Introduction To Logic

Ryan Jhon Lee Lajola

Introduction to Logic

Learning Objectives

At the end of the lesson, the students are expected to:

1. Define and illustrate a **proposition**
2. Distinguish between **simple** and **compound** propositions
3. Demonstrate understanding of propositions through **real-life applications**

Content Standards

The learner demonstrates understanding of key concepts in **propositional logic**, **syllogisms**, and **fallacies**.

Performance Standards

The learner is able to **apply logic judiciously** in real-life arguments.

Learning Competencies

- Illustrates and symbolizes propositions.
- Distinguishes between simple and compound propositions. (M11GM-IIg-3)
- Performs different types of operations on propositions. (M11GM-IIg-4)

Review Activity

Activity: *Is it True?*

Tell whether each item is **true**, **false**, or **cannot be determined**.

1. Manila is the capital of the Philippines.
2. What is your favorite color?
3. $4 + 2 = 7$
4. Who invented the microscope?
5. The Earth is round.

Guide Answer:
1 – True
2 – Cannot be determined
3 – False
4 – Cannot be determined
5 – True

What is a Proposition?

A **proposition** is a declarative sentence that is **either true or false**, but not both.
If the proposition is true, its truth value is **T**.
If the proposition is false, its truth value is **F**.

Propositions are usually denoted by **small letters** such as p, q, r, etc.

Example:

- **p:** "Everyone should study logic."

We may write it symbolically as:

> p is the proposition "Everyone should study logic."

Types of Propositions

Simple Proposition

A **simple proposition** cannot be broken down into smaller propositions.

Examples:

1. Letter E is a vowel.
2. 2x + 5x = 7x
3. Bagabag is in Nueva Vizcaya.

Compound Proposition

A **compound proposition** is formed by connecting two or more simple propositions using logical connectors.

Logical Connectors

- $\sim$: negation (not)
- $\vee$: or
- $\wedge$: and
- $\rightarrow$: if... then
- $\leftrightarrow$: if and only if

Examples on Logical Connectors

Let:

- **p:** Even numbers are divisible by 2
- **q:** Five is an odd number

Then:

- $\sim$**p** : Even numbers are **not** divisible by 2
- **p** $\vee$ **q** : Even numbers are divisible by 2 **or** five is an odd number
- **p** $\wedge$ **q** : Even numbers are divisible by 2 **and** five is an odd number
- **p** $\rightarrow$ **q** : If even numbers are divisible by 2, then five is an odd number
- **p** $\leftrightarrow$ **q** : Even numbers are divisible by 2 *if and only if* five is an odd number

---

Another Example

Let:

- **p:** The Earth is round
- **q:** The Moon orbits the Earth

Then:

- ~**p** : The Earth is not round
- **p** **q** : The Earth is round or the Moon orbits the Earth
- **p** **q** : The Earth is round and the Moon orbits the Earth
- **p** $\rightarrow$ **q** : If the Earth is round, then the Moon orbits the Earth
- **p** **q** : The Earth is round if and only if the Moon orbits the Earth

---

Activity 1: Logical Connectors

Given:

- **p:** Andrei is watching
- **q:** Justine shares a bond with Jane

Write the compound propositions:

a. ~p

b. p q

c. p q

d. p $\rightarrow$ q

e. p q

Answer Key:

a. Andrei is not watching.

b. Andrei is watching or Justine shares a bond with Jane.

c. Andrei is watching and Justine shares a bond with Jane.

d. If Andrei is watching, then Justine shares a bond with Jane.

e. Andrei is watching if and only if Justine shares a bond with Jane.

Real-Life Application

Reflection Question

How can you apply the concept of propositions in real-life situations?
(Answers may vary.)

Generalization

1. What is a proposition?

2. What are the two types of propositions?

3. Give an example of each type.

Evaluation

Part I. Identify if the statement is a proposition. If it is, give the truth value.

1. Mindanao is an island in the Philippines.

2. Find a number that divides your age.

3. My seatmate will get a perfect score in the Logic exam.

4. Welcome to the Philippines!

Part II. Symbolic Form

Let:

- **p:** You drive over 65 miles per hour.
- **q:** You get a speeding ticket.

Write the symbolic form:

a. You do not drive over 65 miles per hour.

b. You will get a speeding ticket if you drive over 65 miles per hour.

c. If you do not drive over 65 miles per hour, then you will not get a speeding ticket.

Answer Key:

1.

- p: Proposition – True
- q: Not a proposition (directive)
- r: Proposition – truth depends on outcome
- s: Not a proposition (greeting)

2.

a. $\neg p$

b. $p \rightarrow q$

c. $\neg p \rightarrow \neg q$

End of Lesson

Thank you for listening!
Goodbye, class.