Categorical propositions are statements that describe classes (groups) of objects designate by the subject and the predicate terms.

A class is a group of things that have something in common (birds, light bulbs, desks, etc.)

Categorical statements describe the ways in which things are related.

For example, the categorical statement “All screwdrivers are tools,” says that if we look into the class of tools, we will see that all screwdrivers in the world are inside it.

A proposition may refer to classes in different ways: to all members or some members.

The proposition “All senators are citizens” refers to all senators, but not to all citizens: All senators are citizens, but not all citizens are senators!

Notice that this proposition does not affirm that all citizens are senators, but it does not deny it either.

To characterize the way in which terms occur in categorical propositions, we use the term “Distribution.”

Distribution of a term:

A distributed term is a term of a categorical proposition that is used with reference to every member of a class.

An undistributed term is a term of a categorical proposition that is not being used to refer to each and every member of a class.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Predicate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A: All Birds are winged creatures.</strong></td>
<td>Subject refers to all birds. All birds are part of the predicate class. Predicate does not refer to every member, e.g., bats, flying fish. Not all member of the predicate class are members of subject class.</td>
</tr>
<tr>
<td><img src="image1" alt="All birds are winged creatures." /></td>
<td><img src="image2" alt="Birds, Bats, flying fish" /></td>
</tr>
<tr>
<td><strong>S is distributed</strong></td>
<td><strong>P is undistributed</strong></td>
</tr>
<tr>
<td>Birds</td>
<td>Winged Creatures</td>
</tr>
<tr>
<td><strong>E: No birds are wingless creatures.</strong></td>
<td>Subject refers to all birds by indicating that they (All) are not part of the predicate class. Predicate refers to all wingless creatures by indicating that they (all) are not part of the subject class</td>
</tr>
<tr>
<td><img src="image1" alt="All birds are winged creatures." /></td>
<td><img src="image3" alt="No birds here! Ants, turtles" /></td>
</tr>
<tr>
<td><strong>S is distributed</strong></td>
<td><strong>P is distributed</strong></td>
</tr>
<tr>
<td>Birds</td>
<td>Wingless Creatures</td>
</tr>
<tr>
<td><strong>I: Some birds are black things.</strong></td>
<td>Subject refers only to some birds as being part of the predicate class. Predicate refers only to some black things, being part of subject class. Those that are birds</td>
</tr>
<tr>
<td><img src="image4" alt="Black Birds" /></td>
<td><img src="image5" alt="Black Birds" /></td>
</tr>
<tr>
<td><strong>S is undistributed</strong></td>
<td><strong>P is undistributed</strong></td>
</tr>
<tr>
<td>Birds</td>
<td>Black Things</td>
</tr>
<tr>
<td><strong>O: Some birds are not black things.</strong></td>
<td>Subject refers only to some birds, not all of them. Predicate refers to all members of the class! Not one of them is in the class referred to by &quot;some birds&quot;</td>
</tr>
<tr>
<td><img src="image6" alt="Black Birds. No black things here!" /></td>
<td><img src="image5" alt="Black Birds" /></td>
</tr>
<tr>
<td><strong>S is undistributed</strong></td>
<td><strong>P is distributed</strong></td>
</tr>
<tr>
<td>Birds</td>
<td>Black Things</td>
</tr>
<tr>
<td>Name</td>
<td>Form</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>A</td>
<td>All S is P</td>
</tr>
<tr>
<td>E</td>
<td>No S is P</td>
</tr>
<tr>
<td>I</td>
<td>Some S is P</td>
</tr>
<tr>
<td>O</td>
<td>Some S is not P</td>
</tr>
</tbody>
</table>
Let’s apply our knowledge of Venn diagrams to describe the relations among propositions.

The way categorical propositions relate is called OPPOSITION.

OPPOSITION is the logical relation between any two categorical propositions.

There are 5 ways in which they relate (They are opposed):

1. CONTRADICTORIES

Two propositions are said to be contradictories if one is the denial of the other—they cannot both be true or both false.

Two categorical propositions that have the same subject and predicate but differ in quantity and quality are contradictories.

The A proposition “All judges are lawyers” and O “Some judges are not lawyers” are contradictories.

They are opposed in quality: A affirms of the subject, O denies it.

They are opposed in quantity: A refers to all, O refers to some.

They cannot both be true: Is it possible that all judges are lawyers but some aren’t? These statements cannot both be true.

Also, if it is false that all judges are lawyers, then it is true that some judges are not lawyers—cannot both be false.

---CONTRADICTORIES---

A

Cannot both be true, cannot both be false.

O
Similarly, \(E\) and \(I\) are contradictories: \(E\) “No politicians are liberal” and \(I\), “Some politicians are liberal,” are opposed in both quality and quantity. If it is the case that no politicians are liberal then it is impossible that some politicians are liberal—cannot both be true.

If it is false that no politicians are liberal, then it cannot be false that some politician are—cannot both be false. That is, if you deny that no politicians are liberal, you affirm that at least one is liberal, which is what \(I\) affirms.

\[
\begin{array}{c}
\text{--- CONTRADICTORIES ---} \\
E \\
I
\end{array}
\]

Cannot both be true, cannot both be false.

**More examples:**

\(A\): All books are good reads—true!  \(O\): Some books are not good reads—false!

\(O\): Some books are not good reads—True! \(A\): All books are good reads—false!

\(E\): No cats are brown—true!  \(I\): Some cats are brown—false!

\(I\): Some cats are brown—true!  \(E\): No cats are brown—false!
2. CONTRARIES

Two propositions are said to be contraries if they cannot both be true, but both can be false:

An $A$ proposition “All judges are lawyers” and $E$, “No judges are lawyers,” are contraries.

It’s not possible that all judges are lawyers but none are! If one is true the other is false.

However, it is possible that both statements are false: Think about it! Some judges are lawyers and some judges are not lawyers. So, if some are and some are not, it is false that all are and it is false that none are.

More examples:

$A$: All cats are grey—true! $E$: No cats are grey—false!

$E$: No cats are grey—true! $A$: All cats are grey—false!

But as we know, in the world some cats are grey and some cats are not grey. So,

$A$: All cats are grey—false! $E$: No cats are grey—false!
3. **SUBCONTRARIES**

Two propositions are said to be subcontraries if they cannot both be false but may both be true:

An *I* proposition, “Some judges are lawyers” and *O*, “Some judges are not lawyers” are subcontraries.

This is evident: Since some judges are lawyers and some are not, *I* and *O* are both true.

However, if it is false that some judges are lawyers, then it follows that some judges are not lawyers—which is what *O* affirms! So, if *I* is false *O* must be true. In other words, *I* and *O* can both be true but cannot both be false.

*I*: Some judges are lawyers—true!  
*O*: Some judges are not lawyers—true!

Since in the world, in fact, some judges are lawyers and some aren’t, if it is false that some judges are lawyers, what does it mean? If you deny that some are, you affirm that some are not. So if *I* is false, *O* is not false.

However, if we deny that some judges are lawyers, automatically we affirm that some are not, which is what proposition *O* affirms.

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More examples:

*I*: Some sandwiches are good—true!  
*O*: Some sandwiches are not good—true!

This is obvious, right? Some are good, some are not.

But if it is false that some are good (False *I*), then by definition some are not good (True *O*).
4. SUPERALTERNATES

When two propositions have the same subject and predicate and agree in quality (Both affirms or both deny) but differ in quantity (One universal the other particular) they are said to be CORRESPONDING propositions.

An \( A \), “All spiders are eight-legged animals” has a corresponding proposition, \( I \) “Some spiders are eight-legged animals.” Both affirm = same quality; One is universal the other particular = differ in quantity.

Propositions \( A \) and \( I \) are said to be superalternates.

Superalternation is the relationship between the universal statements \( A \) and \( E \) and their corresponding particular statements \( E \) and \( O \). In this relationship, the truth of the universal statements implies the truth of the particular statements, but not the other way around.

So, “All spiders are eight-legged animals” (\( A \)) implies that some spiders are eight legged animals (\( I \)).

If it is true that all spiders in the world have 8 legs, obviously it must be true that some spiders have 8 legs.

Remember that “some” means “at least one.”

However, the other way around does not work: “Some spiders are eight-legged animals” does not imply that all spiders are eight-legged animals.

This is obvious: if you take some spiders, say 10, and see that they have 8 legs, can you declare that all spiders in the world have 8 legs? No! So, superalternation says that any true universal and affirmative statement \( A \) implies that its corresponding particular and affirmative statement \( I \) is true. But a true \( I \) statement does not imply an \( A \) statement.

More examples:

If all shoes are comfortable (True \( A \)) then it is true that some shoes are comfortable (True \( I \)).

But if you take some shoes, say, 5 pairs, and they all are comfortable (True \( I \)), it does not follow that all shoes in the world are comfortable (\(? A \)).

If all teachers are good, it follows that some teachers are good.

But if some teachers are good, it does not mean all are.
Similarly \( E \) and \( O \) propositions are in a relation of superalternation.

\[ E \text{ implies } O \text{ but } O \text{ does not imply } E \]

So “No spiders are eight-legged animals” \((E)\) implies that “Some spiders are not eight-legged animals” \((O)\). However, I take some spiders, say, 10, and 7 of them have 8 legs and 3 of them have 6 legs. I declare that some spiders are not eight-legged animals. But obviously I may not assume that none are.

More Examples:

If no socks are made of cottons, it follows that some socks are not made of cottons.

But if some socks are not made of cottons, I may not assume none are.

If no music is good, some music is not good.

But if some music is not good, it does not mean that none is.
5. SUBALTERNATES

If superalternation is the relationship between the universal statements $A$ and $E$ and their corresponding particular statements $E$ and $O$, SUBALTERNATION is the relationship between the particular statements $I$ and $O$ and their corresponding universal statements $A$ and $E$.

In the relationship of subalternation, the falsity of the particular statements $I$ and $O$ implies the falsity of the corresponding universal statements $A$ and $E$, but not the other way around.

So, a false $I$ implies a false $A$: If it is false that some people are blond, it must be false that all people are blond. However, a false $A$ does not imply a false $I$: if it’s false that all people are blond, it does not imply that it’s false that some are.

More Examples:

If it’s false that some days are holidays, then it must be false that all days are holidays. But if it’s false that all days are holidays, this does not imply the falsity that some days may be holidays.
Summary:

1. Contradictories:
   - A and O are contradictories. They have exact opposite truth-value.
   - E and I are contradictories.

2. Contraries:
   - A and E are contraries. Cannot both be true, may both be false.

3. Subcontraries:
   - I and O are subcontraries. Cannot both be false, may both be true.

4. Superalternation:
   - A implies I. I doesn’t imply A. Truth goes down.
   - E implies O. O doesn’t imply E.

5. Subalternation:
   - False I implies false A, but not the reverse. Falsehood goes up.
   - False O implies false E, but not the reverse.
The Traditional Square of Oppositions

A: All S are P
E: No S are P
I: Some S are P
O: Some S are Not P

Contraries

Subalternation

Contradictories

Superalternation

Subcontraries

True
False
True
False
True
False
True
False

Contraries

(Cannot both be true may both be false)

Subcontraries

(Cannot both be false may both be true)
INFERENCES ON THE TRADITIONAL SQUARE OF OPPOSITION

A number of immediate inferences may be drawn from any of the four categorical forms:

Let $A$ = “All cats are grey.”

If $A$ is true: $E$ is false, $I$ is true, $O$ is false.  

If $E$ is true: $A$ is false, $I$ is false, $O$ is true.  

If $I$ is true: $E$ is false, $A$ and $O$ are undetermined.  

If $O$ is true: $A$ is false, $E$ and $I$ are undetermined.  

If $A$ is false: $O$ is true, $E$ and $I$ are undetermined.  

If $E$ is false: $I$ is true, $A$ and $O$ are undetermined.  

If $I$ is false: $A$ is false, $E$ is true, $O$ is true.  

If $O$ is false: $A$ is true, $E$ is false, $I$ is true.