This chapter analyses logical propositions and their differences with ordinary language sentences. The chapter aims at classifying propositions into traditional and modern. It analyses them using diagrams. It also changes reducing ordinary sentences into logical form.
Read the following statements.

“Neither a borrower nor a lender be
For loan oft loses both itself and friend
And borrowing dulls the edge of husbandry.”

*William Shakespeare*—(Hamlet Act 1, scene 3, 75–77)

“Titanium combines readily with oxygen, nitrogen and hydrogen, all of them which have an adverse effect on its chemical properties. As a result titanium must be processed in their absence.”

*Illustrated World of Science Encyclopedia*
Edition 1971

Shakespeare is trying to establish an opinion whereas the one from the 'Encyclopedia' is trying to establish a scientific fact. Mass media like newspapers, magazines, television, radio and all the social media on the Internet provide enough space for arguments. We argue to establish our convictions to be true and try to secure the approval of others.

**Activity 1**

- Think of a situation when you engaged in an argument with your friend, teacher or parent.
- Try to write any of the arguments in the form of a dialogue.
Read the following conversations between a father and his son and a doctor and his patient.

The above conversations express arguments which are there in every realm of our life. However, how do we know our arguments are strong and valid?
It is in this context one recognises the aim of logic as to formulate proper methods and principles for evaluating arguments.

The study of logic gives us confidence when we argue with others to establish our reason to be true. An argument consists of a group of **statements** which support each other. A statement is a sentence that is either true or false – in other words, it is a **declarative sentence**. E.g. ‘The earth revolves round the sun’, ‘Tablet computer is an electronic gadget’. A statement or a declarative sentence in logic is called a **proposition**. The two hallmarks of a proposition are completeness of meaning and capacity to be either true or false. Proposition is the building block of logical reasoning.

**Sentences in Language**

A sentence is a group of words that gives a complete sense. It is the verbal expression of our thought. In other words, our thoughts are expressed through sentences in every language.

You may recall studying different types of sentences in your grammar class at school. Sentences that ask questions, e.g. ‘*Who is the present Prime Minister of India?*’ are interrogative sentences. Sentences that express wonder, e.g. ‘*How cute!*’ are exclamatory sentences. Sentences that express command or request, e.g. ‘*Remove the sandals from your feet, for this is a holy place.*’ and ‘*Have mercy on me.*’ are imperative sentences. The sentences that express a statement, such as ‘*The sun is a star*’ are called declarative sentences. The scope of grammatical sentences is not restricted. Not only thoughts but also wishes, feelings etc. may be expressed in sentences.

**Logical Propositions and Grammatical Sentences**

We have already gone through various sentences in grammar. The logical proposition is rather different from grammatical sentences. Every sentence is not a proposition. Only those sentences which express what is either true or false are logical propositions. The sentences expressing questions, exclamations, commands or requests carry neither truth nor falsity. The interrogations like ‘*Am I the keeper of my brother?*’, the commands like ‘*Do your duty without caring for the reward*’, and the exclamation like ‘*Hurray!*’ are not logical propositions. The question contains its own answer. It may in effect mean that ‘*I am not the keeper of my brother*’ or ‘*I am the keeper*’. The command implies that duty is to be done without thinking of the reward. The exclamation refers to the fact that something good is achieved. So in such cases the proposition must be extracted and stated in logical form.
Let us check

Try to complete the following table comparing the characteristics of Logical Propositions and Grammatical Sentences

<table>
<thead>
<tr>
<th>Logical Propositions</th>
<th>Grammatical Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every proposition is a sentence.</td>
<td>Every sentence is not a proposition.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Richard Whately refers to the proposition as ‘an indicative sentence’. In other words it is a declarative sentence. In what is considered to be the Bible of logic, ‘Prior Analytics’ Aristotle defines a proposition as ‘a statement in which something is said regarding something else either affirmatively or negatively’.

The proposition ‘Mahatma Gandhi is a human being’ declares affirmatively the human aspect of Mahatma Gandhi. The proposition ‘No stars are planets’ denies the planetary feature of stars.

That about which something is declared, is the subject of the proposition; that which is declared of the subject is the predicate of the proposition. In the proposition ‘All humans are mortal’ the subject is ‘all human’ and the predicate is ‘mortal’. In the proposition ‘Blood is thicker than water’ ‘blood’ is the subject and ‘thicker than water’ is the predicate.

Activity 2

Prepare a few propositions from the areas of Physics, Biology, Mathematics, Literature and Sports. Identify their subject and predicate.

Example.

- Some machines are robots.
  Subject : machines
  Predicate : robots
Traditional logicians followed Aristotle’s analysis of propositions. Any statement to be a proposition must be in the proper logical form of ‘\textit{S is P}’ if affirmative and ‘\textit{S is not P}’ if negative. ‘S’ stands for the subject. ‘P’ stands for the predicate. Subject and predicate are linked with ‘\textit{is}’ or ‘\textit{are}’ in English. This connecting link between subject and predicate is called \textit{Copula}. The function of copula is to express the unity of the terms in a proposition. Hence, \textit{the structure of the logical proposition is subject and predicate connected by a copula}. Modern logicians, however, differ from Aristotle’s analysis of proposition.

\textbf{The reasons for modern logicians’ disagreement with Aristotle’s view of propositions}

Traditional logicians supposed that every proposition was analyzable into subject and predicate. Therefore they must be expressed with the help of the verb forms of ‘\textit{be}’. According to them, a proposition such as ‘Bagpipes make a horrid noise’ should be restated as ‘Bagpipes are things which make a horrid noise’, for the logical form of subject-copula-predicate. But every proposition does not assert a predication, that is, attributes a characteristic to a subject. For example, ‘Cats like fish’, ‘Brutus killed Caesar’, ‘John gave the man some money’ assert relations between subjects. They do not attribute a characteristic to the subject. We do not get rid of the relation by expressing the proposition ‘\textit{Brutus killed Caesar}’, in the verbal form ‘\textit{Brutus is a killer of Caesar}’. Such a restatement is logically futile and it is practically absurd. The awkwardness of the sentences suggests their unsuitability to express what the proposition means. Propositions may have any number of constituents. These constituents may be combined in various ways. The traditional limitation to two constituents (Subject and Predicate) and to one mode of combination (predication) was an undue simplification.

\textbf{Kinds of Propositions}

As there is difference in the concept of the structure of proposition held by traditional and modern logicians, there is difference in the classification of propositions too. Hence we will study the two views of classification of proposition, i.e. traditional and modern.
Traditional Classification of Propositions

Propositions are generally classified as *categorical* and *conditional*. This is the traditional classification done by Aristotle.

A. Categorical Propositions

Read the following propositions.
- All cricketers are sportsmen.
- No novels are biographies.
- Some chemicals are medicines.
- Some papers are not A4.

Traditional logicians called the above propositions “Categorical”. *The categorical proposition asserts directly and without any condition. The predicate is either affirmed or denied unconditionally of the subject.* In the proposition ‘All cricketers are sportsmen’ and ‘Some chemicals are medicines’ the predicates ‘sportsmen’ and ‘medicine’ are affirmed unconditionally of their subjects. In the proposition ‘No novels are biographies’ and ‘Some papers are not A4’ the predicates ‘biographies’ and ‘A4’ are denied unconditionally of their subjects.

Categorical propositions are classified on the basis of **quality** and **quantity**. Based on quality, the propositions are either Affirmative or Negative. *An affirmative proposition is one in which an agreement is affirmed between the subject and the predicate.* The proposition ‘All herbs are medicinal plants’, indicates such an agreement between the subject and the predicate. Therefore it is affirmative in quality.

*A negative proposition indicates a lack of agreement between the subject and the predicate.* The proposition ‘No ice creams are hot things’ shows a disagreement between the subject and the predicate. Therefore it is negative in quality.
Every term as subject and predicate has a double significance. It refers (1) to an object or group of objects and (2) to a quality or a set of qualities. The objects to which the term is applied, form the denotation or the extension of the term. The attributes which it implies, form the connotation or intention of the term. A term then denotes objects and connotes qualities. Connotation is also known as its intention because it is what is intended by the term. Denotation is called extension because it refers to the various objects over which the predication of the term may extend. Thus in the proposition 'All lions are carnivorous', the term 'lion' has extension or denotation in so far as it refers to the various individual lions or to the different varieties of lions like the African and the Asiatic, and it has intention or connotation in so far as it refers to the qualities or attributes of lions like being quadrupeds (four-legged), mammals, feline, etc. While denoting or naming an object, terms are employed in extension. When terms are used to define or describe things, they are employed in intention. Denotation and connotation are different aspects of the significance of terms. Every term must have both these aspects.

The quantity of a proposition is determined by the extension of subject. When the proposition refers to all of the individuals denoted by the subject, it is said to be universal in quantity. When, on the other hand, the proposition affirms that the predicate belongs only to a part of the subject, it is said to be particular. For example, 'All metals are elements' is universal, because the assertion is made of the subject in its widest or fullest extent. 'Some metals are white' is particular, because reference is made to only a part of the subject 'metal'.

According to quality and quantity logicians divide categorical propositions into four different types: Universal in quantity, affirmative in quality; Universal in quantity, negative in quality; Particular in quantity, affirmative in quality; Particular in quantity, negative in quality.
The categorical propositions are:
1. Universal affirmative
2. Universal negative
3. Particular affirmative
4. Particular negative.

The vowels A, E, I and O are traditionally used to refer to the four different types of propositions.

These symbols were traditionally based on the vowels in the Latin word ‘affirmo’ for the affirmative propositions and the comparable vowels in the Latin word “nego”.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name of proposition</th>
<th>Example</th>
<th>Logical Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Universal affirmative</td>
<td>All chemicals are medicines.</td>
<td>All S is P</td>
</tr>
<tr>
<td>E</td>
<td>Universal negative</td>
<td>No chemicals are medicines.</td>
<td>No S is P</td>
</tr>
<tr>
<td>I</td>
<td>Particular affirmative</td>
<td>Some chemicals are medicines.</td>
<td>Some S is P</td>
</tr>
<tr>
<td>O</td>
<td>Particular negative</td>
<td>Some chemicals are not medicines.</td>
<td>Some S is not P</td>
</tr>
</tbody>
</table>

Let us check

From the given proposition create the other three categorical propositions.
A Proposition: All atoms are divisible.
E Proposition: ..............................
I Proposition: ..............................
O Proposition: ..............................
Boolean Analysis of Proposition

We can show the class distinction of categorical proposition by drawing two overlapping circles, labeling one circle ‘S’ for the subject term and the other ‘P’ for the predicate term.

The part of the circles overlapping can be denoted as the class of SP. To the left of the class of SP is the class of $S\overline{P}$; to the right of the class of SP is $\overline{P}S$. The class outside all of the circle is the class of $\overline{S}\overline{P}$. A universal affirmative proposition states that the part of the circle designated S and not P ($S\overline{P}$) is null: it has no members. A universal negative proposition states that the part of the circle designated S is common to P (SP) is null. A particular affirmative proposition states that the part of the circle designated S that is common to P (SP) is not null: it has at least one member. A particular negative proposition states that the part of the circle designated S and not P ($S\overline{P}$) is not null: it has at least one member. To signify that a class is known to be empty, we shall use a shaded area, and to indicate that a class has a member, we shall insert a letter “x” in that place.

On the basis of Boolean analysis, the different types of categorical propositions are exemplified as shown in the fig. 2.

![Fig. 1](image)

![Fig. 2](image)
B. **Conditional Propositions**

- If you destroy forests then you destroy our planet.
- A restaurant is either vegetarian or non-vegetarian.

These two propositions are called *conditional* by traditional logicians. The former is a *Hypothetical Proposition* and the latter a *Disjunctive Proposition*. Both of them state the facts with certain conditions or suppositions. It is just in contrary to categorical proposition which asserts the facts without any condition. A conditional proposition is a *complex proposition that affirms or denies something to something else conditionally.*

1. **Hypothetical Proposition**

The proposition ‘*If you destroy forests, then you destroy our planet*’ is a type of conditional proposition. There are two constituent parts in the same proposition. The condition or ‘if-clause’ is called the *antecedent*. The ‘then-clause’ is called the *consequent*.

2. **Disjunctive Proposition**

‘A restaurant is either vegetarian or non-vegetarian’ is a kind of conditional proposition. There are two constituent parts in this proposition, they are, ‘A restaurant is vegetarian’ and ‘A restaurant is non-vegetarian’. Such types of propositions are called Disjunctive proposition by traditional logicians. Disjunctive propositions are made up of “either … or” or just placing the word “or” between the propositions. The constituent propositions are called *Disjuncts.*

---

**Let us check**

Recall a few life situations when you were caught up with hypothetical propositions and disjunctive propositions. Identify their constituent parts.

- If you don’t wear helmet, you will be fined.
  
  Antecedent : ………………………..Consequent : ……………………..
  
  If……………………………… then……………………………………
  
  Antecedent : …………………….Consequent : ……………………..
  
  Either …………………….. or…………………..
  
  Disjunct 1 ………………………..Disjunct 2 ……………………..

---

“Hypothetical Proposition is one which connects a consequent with a condition which it does not, however imply to be necessarily fulfilled”

-Joseph Diaz Gergonne (1771-1859)
Modern Classification of Propositions

Modern logicians classify propositions into simple and compound. Let us analyse them in detail.

A. Simple Propositions

Let us go through a few propositions.

- Tajmahal is spectacular.
- A.P.J. Abdul Kalam is the author of Wings of fire.
- Sachin Tendulkar is a cricketer.
- All mobile phones are electronic devices.

These four propositions are examples of four different kinds of simple propositions. A proposition that consists of a subject and a predicate that is attributed to the subject is called a simple proposition. They are:

i. Subject-predicate proposition
ii. Relational propositions
iii. Class membership propositions
iv. General propositions.

i. Subject-predicate Proposition

The proposition ‘Tajmahal is spectacular’ is a type of simple proposition, wherein, the subject is that of which an attribute is predicated. ‘Taj Mahal’ is the subject of which ‘being spectacular’ is predicated. Such types of propositions are called subject-predicate propositions. Thus we can say that a proposition that asserts a quality or an attribute that belongs to something is a subject-predicate proposition. The predicate term simply qualifies the subject term. Nothing more about the subject is predicated here. In such propositions predicate may be an adjective.

ii. Relational Proposition

The proposition ‘A.P.J. Abdul Kalam is the author of the book Wings of Fire’ is a type of simple proposition. Here the subject term and predicate term establish a relationship between each other. The subject term ‘A.P.J. Abdul Kalam’ asserts a
relation of authorship with the book ‘Wings of Fire’.

*Proposition that asserts a relation between constituent terms is called a relational proposition.*

**Relational Statements**

There are various words in ordinary use that express relations e.g. the transitive verbs (build, play, love etc.); words expressing equalities, inequalities and degrees in any respect (greater than, smaller than, equals, matches etc.); words expressing measurement (e.g. of heat).

The following are examples of relational propositions although they are not in strict logical form.

- Shajahan built Tajmahal.
- The value of a triangle equals two rectangles.
- The culture of North Indians differs from that of the South Indians.

It has been found convenient to use special names to distinguish relational propositions according to the number of terms involved. They are:

- Dyadic relation (two-termed relation)
- Triadic relation (three-termed relation)
- Tetradic relation (four-termed relation)
- Pentadic relation (five-termed relation)
- Polyadic relation (more than five-termed relation)

These are very important in mathematics and metaphysics. But the logical technique required for dealing with them is difficult. So cannot be treated in an elementary manner.

**iii. Class Membership Propositions**

The proposition ‘Sachin Tendulkar is a cricketer’ is a type of simple proposition. Here the subject is a member of a class indicated by the predicate term. The subject term ‘Sachin Tendulkar’ is said to be a member of a class of ‘cricketers’. *A proposition which asserts that something/somebody is a member of a given class is called a class membership proposition.*
IV. General Propositions

‘All mobile phones are electronic gadgets’ is simple proposition. In such proposition we find the relation of different classes. In the above proposition the subject term refers to a class of objects ‘mobile phones’ and the predicate term refers to another class of objects ‘electronic gadgets’. So, a general proposition is a proposition which asserts that one class is wholly or partly included in or excluded from another class. A general proposition, therefore, makes an assertion about all or about some of the members of a class.

**Let us check**

Write SP if the following is a subject-predicate proposition, RP if it is a relational proposition, CP if it is a class-membership proposition and GP if it is a general proposition.

- Child labour is a crime.  
- All farmers are contributors to the wealth of nation.  
- Tzunami is catastrophic.  
- Aristotle was the tutor of Alexander the Great.

**Distinction between class membership and general propositions**

It is important to distinguish the propositions ‘Sachin Tendulkar is a cricketer’ or ‘Justin Beiber is a singer’ (Class membership) from such propositions as ‘All cricketers are sportsmen’ or ‘Some singers are Indians’ (General). They are fundamentally in different logical forms. The distinction between the two logical forms, class-membership proposition and general proposition was first stated by a German logician Frege around 1879, and little later independently by an Italian logician Peano.

**Friedrich Ludwig Gottlob Frege** (1848-1925) was a German mathematician, logician and philosopher. He made major contributions to mathematics. He is generally considered to be the father of analytic philosophy.

**Giuseppe Peano** (1858 -1932) was an Italian mathematician. He wrote over 200 books and papers. He was one of the founders of mathematical logic and set theory. The standard axiomatization of the natural numbers is named ‘the Peano axioms’ in his honor.
B. Compound Proposition

Let us analyse the following propositions.

- If you eat few suppers, then you will need few medicines.
- The price of fuel is high and the price of commodities is high.
- Blackberry is either a mobile phone or a fruit.
- A student is not both a hosteler and a day scholar at the same time.

i. Conjunctive Proposition

In the proposition ‘The price of fuel is high and the price of commodity is high’ we can find two simple propositions: (1) ‘The price of fuel is high’ and (2) ‘The price of commodity is high’. The two propositions are joined by ‘and’. The word ‘and’ is a conjunctive. The constituent propositions are called ‘conjuncts’. A compound proposition in which the simple propositions are combined by the conjunctive ‘and’, is called a conjunctive proposition.

ii. Implicative Proposition

‘If you eat few suppers then you will need few medicines’ is a kind of compound proposition. Two simple propositions ‘You eat few suppers’ and ‘you will need few medicines’ are joined by the words ‘If …then’ to make a single proposition. A compound proposition in which simple propositions are combined by ‘If … then’ is called an implicative proposition. In an implicative proposition one of the constituent propositions implies the other. The constituent part that consists of the word ‘If’ is called the ‘implicans’ and that consists of the word ‘then’ is called ‘implicate’.

iii. Alternative Proposition

‘Blackberry is either a mobile phone or a fruit’ is a kind of compound proposition. There are two constituents in this proposition. They are ‘Blackberry is a mobile phone’ and ‘blackberry is a fruit’. They are connected using the words ‘either…or’. A compound proposition in which the simple propositions are combined by ‘either…or’ is called an Alternative Proposition. The components of the alternative proposition are called ‘alternates’.

Activity 4

What differences do you notice between these propositions and simple propositions?

Note down your findings.
Disjunctive Proposition

The proposition ‘a student is not both a hosteler and a day scholar at the same time’ is a kind of compound proposition. ‘A student is a hosteler’ and ‘a student is a day scholar’ are the two constituent propositions. The connecting link of these constituents is ‘not both…and…’. The components of the disjunctive proposition are called the disjuncts. Thus a disjunctive proposition is a compound proposition in which two simple propositions are combined by the words ‘not both…and …’ in a particular manner.

**Let us check**

Identify examples for compound propositions from life situations.

- A man is not both married and bachelor at the same time. \(\text{Disjunctive}\)
- .................................................................
- .................................................................
- .................................................................
- .................................................................

Distribution of Terms in Categorical Proposition

In traditional schedule the subject and predicate of every proposition were regarded as classes. The proposition ‘All scientists are intelligent’ is about relation between the classes ‘scientists’ and ‘intelligent men’. If the reference is to the whole of the class, the subject or the predicate is said to be **distributed**. If the reference is to the part of the class, the subject or the predicate is said to be **undistributed**.
These considerations may be summarised in the mnemonic *Asebinop*, which means A distributes Subject only, E both, I neither, and O predicate only.

**Euler's Circles**

Euler represented the relation between S and P in categorical propositions diagrammatically by means of circles. Hence there are four diagrams corresponding to the four types of proposition - A, E, I, O.

**Leonhard Euler**

(OY-ler; 1707–1783) was a pioneering Swiss mathematician and physicist. He made important discoveries in fields as diverse as infinitesimal calculus and graph theory. He also introduced much of the modern mathematical terminology and notation, particularly for mathematical analysis, such as the notion of a mathematical function.
A proposition

Fig. 1 stands for the A proposition. In an A proposition the class of things denoted by the subject is included in and forms part of the class denoted by the predicate. When we say ‘All men are mortal beings’ the class of ‘men’ is meant to fall entirely within the class of ‘mortal beings’. The bigger circle stands for the denotation of the predicate term ‘mortal beings’ and the smaller circle for the denotation of the subject term ‘men’.

E proposition

In the E proposition the circles representing S and P fall outside each other (see Fig. 2). The proposition E states that the class denoted by the subject is entirely outside the class denoted by the predicate. When it is said ‘No men are perfect beings,’ it is meant that the class of men is completely outside the class of perfect beings. The circles never meet.

I proposition

Fig. 3 represents the proposition I. The two circles intersect or overlap each other. When we assert ‘Some men are wise’ we mean that a portion of mankind is identical with a portion of the class of wise beings. The proposition refers only to those beings that are both men and wise; the common segment of the two circles in the figure.

O proposition

The O proposition is interpreted in terms of circles by Fig. 4. Though the form of the figure is the same as that of Fig. 3, the O proposition does not tell us anything about the common segment. It gives us information only about the outer part of the circle representing S. When we assert ‘Some men are not honest,’ we exclude the subject from the class denoted by the predicate; we refer only to that part of mankind which falls entirely outside the class of honest people.
Reduction of Sentences to Logical Form

A beginner in logic must acquire the skill to reduce sentences to logical form. The hints below will help accomplish this task:

1. The sentences which combine two or more propositions must be **split into simple propositions**.
   Example:
   Gold and silver are precious metals.
   
   \[(A)\] All gold things are precious metals.
   \[(A)\] All silver things are precious metals.

2. The sentences with the words 'alone,' 'only,' 'none but,' and 'none except' are reduced to universal propositions.
   Example:
   Graduates alone are eligible.
   Only Graduates are eligible.
   None but Graduates are eligible.
   None except Graduates are eligible.
   
   \[(A)\] All Graduates are eligible.
   Or
   \[(E)\] No non-graduates are eligible.

3. The sentences with the words like 'unless,' 'except,' 'but,' etc. are reduced to particular propositions.
   Example:
   All metals except one are solid.
   
   \[(I)\] Some metals are solid.

Reducing compound sentences

We come across sentences which combine two or more propositions. Such compound propositions are called exponible by the mediaeval logicians. When reducing them to logical form they must be split into simple propositions as in example 1.

In some propositions the subject is limited by words like ‘alone,’ ‘only,’ ‘none but,’ ‘none except,’ ‘none who is not,’ e.g. ‘Graduates alone are eligible.’ There are two ways of reducing such propositions to logical form: (a) by inverting the subject and the predicate of the given proposition, an A proposition may be formed. ‘All those who are eligible are graduates.’ (b) by taking the contradictory of the given subject as the subject and with the same predicate an E proposition can be constructed. E.g. ‘No non-graduates are eligible.’ In exceptive propositions the predicate is asserted of the whole subject with the exception of certain cases. The application of the predicate is cut off from a portion of the subject by such words as ‘unless,’ ‘except,’ ‘but,’ etc. If the exceptions are definitely known, such propositions are regarded as universal. E.g. ‘All metals, except mercury are solid.’ If the exception is indefinite, the proposition is treated as particular. E.g., ‘All metals except one are solid’ = ‘Some metals are solid.’
4. Words like ‘every,’ ‘each,’ ‘any,’ when used with the subject, signify an *universal proposition*.

Example:

a. *Every* soldier fought valiantly.
   
   =
   
   (A) All soldiers are persons who fought valiantly.

b. *Each* and every one of the students should study hard for examinations.

   =
   
   (A) All students are those who should study hard for examinations.

c. *Any* classroom is a polling station in the election.

   =
   
   (A) All classrooms are polling stations in the election.

5. Propositions with words like ‘all,’ ‘every,’ ‘each,’ ‘any,’ containing the sign of negation ‘not’ are generally regarded as *particular negative* (I).

Example:

a. *All* that glitters is not gold.

   =
   
   (O) Some things that glitter are not gold.

b. *Every* disease is *not* fatal.

   =
   
   (O) Some diseases are not fatal.

c. *Any* excuse will *not* suffice.

   =
   
   (O) Some excuses are not those which will suffice.

6. The absence of any sign of quantity usually signifies a *universal proposition*.

Example:

Blessed are the pure in heart.

   =
   
   (A) All those who are pure in heart are blessed.

7. Propositions with words such as ‘most,’ ‘a few,’ ‘certain,’ ‘many,’ ‘almost all,’ ‘all but one,’ ‘several’ are *particular*. 
Example:

a. Most of the legislators did not attend the meeting.
   = (O) Some of the legislators are not those who attended the meeting.

b. A few students have prepared their lessons.
   = (I) Some students are those who have prepared their lessons.

c. Certain animals are poisonous.
   = (I) Some animals are poisonous.

8. Propositions containing words like ‘mostly,’ ‘generally,’ ‘frequently,’ ‘often,’ ‘perhaps,’ ‘nearly’ ‘always,’ ‘sometimes’ are particular.

Example:

a. Indians are mostly literates.
   = (I) Some Indians are literates.

b. Students sometimes engage in extra-curricular activities.
   = (I) Some students are those who engage in extra-curricular activities.

9. Sentences beginning with the word ‘few’ are to be reduced to particular negative.

Example:

a. Few books on logic are easy to read.
   = (O) Some books on logic are not easy to read.

b. Few persons are not selfish.
   = (I) Some persons are selfish.

10. Sentences with words like ‘seldom,’ ‘hardly,’ ‘scarcely’ should be reduced to particular.
Words like ‘seldom,’ ‘hardly,’ ‘scarcely’ have a negative meaning. When they occur in sentences not containing any negative signs, those sentences should be reduced to O. But when they are found in sentences containing a sign of negation, the sentences should be reduced to I proposition.

Example:

a. Unasked advice is seldom accepted.
   =
   (O) Some pieces of unasked advice are not accepted.

b. Prosperous lawyers are not seldom honest.
   =
   (I) Some prosperous lawyers are honest.

Let us check

Let us see how the quotes at the beginning of the unit are reduced.

“Neither a borrower nor a lender be
For loan oft loses both itself and friend
And borrowing dulls the edge of husbandry.”

• No man is the one who should be a borrower. E
• No man is the one who should be a lender. E
• ........................................
• ........................................
• ........................................

Reduce the underlined sentences in the illustrated dialogues between father and his son and doctor and his patient into logical form. (Page 30)

Dialogue between father and son.
• ........................................

Dialogue between doctor and patient.
• ........................................

Summary

Proposition is the building block of logical reasoning. It is a logical sentence in ‘subject-copula-predicate’ form. But it is different from a grammatical sentence. Propositions are broadly classified in two ways. (1) The traditional classification consists of four categorical propositions and two conditional propositions. (2) The modern classification includes simple and compound propositions. In categorical proposition subject and predicate are either distributed or undistributed. Euler’s circle illustrates the distribution of terms in A,E,I and O propositions. The ordinary sentences can be transformed to logical sentences using ‘S is P’ format.
Preposition at a Glance

- Proposition -
  A logical sentence

Categorical

Universal Affirmative (A)
Universal Negative (E)
Particular Affirmative (I)
Particular Negative (O)

Quantity

Affirmative

Quality

Universal

Particular

Conditional

‘If’ clause

Antecedent

Consequent

Hypothetical

Disjunctive

The constituents are disjuncts, separated by either... or...

Simple

Modern Classification

Subject - Predicate

Relational

General

Class membership

Compound

Conjunctive

Implicative

Alternative

Disjunctive
I can

- distinguish between logical proposition and ordinary language sentence.
- identify the limitations of ordinary language.
- classify proposition.
- construct propositions out of daily life situations.
- illustrate distribution of terms using circles.
- form propositions from ordinary language sentences.

Let us assess

Exercise 1

1. Here are four news headlines from a daily. Identify the logical proposition among them.
   a. India to overtake China as the world’s most populous country by 2050.
   b. Kudamkulam Nuclear Power Plant becomes operational.
   c. Rithy Panh is Asian filmmaker of the year.
   d. Indo-Russian joint military exercise ‘INDRA2013’ kicked off in Rajastan.

2. The structure of a categorical proposition is ____________.
   a. Subject-verb-object
   b. Subject-verb-predicate
   c. Subject–copula-predicate
   d. None of the above

3. Identify the subject, copula and predicate from the given categorical proposition. ‘Some scientists are not humanitarian.’

4. Conjunct : conjunctive proposition, disjunct : disjunctive proposition. If so, antecedent and consequent : ______________.
   a. simple proposition
   b. hypothetical proposition
   c. class membership proposition
   d. general proposition.
5. Find out the class membership proposition from the following.
   a. If you destroy forest then you destroy our planet.
   b. Tajmahal is spectacular.
   c. Aristotle was the tutor of Alexander the Great.
   d. Kathakali is a classical art form of Kerala.

6. Choose the diagram that represent Particular Affirmative proposition.

   a. ![Diagram a]
   b. ![Diagram b]
   c. ![Diagram c]
   d. ![Diagram d]

Questions 7-10: Each of the questions has an ordinary sentence followed by two logical propositions I and II. Consider the ordinary sentence and logical propositions. Decide which of the propositions follows from the sentence. Write answer a-d in the space.

a) If proposition I follows
b) If proposition II follows
c) If neither proposition follows
d) If both the propositions follow

7. Ordinary sentence : Graduates alone are eligible.
   Logical propositions : ........................................
                         I. All graduates are eligible.
                         II. No non-graduates are eligible.
8. Ordinary sentence: Indians are mostly literate.
Logical propositions: ..............................................
I. All Indians are literate.
II. Some Indians are literate.

9. Ordinary sentence: A few students have prepared their lessons.
Logical propositions: ..............................................
I. All students are those who prepared their lessons.
II. No students are those who prepared their lessons.

10. Ordinary sentence: Unasked advice is seldom accepted.
Logical propositions: ..............................................
I. No pieces of unasked advice are accepted.
II. Some pieces of unasked advice are accepted.

1. The passages given below are from a newspaper. Reduce the underlined sentences into logical form.

The pineapple is a highly popular tropical fruit. The plant grows to a height of 3 or 4 feet and has a crown of spiky leaves. The pineapple is a fruit of the summer season. It is abundantly found in all south tropical countries.

The seagull can drink salt water because it has special glands that filter out the salt.

Kangaroo rats never drink water. Like their relative, the pocket mouse, they carry their own water source within them, producing fluids from the food they eat and the air they breathe.
Exercise 2

1. Prepare a seminar report on the topic 'ordinary language sentences and logical propositions.'

2. Prepare a chart showing the classification of proposition.

3. Illustrate the distribution of terms using Euler's circle and explain.

4. Compare hypothetical propositions and implicative propositions in traditional and modern classification respectively.