form "No *S* is *P*," where *S* is the Subject and *P* the Predicate. These are also sometimes referred to as *E Sentences*.

Generally, to affirm is to say "yes" to something, or to take it as true ; to negate is to say "no", or to take it as false. Universal Affirmative and Universal Negative propositions get their names by affirming or denying that some predicate is true of a subject. For instance, in the Universal Affirmative proposition, "All cats are mammals," we *affirm* that the predicate, 'is an animal', is true of every cat. In other words, we affirm that everything that has the *property* of being a cat *also* has the *property* of being an animal. Put one more way, every member of the category "cats" is *also* a member of the category "animals." In the Universal Negative proposition, "No cats are reptiles", we *deny* that the predicate, 'is a reptile', is true of any cat. In other words, we are saying that no members of the category "cats" are *also* members of the category "reptiles" (and vice-versa).

It is important to observe, however, that in calling a proposition "affirmative", we are not saying that *we* affirm it, in the sense that we think the proposition as a whole is true. Affirmative and negative propositions get their names for what *they* express about their subjects: affirmative propositions say that some predicate is true of their subject, negative propositions deny that some predicate is true of their subject. *Any* one of these propositions can turn out to be true or false, as the examples below will show.

Lastly, we should note that these propositions are *universal* because their subject talks about *all* members of the category referred to by the subject, not just merely some of them. They say that *all* members of a category either satisfy or do not satisfy some predicate. Compare, for example, "All cats are mammals" with "Some cats are mammals"; only the first is a universal proposition, speaking about all cats, rather than just some particular cats. These latter propositions are called *particular* propositions; we'll deal with those in the next lesson.

II. Examples

- **Universal Affirmative:**

(1) "All cats are animals"
(2) "All cats are albinos"

(3) "Socrates is a Philosopher."

Propositions (1) - (3) are all examples of the **Universal Affirmative**. However, there is an important distinction between these propositions: the first and third are *true*, whereas the second is *false*. (1) is true because all members of the category "cats" are in fact *also* members of the category "animals." But (2) is false because there are members of the category "cats" that are not in the category "albino things". In other words, some cats are not albino, and those cats are counterexamples to the (2). We can see from (2) that an affirmative statement is not the same thing as a true statement!

Now, it might seem counterintuitive that (3) is a Universal Affirmative proposition, but Aristotle treats propositions with singular subjects as universal. Why? Well, when we say that Socrates is a philosopher, we are saying that *all* of the members of the category "Socrates" are *also* members of the category "philosophers." There is *only one* member of the category "Socrates", so if he (Socrates) is *also* a philosopher, then (3) is a true Universal Affirmative proposition.

- **Universal Negative:**

(4) "No snakes are reptiles"
(5) "No snakes are birds"

(6) "Plato is not French"

Propositions (4) - (6) are all examples of the **Universal Negative.** But once again, there is an important distinction between these propositions: (4) is false, whereas (5) and (6) are true. We can see from (5) that a negative statement is not the same thing as a false statement! Finally, (6) is a Universal Negative proposition because *no* members of the category "Plato" have the property of being French. Plato was a Greek philosopher, so even though the category "Plato" has only one member (Plato himself), (6) is a Universal Negative proposition.

Activity: Fill out the box below with your own examples of a Universal Affirmative proposition that is true, a Universal Affirmative proposition that is false, a Universal Negative proposition that is true, and a Universal Negative proposition that is false. When you're done, share your examples with at least two of your classmates so that you can check over each other's work.

Universal Affirmative (true)	**Universal Negative (true)**
Universal Affirmative (false)	**Universal Negative (false)**

III. Visualization

To get a better sense of how Universal Affirmative and Negative propositions compare to one another, it can be helpful to try to visualize the meanings of these two kinds of propositions. For this, we can use what are called "Euler Circles." This is a common way for logicians to represent what these types of propositions mean.

- **Euler Circles:**

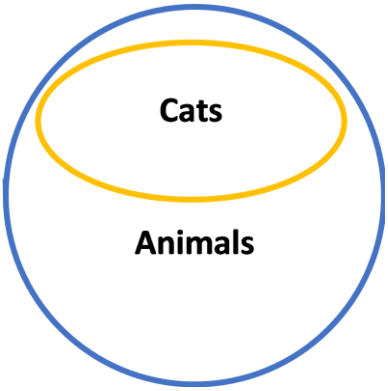


Figure 2:"All cats are animals"
(Universal Affirmative)

Figure 3:"No snakes are birds"
(Universal Negative)

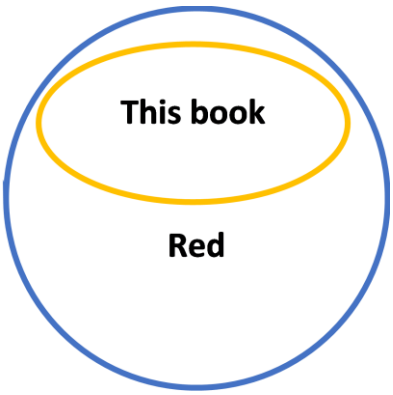


Figure 5:"This book is red"
(Universal Affirmative)

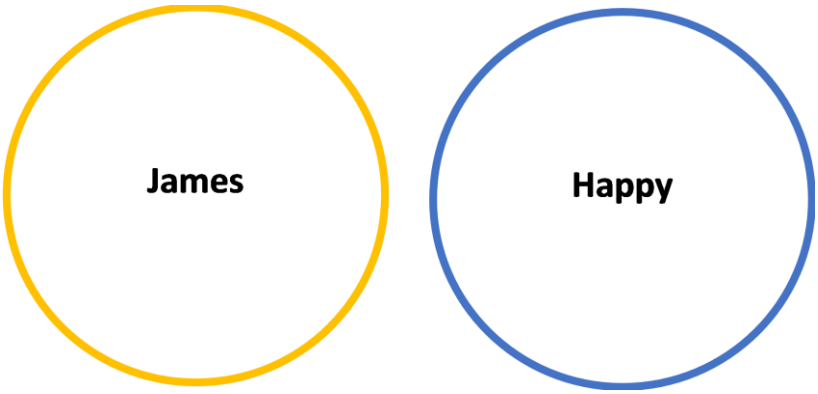


Figure 6:"James is not happy"
(Universal Negative)

In Euler Circles, a circle represents a category. Thus, in figure 2, we see that the category "Cats" is *entirely inside* the category "Animals." In other words, *all* members of the category "Cats" are *also* members of the category "Animals." This relation represents the Universal Affirmative proposition "All cats are animals." For another example, in figure 3, we see that there is *no overlapping part* between the category "Snakes" and the category "Birds." In other words, there is *no* member of the category "Snakes" that is *also* a member of the category "Birds." This relation represents the Universal Negative proposition "No snakes are birds."

Finally, let's take a look at figure 4. The term "this book" refers to a category with only *one member*. That is, if one points to a book and says "this book," one is only referring to *one* book. Therefore, if one says "This book is red," one is saying that *all* members of the category "this book" are also members of the category "Red". Namely, *the only* member of the category "this book" is also a member of the category "Red". Figure 5 shows that no members of the category "James" (just James himself) are also members of the category "Happy".

IV. Exercises

Exercise 1

What is a category in your own words? Give 5 examples of categories and list a few members of each category that you list.

Exercise 2

Looking at the following statements, decide which one is an example of a Universal Affirmative proposition that is true, a Universal Affirmative proposition that is false, a Universal Negative proposition that is false, and a Universal Negative proposition that is true.

i. No mammals lay eggs.
ii. All mammals lay eggs.
iii. All humans are mammals.
iv. No humans lay eggs.

Exercise 3

Represent the proposition "All concerts are loud" with Euler Circles. *Note*: it does not matter how one labels one's circles, as long as it is clear what the categories are.

Exercise 4

Come up with your own Universal Affirmative proposition. Represent it with Euler Circles.

Exercise 5

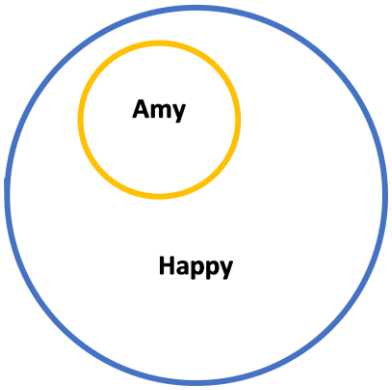
Represent the proposition "No day is longer than 24 hours" with Euler Circles.

Exercise 6

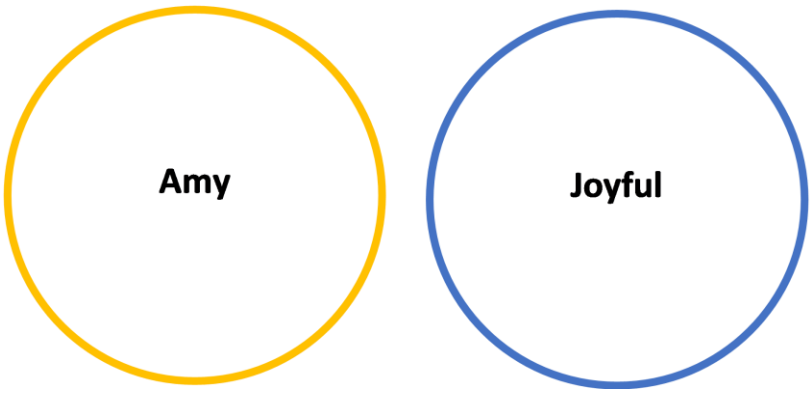
Come up with your own Universal Negative proposition. Represent it with Euler Circles.

Exercise 7

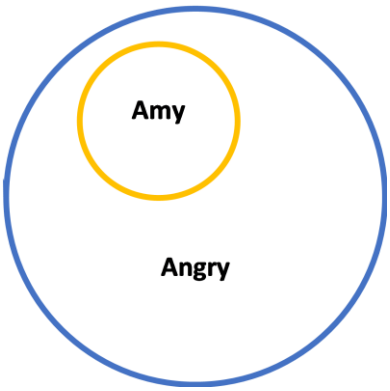
What are the propositions that correspond to the following Euler Circles?

i. 

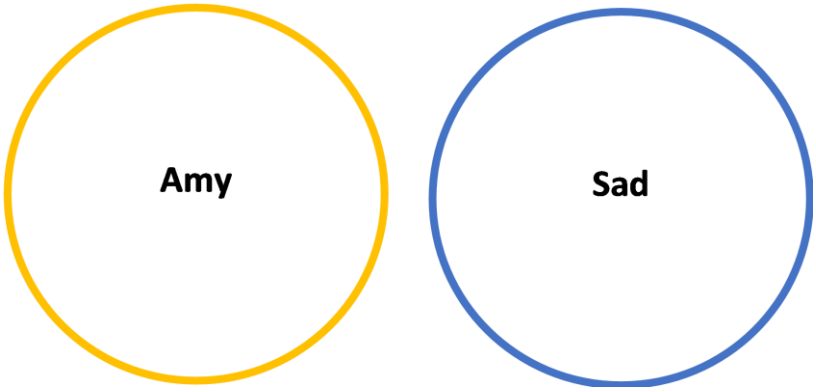
ii.



iii.



iv.



Exercise 8 (Challenge):

Do the following pairs of propositions mean the same thing?

i. No apples are green; not all apples are green.

ii. All babies cry sometimes; no babies never cry.

V. Conclusion

Many of the assertions that we make about the world are actually instances of Universal Affirmative or Universal Negative propositions. Because of this, understanding the way that these two types of

propositions function and relate to one another is very important; in doing so, we get clearer about what exactly we're asserting about the world around us.

VI. Lesson Goals

At the end of this lesson, students will be able to:

- Understand what a category is
- Understand what it means to be a member of a category
- Understand why propositions with singular subjects are treated as universal propositions.
- describe what Universal Affirmative and Universal Negative propositions are
- explain the difference between true and false propositions of each type
- determine which sentences are examples of each type of proposition
- use Euler Circles and Venn diagrams to represent each type of proposition

Answer Key:

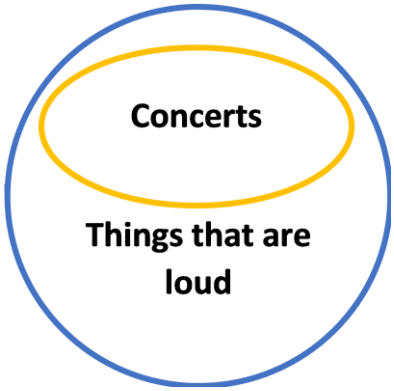
Exercise 1

A category is a collection of things that have some sort of relevant commonality. The name of the category is almost always reflective of that commonality. For instance, the category "dogs" is the collection of all things that have the commonality of being a dog.

Exercise 2

i. No mammals lay eggs – Universal Negative, false
ii. All mammals lay eggs – Universal Affirmative, false
iii. All humans are mammals – Universal Affirmative, true
iv. No humans lay eggs – Universal Negative, false

Exercise 3

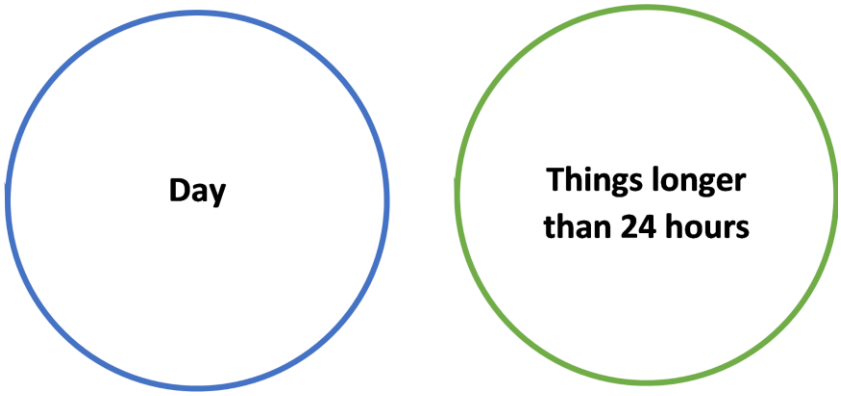


Euler Circles for "All concerts are loud" (answers may vary in terms of labelling)

Exercise 4

Answers will vary, but diagrams should look similar to the ones directly above.

Exercise 5



Euler Circles for "No day is longer than 24 hours." (answers may vary in terms of labelling)

Exercise 6

Answers will vary, but diagrams should look similar to the ones directly above.

Exercise 7

i. Amy is happy.
ii. Amy is not joyful.
iii. Amy is angry.
iv. Amy is not sad.

Exercise 8 (Challenge)

i. They do not mean the same thing. The first proposition is true only if there is not a single apple that is green. However, the second sentence can still be true if some apples are green, so long as there are also some that aren't green.
ii. They mean the same thing.