HUMANISM AND LOGIC

COURSE CODE: SGB24UC201SE

Skill Enhancement Course
For FYUG Programmes
Self Learning Material

SREENARAYANAGURU
OPEN UNIVERSITY

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The State University for Education, Training and Research in Blended Format, Kerala

Vision

To increase access of potential learners of all categories to higher education, research and training, and ensure equity through delivery of high quality processes and outcomes fostering inclusive educational empowerment for social advancement.

Mission

To be benchmarked as a model for conservation and dissemination of knowledge and skill on blended and virtual mode in education, training and research for normal, continuing, and adult learners.

Pathway

Access and Quality define Equity.

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Humanism and Logic

Course Code: SGB24UC201SE

Semester - III

Skill Enhancement Course
For FYUG Programmes (Honours)
Self Learning Material
(With Model Question Paper Sets)

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Message from Vice Chancellor

Dear Learner,

It is with great pleasure that I welcome you to the Four Year UG Programme offered by Sreenarayanaguru Open University.

Established in September 2020, our university aims to provide high-quality higher education through open and distance learning. Our guiding principle, 'access and quality define equity', shapes our approach to education. We are committed to maintaining the highest standards in our academic offerings.

Our university proudly bears the name of Sreenarayanaguru, a prominent Renaissance thinker of modern India. His philosophy of social reform and educational empowerment serves as a constant reminder of our dedication to excellence in all our academic pursuits.

Committed to promoting value-based education and fostering a humanistic outlook across boundaries, the University has introduced this Skill Enhancement Course, Humanism and Logic, for FYUGP learners. The syllabus has been designed to emphasise interconnectedness rather than divergence, reflecting the University's commitment to social harmony. The course underscores that diversity is important and that a symbiotic coexistence is the logical conclusion. The second part of the course focuses on the fundamentals of Logic, which are essential for meaningful and reasoned dialogue. Interestingly, Humanism and Logic share a natural thematic connection: Logic is necessary to attain Humanism, and Humanism cannot thrive without Logic. The University therefore celebrates both. This course represents the first step towards a broader vision of sustainable peace.

Our teaching methodology combines three key elements: Self Learning Material, Classroom Counselling, and Virtual modes. This blended approach aims to provide a rich and engaging learning experience, overcoming the limitations often associated with distance education. We are confident that this programme will enhance your understanding of statistical methods in business contexts, preparing you for various career paths and further academic pursuits.

Our learner support services are always available to address any concerns you may have during your time with us. We encourage you to reach out with any questions or feedback regarding the programme.

We wish you success in your academic journey with Sreenarayanaguru Open University.

Best regards,

Dr. Jagathy Raj V.P.
Vice Chancellor

01-10-2025

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Unit 1

Foundational Terms

Learning Outcomes

Upon completion of the unit, the learner will be able to:

- understand the concepts of Sradha, Agape, kenosis, karuna, rahma, Insaniyya, Anukampa, Ubuntu, and Ahimsa in different traditions
- discuss the European ideas of equality and emancipation
- appreciate Dhammapada, Basheer's short story, and Narayanaguru's poems based on the concepts and values learned
- develop a critical understanding of different ecological perspectives (Gandhi, Thoreau, and deep ecology)
- express the values of compassion, equality, and environmental sensitivity in their living and working contexts
- evaluate and critically analyse the ongoing public debates, drawing on the above conceptual insights

Prerequisites

Human beings possess an innate moral sensitivity that makes them respond to the suffering, danger, or misfortune of others. Even without personal connection or gain, people often feel compelled to help, pray, or act for those in need. This universal tendency to empathise and extend compassion reflects the more profound unity of human life. From fishermen risking their lives to rescue flood victims to nations extending aid to disaster-stricken regions, such acts reveal the strength of shared human values that transcend the boundaries of religion, culture, and geography. They show that kindness, care, and moral responsibility are not learned from institutions

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alone but arise from the very essence of being human. This natural sense of empathy and solidarity is the seed from which humanism grows. Humanism is built upon the recognition of human dignity, equality, and moral worth. It reminds us that every individual is part of a larger moral community in which the happiness and suffering of one person affect all. Understanding this interconnectedness encourages reflection on how values like compassion, justice, freedom, and mutual respect guide human life. These values form the moral and philosophical foundation upon which human civilisation and ethical progress stand.

Keywords

Sraddha, Arul, Kenosis, Insaniyya, Rahma, Anukampa, Ubuntu

Discussion

1.1.1 Sraddha/Care - Katha Upanishad

Most of the knowledge a person gains in daily life comes indirectly from a teacher or other sources, such as books and texts. Only certain pieces of knowledge are acquired directly by means of incessant observation and scrutiny with the help of evidence. In all the other instances, a person/student will have to follow a learned person/teacher who has more knowledge and authenticity in those particular topics. At the initial stage of learning, a student may not have all the data needed to fully understand a specific subject. These data can be overwhelming and confusing. At the primary stage of learning, the student should show complete trust and faith in the words of those trustworthy persons (apta/preceptor) to make their academic pursuit easier and more feasible. This trust and attention is generally called sraddha in Indian philosophy.

In some other instances, this sraddha can also be denominated as care towards other beings. In the Kathopanishad, a king named Vajasrava performed a sacrifice in which all his possessions were to be given away to consummate the full advantage of that sacrifice. The king was giving away his many cows, which were weak, impotent, and unable to lactate, to the brahmins. Having seen all these irresponsible deeds, his son, Nachiketa, asked him to whom the king was going to give him. Nachiketa's question is a response to the king's apathetic approach towards the people he is trying to bestow gifts on. Moreover, this is his protest against abandoning the cattle, which need special care and attention.

The king answered that he would give Nachiketa to Yama, the god of death. Hearing this, Nachiketa went to the abode of Yama and discussed mundane and metaphysical problems. The questions of Nachiketa constitute the purport of the Kathopanishad. In the Kathopanishad, Nachiketa is depicted as a curious, inquisitive child. His investigations concern the agonies and troubles of human life. The god of death himself later praises Nachiketa for his investigative approach to the tribulations of human beings. The god also aspires that people like Nachiketa, who have Sraddha, are inevitable in this world. This Sraddha of Nachiketa is a mark of humanity found in the Kathopanishad. Sraddha motivates people to care for one another and to raise questions bravely when justice is betrayed.

1.1.2 Dharmapada/Dhammapada

Dharmapada/Dhammapada is a book containing the teachings of the Buddha to his followers. This book is included in the Khuddakanikaya of Suttapitaka. This text consists of twenty-six chapters divided based on topics, and contains four hundred and twenty-three gadhas/ slokas. The name Dhammapada means the 'path to the virtue or doctrine of Buddha'. Dhamma, the Pali equivalent of Sanskrit 'Dharma', refers to the teachings of the Buddha. The term 'pada' can be roughly translated as 'way' or 'path'. It is the most eminent book in Buddhist literature, whose ethical and moral vision remains relevant to the conception of a peaceful society.

The chapters in the Dhammapada discuss the Pairs of choices, Heedfulness (Jagrata), Mind, Flowers, Fools, Wisemen, Arhat, The thousands, Evil, Punishment, Old age, Self, World, Buddha, Joy, Affection, Anger, Impurity, Justice, Path, Miscellaneous, Woe, Elephant, Craving, Ascetic, and the Holy man respectively. The verses in the text are not attributed to any particular context but stand independently, exhorting the various means necessary for leading a peaceful and virtuous life. All the teachings aim to provide insights that enable human beings to live a peaceful, calm, and moral life, thereby allowing them to play a rightful role in society.

The text hints at the outcomes of both virtuous and evil choices. Virtuous and positive thoughts about oneself and one's experiences have a positive effect, enabling us to lead a more vibrant and calm life. In contrast, negative thoughts about one's past experiences reap nothing but hatred and stress, leading to self-destruction. Our choices always come in pairs, viz, the right choice and the wrong choice. If we make the right choices, our lives will flourish spiritually, and the bad choices will lead to the destruction of inner peace and calamities.

Heedfulness, known as apramada or jāgrata, is regarded as the foundation of higher spiritual development. A person who practices apramada remains alert and conscious of their actions, always striving to act with righteousness and moral awareness. Such vigilance leads to inner peace, courage, fame, and spiritual joy. The heedful individual is not disturbed by the attractions of the material world and remains unaffected by the sufferings and disappointments that trouble ordinary people. The discipline of the mind is central to spiritual growth. Training the mind to focus on good and virtuous thoughts is a higher achievement than conquering thousands of people. The human mind often drifts toward harmful or meaningless thoughts; therefore, it must be guided and disciplined

to concentrate on what is good and beneficial. A disciplined mind brings clarity, peace, and stability, while an undisciplined one, filled with disturbing memories and negative experiences, prevents a person from attaining a calm and harmonious life.

Uncontrolled inner drives are another obstacle to spiritual life. An untrained mind is constantly pulled towards sensual drives. In controlling such drives, the trained mind should be directed to the right target by employing intellect and reason, like arrows. The mind which lingers over virtue and rightfulness will bestow more qualities than can be bestowed by one's own parents or relatives. Those who are stranded by the temptations of the world will be wiped out as in a flood.

The fools who indulge in evil deeds will face ruthless repercussions in their own lives and in the lives of others. Such deeds should be avoided in one's life. The evil deed will lead to repentance and, eventually, tears, so a virtuous person should abstain from such deeds. Actions that bring joy to oneself are virtuous. Wrong actions may bring happiness for a short time, but they will soon produce negative consequences for the doer.

The chapter about the Wise Men expounds on good people and good deeds. The Wiseman preaches about the right ways, and their advice should be listened to with great care. A Wiseman leads a truthful life, abstains from foul language, and relinquishes all urges for money or offspring. He has an unwavering mind that is not touched by praise, insult and humiliation. The jagrata on the proper aim is the only business of the Wiseman. Such a person's mind becomes a seat of solace, and all his words and actions become seats of tranquillity.

The chapters on 'evil' and 'punishment' adopt a more humanistic approach. A person should be prompt in doing good deeds, lest evil thoughts rush into her mind and displace them. Even though wrongdoing is once committed, one should be vigilant not to repeat it. On the contrary, good deeds should be repeated incessantly. The wrongdoings may give temporal joy but will soon lead one to destruction; meanwhile, the good deeds may not seem joyful at first, but they will eventually lead one to good merits or punya. The deeds, either good or bad, are similar to water drops; a single drop may seem harmless or useless, but they will gather slowly and will accumulate together to bear corresponding results. Evil deeds should be omitted as an unguarded wealthy merchant avoids perilous trade routes or a man avoids poison.

Wrongdoings will always have corresponding repercussions. One should be very careful not to hurt other beings. All living beings aspire for their own happiness. If anyone hinders this happiness or kills a being, then it is wrong. Such a person will definitely face the consequences of her deeds in future. So, the care for others should be observed not only as a means to lead a good life but also as a means to avoid unnecessary repercussions that will jeopardise one's own life. The text warns that evil-doers will undergo great suffering, loss of wealth, accidents, physical and mental illness, loss of friends, etc. No artificial methods will help an evil doer to redeem herself from her past if her mind is not purified. The ascetic life and different kinds of penance, such as cutting one's hair, smearing dirt on the body, sleeping on the ground, etc., will not help a person unless her mind is devoid of all earthly desires.

The chapter 'World' says that good people should entertain themselves by giving away their wealth to those in need. The miser will never see the enjoyment of heaven because they shun altruism during their life on earth.

In the chapter 'Buddha', it is stated: "Avoid all evil, cultivate good, purify your mind; this sums up the teachings of the Buddha" Doing good and avoiding evil deeds are the most virtuous things in this world, which constitute the most profound teaching of the Dhammapada. The one who inflicts pain on others and causes insult to others can never be a monk. A good person should elevate oneself from conquests because the conquests bear hatred, and the defeat bears pain and sorrow. "There is no fire like lust, no sickness like hatred, no sorrow like separateness, no joy like peace. No disease is worse than greed, no suffering is worse than selfish passion." A good person should keep these teachings in mind to lead a healthy and peaceful life. One should conquer hatred with love, defeat evil with virtue, vanquish greed with charity and win falsehood with truth.

The exhortation to control oneself is a common theme throughout the text. It is the key to achieving all the virtues promised by Buddhism. Advancement in spiritual life can be attained only by restraining the mind, because the mind is the entity that drags a person into all kinds of unwanted deeds. A good person has to show purity in her words, deeds and thoughts; only a rightful and focused mind can help one to attain this. Most of the text discusses the importance of controlling the mind and focusing on the right goal in life. Such discipline helps a human being lead a peaceful and serene life and bring happiness to oneself and others.

1.1.3 Agape/ Empathetic Love

Agape is a Greek word most commonly used in the New Testament. Usually, this word has two meanings.

1. God's unconditional love towards man
2. Selfless love between men

The term agape also refers to the fellowship among followers of Jesus.

In the first book of Corinthians, Paul commemorates the eucharist in which Jesus gathered all his disciples, washed their feet and broke bread with them. This communion represents the confidence and love that each person bestows on the other. So, the second meaning of the word agape gets a social force that keeps all the members of a society together.

St. Paul explains the meaning of the Eucharist in his first letter to the Christian community of Corinth, in relation to a social problem faced by a section of the Corinthian Ecclesia (I Cor 11:17-34). Some faithful had drawn the apostle's attention to it. Poor Greek widows of the community were disregarded by a rich section in the fellowship meal during the Eucharistic celebration. This disrespect was against the ideal of communion in the Eucharist. St. Paul reminded them of Jesus' insights into love. In this exhortation, he describes the context and meaning of sacrificial love as established by Jesus at the Last Supper. Without this filial love and sacrificial attitude, Eucharistic celebration and Christian liturgical living are impossible.

Jesus gives his disciples the command of love in his farewell speech at the Last Supper. "As I have loved you, you love each other" is the command of agape (Jn. 13:34-35). St. John, the beloved disciple of Jesus, calls God Love (I Jn. 4:7-8). Agape is the synonym of God in Johannine Theology. This experience of Agape in communion is elaborated by St. Paul in his Letter to the Corinthians (1 Cor 13:1-13) as a Hymn of love. This hymn is a test for the faithful to see whether they are in a true sense of love, as Jesus describes it, namely, agape. According to St. John, those who do not dwell in agape do not inhabit God. Jesus teaches that there is no greater love than the one who sacrifices one's life for a brother/sister. In his parable of the Good Samaritan, Jesus explains who this brother/sister/neighbour is. This is the one who risks their life to care for the other. Agape is the answer to the question of Cain: 'Am I the custodian of my brother?'. Agape is the answer, i.e., Yes, I am.

1.1.4 Kenosis/Self-emptying

The term Kenosis is closely associated with the self-emptying or self-renunciation of Jesus Christ. In Christian theology, Jesus is considered the son of God, but he renounces this status to fulfil his destiny. Jesus was supposed to be crucified after undergoing rigorous persecution to fulfil the prophecy. On the verge of crucifixion, Jesus renounced his divine nature and became just a tool of the Father/God and surrendered himself to the will of God so that God could salvage the lost humanity through Jesus. This self-renunciation or self-emptying is done by Jesus Christ for the sake of others. If Jesus had maintained his glory and grandeur, he could never have been crucified and redeemed the people from their ill-fate. But Jesus cared for others and made the greatest sacrifice to uplift people. This act of self-renunciation serves as an example for every human being to follow, contributing to the moral and spiritual advancement of society.

In literary studies, kenosis refers to the feeling experienced by the reader of a poem. It is the experience of the emptying of the ego of the reader.

The doctrine of kenosis seeks to explain why the Son of God chose to relinquish his divine attributes to assume human nature. Specifically, it refers to characteristics of God considered incompatible with becoming human. For example, God's omnipotence, omnipresence, etc. Theologians who support this doctrine urge believers to imitate Christ's self-emptying.

1.1.5 Insaniyya / Humanity

The oneness of humanity is essential for the existence and a happy life of human society. That is why all scriptures and religious philosophies proclaim that human society is a society. In the Qur'an, humans are referred to as insan. Insaniyya relates to the manners people should adopt to accept one another. Insaniyya refers to humane content. There is a chapter in the Quran called Insan.

Banu Adam, meaning the children of Adam, is another usage of human society in the Qur'an. The Qur'an says that all human beings are born from the first man, Adam. The Qur'an records that Allah honoured the children of Adam. The rule in Islam is to keep this sense of insaniyya in any action. Even if the clan, caste, and creed are different, we should accept the insaniyya in everyone and live together. There should be no polarisation

in the name of religion or community. In the Qur'an, there is a verse, Lakum Deenukum Waliya Deen, which means "You have your religion and I have my religion". Mutual respect should be maintained not only during life but also after death. That is the message of insaniyya. For instance, while carrying the dead body of a Jew, Prophet Muhammad stood up respectfully. The companions were surprised that they showed respect to the dead body of the enemy. Then the Prophet said, 'Isn't it a human body?' This is the meaning of humanity or insaniyya. In the same way, the Qur'an says that it is necessary to create conditions for all people to live harmoniously and to cooperate in good and not to cooperate in evil.

1.1.6 Rahma / Mercy

Allah is the Arabic word for God. The word Allah has no dual or plural forms; it means the one and only God. Many attributes of God are found in the Qur'an. Names like Rahman and Rahim are essential among them. The words Rahman and Rahim have the same meaning: one who has a lot of Rahma (mercy). Those words can be translated as "Paramakarunikan" and "Karunanidhi" (Most Gracious, Most Merciful). In the first chapter of the Qur'an, Al-Fatiha (The Opening), Rahman and Rahim are said to be the epithets of Allah. The rule is to say Bismi when starting the recitation of the Qur'an, like when starting any good deed. Bismi can be recited as Bismillah Rahmani Rahim, meaning, "In the name of God, the Most Gracious, and the Most Merciful."

God's mercy should always be remembered in daily life, during the recitation of the Qur'an and in prayers. When a Muslim prays five times during the day and night, they mention God's mercy seventeen times in Al-Fatiha and when reciting the Qur'an. In the Qur'an, it is repeatedly said that people should be merciful. Prophet Muhammad has said, "Show mercy to all on earth, and God will show mercy to you". The Qur'an says that the Prophet is Rahma (Surah Al Abia 21/107). In the Holy Quran, revealed as a guide for human society, the holy text is described as Rahma (Mercy) (Quran 17/82). From all this, we can understand the importance of mercy. Our lives should be compassionate. All words, actions, and thoughts should be empathetic. Do not harm any living being. The Prophet said that a person who gave water to a thirsty dog was admitted to heaven by Allah, and a person was admitted to hell for tying up a cat and starving it. The Prophet reprimanded the person who had taken some of the baby birds from the mother bird and ordered them to be returned to the mother and released. Islam teaches to treat animals, birds, and other creatures with mercy (Rahma).

The most incredible mercy is to help those who suffer in life. The Prophet said that striving for the welfare of the poor and widows is more virtuous than praying and meditating in the mosque of Madinah. The bottom line is that not only are spirituality and worship virtues, but Allah loves human service and compassion more than that. Mercy is what the merciful God teaches man. Prophet Muhammad taught that children should be treated with mercy. A companion who saw the Nabi kissing his child said, "I do not kiss my children." Then the Prophet said, "It is because you do not have compassion in your heart." The Qur'an says that children should pray for their aged parents as follows: Oh Creator, shower mercy (Rahma) on them, as they (parents) nurtured us when we were young (Quran 17/24).

1.1.7 Anukampa / Compassion— Anukambadasakam

Narayanaguru upheld a philosophy based on compassion. The ideal of care for others is one of the basic principles of humanism. We can find these concepts in his works like *Atmopadesasathakam*, *Jivakarunyapanchakam*, *Ahimsa*, *Sadacharam*, etc. 'The deed of one for his own sake should bring joy to others' This was his motto.

"Whatever one does for one's own happiness. Should be conducive to the happiness of others as well", *Atmopadesasatakam*, 24.

Anukampadasakam is the best example of the announcement of these ideals in ten slokas. The first five slokas discuss anukampa or compassion. The latter five slokas discuss the compassion of great personages of different religions around the globe. He commemorates Sri Sankara, Sri Krishna, Jesus Christ, Muhammad, and some Tamil Saiva saints in this context.

The first sloka entreats the God to confer sufficient compassion, so that we will not harm even an ant. When the heart is filled with grace, the life too becomes filled with blessedness. When we become devoid of anpu or love, then problems start to emerge in our lives. The anpu is terminated due to the darkness of ignorance. This is the sole cause of all miseries. Grace, love and compassion are one in reality. And this reality is the illuminating star of our life. The one who has arul/love is the jivi/living being. This maxim should always be remembered. Metaphorically speaking, compassion is the Kamadhenu, which bestows all the desires of people and Kalpatharu, the tree which gives everything to us.

In the fourth sloka, Narayanaguru draws on ideas from Thirukkural. One who lacks love is just a foul-smelling creature with skin and bones.

In the fifth sloka, he says the shadbhavavikara/six phases are found everywhere, but the wisdom is not affected by them. Six phases denote the different states that everything in this world undergoes.

1. Emergence
2. Existence
3. Development
4. Transformation
5. Waning
6. Destruction

Narayanaguru states that these states are not applied to wisdom. A person with rata/love will lead a virtuous life. The reputation of a man with arul will survive even after his death. So, Arul and Anukampa should be upheld by everyone.

Narayanaguru reminds us that Krishna, who taught the Gita, and Sankara, who wrote the commentaries, have preached this compassion. Jesus Christ and Muhammad have also taught this compassion. Thirujnanasambandhar, Appar, Manikkavachakar, and Sundharamurthi Nayanar, collectively known as the Nalvar, have also taught this compassion.

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1.1.8 Excerpts from

ANUKAMPADASAKAM

[This work was dictated by Guru to his disciple Gurudas (Later Swami Poornananda) while in Sivagiri about 1920.]

1

Such compassion that even to an ant

Would brook to befall Not the least of harms, Confer on me;

O mercy-maker,

Along with the thought

That from your sacred presence

Never to go astray

2

Grace does bring about True blessedness in life. A heart empty of love

Spells disasters

Of every kind. Darkness effaces love and is the root cause of all miseries.

It could be the root cause

Of everything (dismal) in life.

3

Grace, Love, Compassion-

All these three

Have one reality alone

For their meaning content, the star that is life's saviour. "He who loves is

Who really lives"

Do repeat this sacred Nine-syllabled charm.

1.1.9 Karuna – Buddha

Human beings are a social species. We have evolved that way and should remain the same to survive in this world. So, the association between two or more human beings is indispensable. Many human emotions help us build this sense of human association. Consideration for human feelings or kindness is the most essential aspect in creating this association between people. Integration of human society relies on this value. Without kindness, human civilisation will collapse.

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Buddha, one of the greatest philosophers of India, taught and disseminated this value to bring peace among people. The kindness/karuna of Buddha not only pertained to humankind but also enveloped all sentient species. Thus, the karuna of Buddha put forward a great sympathy towards all creatures. He prohibited people from killing the creatures for religious customs. Buddha was a great pragmatic social reformer. His whole philosophy is centred on the problem of human suffering. He pondered over the miseries of human beings and wanted to put an end to them. He renounced all his princely privileges and enjoyments to find a remedy for the sufferings of humankind. After his long years of search for an answer to the tribulations of mankind, he found out that avidya/ignorance is the primal cause of all sufferings. To put an end to this ignorance, he advocated a lifestyle based on the eightfold path. And this path consists of the following maxims:

1. Right view
2. Right resolve
3. Right speech
4. Right conduct
5. Right livelihood
6. Right effort
7. Right mindfulness
8. Right concentration

All these maxims pertain to the care of others in all respects. The right vision, right speech, right action and right livelihood give special attention to the manner in which a person is expected to live his/her life. And this lifestyle places great importance on each person's personal discipline. This also provides care and respect to others who live around us. The whole philosophy of Buddha thus revolves around the central concept of karuna/ kindness. Ahimsa, or non-violence in the word, thought, and deed, is the central theme of Buddhism.

The Theravada and Mahayana traditions have their own views on karuna/mercy. The Theravada tradition envisages a fourfold division of meditation as follows.

1. Karuna (universal pity)
2. Maitri (universal friendship)
3. Mudita (happiness in the prosperity and happiness of all)
4. Upeksha (indifference to any kind of preferment of oneself, his friend, enemy or a third party)

These four are called the four sublime meditations or brahmavihara. The karuna and maitri are closely associated as they represent the two reciprocal sides of the coin of happiness. Karuna inspires us to refrain from causing harm to others. Maitri motivates us to bring joy to the lives of other creatures around us. Karuna is the essential path

a person should take first to attain maitri. Karuna leads a person to maitri. Karuna is not only directed towards friends, but also towards enemies and strangers. In karuna, a person's own safety becomes intertwined with others' safety.

The Mahayana tradition considers karuna and prajna as the two essential qualities a person must cultivate to fulfil their journey to become a Bodhisattva.

1.1.10 Emancipation

One of Rousseau's most famous statements is that "Man is born free; and everywhere he is in chains". Wherever there is bondage, we can think of emancipation. We could think of those who need emancipation: the proletariat, women, slaves, queer people, Dalits and so on. We could also think about the nature of emancipation. What exactly is meant by this concept?

The word 'emancipation' is derived from the Latin word emancipo, which means 'the act of liberating a child from parental authority'. In Roman law, emancipation referred to the freeing of a son or wife from the legal authority of the father of the family. Literally, it means 'to give away ownership'. Thus, conceptually, it implies giving away one's authority over someone else. Through this process, the person being emancipated becomes free. Legally, this term refers to the freeing of someone from another's control.

Emancipation is often thought of in conjunction with other terms such as rights, reason, revolution, science, and freedom. Broadly, it is used to indicate efforts to achieve economic equality, social and political rights, etc. Historically, this term has undergone many changes. In the eighteenth century, it was used in relation to the Enlightenment. Enlightenment was defined as a process of emancipation. In his famous article, "What is Enlightenment", Immanuel Kant defines enlightenment as "man's release from his self-incurred tutelage". He saw tutelage or immaturity as man's inability to make use of his understanding without the direction from another. For Kant, immaturity's cause lies not in lack of reason but in lack of courage to use it without the direction from another.

Enlightenment thus involved a process of becoming independent or autonomous. For Kant, this autonomy was based on one's use of reason.

In the nineteenth century, it was linked to the emancipation of women and workers. As mentioned above, one central concept linked to emancipation is revolution. From 1776, the revolution evolved as a concept and practice. It aimed at human emancipation. Karl Marx considered human emancipation as central in his thinking. As a process, it envisaged social change rather than mere shifts in government. It is not a mere revolt. It aims at equality. Thus, for Marx, revolution becomes emancipatory through what is made of it, i.e., communism. He separated political emancipation from human emancipation. Human emancipation is emancipation from necessity (crude physical needs). Hannah Arendt, in her work 'On Revolution,' argues that change is revolutionary only if it creates something new. It will bring greater freedom and greater equality.

In political theory, the idea of emancipation has been understood as a process of establishing human rights. There are interesting debates around this term. First, we find an antagonism between liberalism and Marxism. Then we see conflicts between

Enlightenment thinking and critiques of the Enlightenment.

1.1.11 Ubuntu

The word 'Ubuntu' belongs to the African language group Nguni Languages, such as Zulu, Xhosa and Ndebele. Etymologically, it is a combination of two words: 'ntu' and 'ubu'. 'Ntu' means human. 'Ubu' is a prefix term in Nguni languages. This prefix functions like 'ity' in the word human-ity (humanity). Hence, the word Ubuntu primarily means 'humanity', combining the senses of 'humanness' and 'humaneness'. Linguistically, this word suggests the origin of an abstract noun out of a concrete one. In African literature, this word is a part of writings about humanism in general.

In African philosophical literature, ubuntu broadly conveys the concept of human moral existence. Morality is the expression of the ethical relations between human beings and their relations with the world around. Human moral existence thus reveals the fundamental relational nature of human beings. As an indication of this relational human moral existence, ubuntu explains the human nature in terms of the interconnectedness of human persons.

A.C. Grayling explains this specific nature of human beings in relation to the word ubuntu in the following way:

"The constellation of ideas captured by ubuntu includes kindness, goodness, generosity, friendliness, compassion, caring, humane attitudes and actions and the recognition of interdependence, which confers a freely claimed entitlement and, simultaneously, a willingly accepted obligation to reciprocity. The briefest encapsulation of these humanistic values is the assertion- 'I am, because of You'". This assertion- 'I am because of you'- shows the interconnectedness of human nature. African philosophical writings generally highlight this sense of ubuntu.

N. Makhudu, African thinker and author, writes about ubuntu by emphasising this specific sense of the word in her study "Cultivating a Climate of Co-operation through Ubuntu". According to her, harmony, co-operation, and a shared world-view collectively make up the ubuntu culture. In her view, in the sense of ubuntu, a person is a person only because of and in relation to other persons.

The concept of ubuntu suggests that individuality is always expressed in a collective sense. As the author, Erasmus D. Prinsloo, points out in his article "Ubuntu Culture and Participatory Management", there is no dualism in ubuntu because human beings acquire their rationality and morality from their community life. The concept of ubuntu thus highlights the communitarian aspect of human nature and critically engages with the notion of the individual human being prevalent in Western humanistic traditions. In Ubuntu culture, a human being is defined dynamically and relationally, in contrast to the static definition of a person as one who possesses human nature and individual reasoning capability. According to this view, humanism, in general, has remained individualistic, whereas, in the light of ubuntu, it is communitarian.

Recap

- Humanism values compassion, reason, and unity beyond differences.
- It stresses interdependence and shared human values.
- Sraddha means deep faith and moral commitment.
- It involves care, trust, and respect for truth.
- Nachiketa's story shows sraddha as moral courage.
- True sraddha combines inquiry with compassion.
- The Dhammapada teaches moral living and mental discipline.
- Good deeds bring peace; evil brings suffering.
- Compassion and self-control form the basis of Buddhist ethics.
- Hatred ends only through love and truth.
- Agape means unconditional love in Christian ethics.
- It teaches love for others as a divine duty.
- True agape is patient, kind, and selfless.
- Kenosis means self-emptying or humility.
- It is giving up ego to serve others.
- It brings empathy and moral transformation.
- Insaniyya stands for universal humanity in Islam.
- Respect for all humans is a moral duty.
- Islam teaches cooperation in goodness and peace.
- Rahma means divine mercy and compassion.
- Acts of mercy are greater than rituals.
- Showing mercy reflects God's nature in humans.
- Anukampa means compassion in Sree Narayana Guru's philosophy.
- Compassion should extend even to the smallest creature.
- Love, grace, and compassion are one reality.

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- Guru honoured all saints for their compassion.
- Karuna is universal compassion in Buddhism.
- It extends kindness to all living beings.
- Karuna with wisdom leads to enlightenment.
- The Brahmavihara practices cultivate love and peace.
- Emancipation means freedom from all forms of bondage.
- It stands for autonomy, equality, and dignity.
- It liberates the weak and oppressed.
- True freedom is the highest goal of humanism.

Objective Questions

1. What does Humanism mainly emphasise?
2. Which quality of humanism promotes mutual respect and cooperation?
3. What does the term Sraddha mean in Indian philosophy?
4. Which value does Sraddha represent, along with moral courage?
5. Who is the ideal example of sraddha in the Upanishads?
6. What combination defines true sraddha?
7. Which text teaches moral discipline and mindfulness in Buddhism?
8. According to the Dhammapada, what leads to peace?
9. What does the Christian term Agape mean?
10. What does Agape teach about human relationships?
11. Which qualities mark true Agape?
12. What is the meaning of Kenosis in Christian ethics?
13. What is the result of practising Kenosis?
14. What does the Arabic term Insaniyya stand for?
15. What moral duty does Islam associate with Insaniyya?

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16. What is the meaning of Rahma in Islam?

17. According to Islamic thought, what is greater than rituals?

18. What does Anukampa mean in Sree Narayana Guru's philosophy?

19. What three values are considered one reality by Sree Narayana Guru?

20. What does Karuna mean in Buddhism?

21. When combined with wisdom, what does Karuna lead to?

22. Which four practices cultivate Karuna in Buddhism?

23. Which three ideals define emancipation?

24. Which quality unites all religions and philosophies?

Answers

1. Compassion, reason, and unity among humans
2. Interdependence
3. Deep faith and moral commitment
4. Care, trust, and respect for truth
5. Nachiketa
6. Inquiry with compassion
7. Dhammapada
8. Good deeds and right conduct
9. Unconditional love
10. To love others as a divine duty
11. Patience, kindness, and selflessness
12. Self-emptying or humility
13. Empathy and moral transformation
14. Universal humanity
15. Respect for all humans

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16. Divine mercy and compassion
17. Acts of mercy
18. Compassion or sympathy for all beings
19. Love, grace, and compassion
20. Universal compassion
21. Enlightenment
22. The Brahmaviharas (love, compassion, joy, equanimity)
23. Autonomy, equality, and dignity
24. Compassion and moral responsibility.

Assignments

1. Explain the concept of sraddha with reference to Nachiketa's story. How does it reflect the humanist spirit of moral courage and inquiry?
2. Discuss the teachings of the Dhammapada on moral living. How does it promote compassion and self-discipline as foundations of humanism?
3. Examine the meanings of Agape and Kenosis in Christian ethics, and explain how these values embody the ideals of love, humility, and service.
4. Analyse the concepts of Insaniyya and Rahma in Islam and elucidate how they express universal humanity and divine compassion.
5. Evaluate Sree Narayana Guru's idea of Anukampa in relation to Karuna and emancipation. How do these concepts contribute to a universal humanist philosophy?

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Unit 2

Concepts

Learning Outcomes

Upon completion of the unit the learner will be able to:

- describe the meaning and importance of *Ahimsa* or non-violence in different religious and philosophical traditions.
- discuss the idea of equality in the works of Rawls, Amartya Sen, and Ambedkar, and its link with justice and democracy.
- interpret the message of compassion and humanity in Vaikom Muhammad Basheer's *"Oru Manushyan."*
- explain Sree Narayanaguru's views on caste and human equality in *Jatinirnayam* and *Jatilakshanam.*
- differentiate between deep ecology and shallow ecology and express a thoughtful attitude toward nature and human life

Prerequisites

Imagine a world where all people are treated with kindness and respect, where your gender, social status, or beliefs do not determine your worth, where humans live in harmony with nature instead of trying to dominate it. This is the world humanists envision. Humanism places human dignity and moral responsibility at the centre of all thought and action. It upholds that every single human, no matter who they are, deserves to be valued. That every individual, irrespective of background or belief, deserves equal respect and opportunity. To harm or degrade others, whether physically or mentally, violates the core of humanist values because humanity is an interdependent whole. Humanism also calls for equality and justice. Prejudice, discrimination, and exclusion have no place in a truly humane society. Every person

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should have the freedom and opportunity to realize their potential without barriers imposed by birth, caste, or class.

At the same time, humanism recognizes our ethical responsibility toward nature. The natural world possesses intrinsic value beyond its utility to humans. Every living being, from the smallest insect to the largest whale, deserves care and protection. Human progress should not come at the expense of other species or ecosystems. At its heart, humanism is about compassion, coexistence and mutual respect. It teaches that love, understanding, and empathy, not hatred or domination, lead to real progress. Humanism offers an inspiring vision of what humanity can become when guided by reason, empathy, and care for both people and planet.

Keywords

Ahimsa, Equality, Compassion, Caste, Ecology, Humanism

Discussion

1.2.1 Ahimsa (Nonviolence) in Different Traditions

Different religions across the world have advocated the principle of non-violence among their followers to ensure peace, social harmony, and the moral integration of society. Human beings are social animals, and the relationships among them are an integral part of the survival of the species. For this association to flourish, non-violence, compassion and the spirit of mutual care and understanding should be promoted. That means, non-violence in thought, word, and deed becomes necessary for any civilized society. Indian philosophical traditions such as Buddhism, Jainism, and various schools within Hinduism, as well as other major world religions have emphasized non-violence as a core ethical principle

Non-violence in Jainism

Jainism originates from a long spiritual lineage of *Tirthankaras*, revered as teachers and guides who illuminated the path of righteousness. There were twenty-four such Tirthankaras, with Rishabhadeva as the first and Vardhamana Mahavira as the last and most prominent one. The hallmark of Jain philosophy is its absolute commitment to Ahimsa (non-violence), not only to human beings but to all living beings, however small or insignificant they may appear.

Jains follow the doctrine of Ahimsa (non-violence), which is the highest duty, according to them. Their strong commitment to this ideal can be seen in their everyday life and simple habits. Some of the jains cover their mouth with a small piece of cloth so that no tiny living creature is accidentally inhaled. They carry a small broom made up of peacock feathers, to sweep the ground gently before walking, ensuring that no small insects or ants are harmed. They also avoid eating after lighting lamps in the evening, as insects might fall into the food drawn to the light. These practices reveal an extreme sensitivity to life and a strong commitment to non-violence in every aspect of existence. The emphasis of Jainism on Ahimsa goes beyond physical restraint also. It extends to non-violence in speech and thought as well. True Ahimsa, according to Jain philosophy, means avoiding anger, hatred, and ill-will towards any being. This comprehensive approach to non-violence reflects the interconnectedness of all forms of life.

1.2.2 Equality

Equality is an important idea in democratic societies. It is closely connected to justice and freedom. In simple terms, equality means that every person should be treated with respect and fairness. It does not mean that all people are the same in every way. Instead, it means that people should have the same value and should receive fair treatment in similar situations. We may use the word equality in two ways. In a descriptive sense, we talk about things that are actually equal, for example, "Two students scored the same marks." In a prescriptive or moral sense, we express how things should be, for example, "All people should be equal before the law." In real life, people are not equal in all respects. They differ in ability, wealth, education, and background. However, equality as a moral idea guides us to treat people fairly and to create a just society. It encourages democratic thinking and discourages discrimination.

Many political thinkers have discussed the meaning of equality and how to achieve it. One important thinker is John Rawls. In his book *A Theory of Justice*, Rawls explains that people in a democratic society should think of themselves as free and equal citizens. To ensure fairness, he suggests a thought experiment called the "veil of ignorance." In this, he asks us to imagine that we do not know our place in society; whether we are rich or poor, educated or uneducated, healthy or sick. If we make rules without knowing our position or status, we will make fair rules that protect everyone. In such a hypothetical state, rule-making will not be influenced by the self-centered desires. Rawls says that society should protect certain basic rights and opportunities for all, such as freedom, education, and access to jobs. He also explains that goods like income, wealth, and opportunities should be distributed fairly, so that everyone has a chance to lead a good life.

Amartya Sen, a well-known economist and philosopher who has written widely on justice and equality, offers a different view on equality. According to Sen, equality should not only be about giving the same resources to everyone. What matters is whether people have the real ability and freedom to use resources and make choices in life. For example, two people may get the same financial support, but if one has a disability or belongs to an oppressed community, they may need more help (positive discrimination) to achieve the same level of opportunity. Sen calls this idea the capability approach. He wants society to provide equal support so that all individuals can live with dignity and develop their potential.

Some other philosophers also speak about equality in social and political life. For example, Jacques Rancière argues that equality is not just a goal but something we must practice in everyday life. He believes that democracy becomes stronger when people who are treated unequally stand up and show that they are equal to others. Similarly, Charles Taylor, a communitarian thinker, says that equality is also about recognition. A person develops his/her identity through interaction with society. If a society disrespects or ignores a group, that group cannot fully grow or participate. Therefore, treating people with respect and recognising their identity or difference is an important part of equality.

The idea of equality has inspired many social movements around the world. Women's movements, LGBTQI movements, anti-racism movements, and anti-caste movements have all demanded equal dignity, equal rights, and equal opportunities. They have fought for access to education, healthcare, employment, property, political participation and presentation and personal freedom. These movements show that the struggle for equality is not only a theory but a real social effort to build a fair and just society.

In India, Dr. B. R. Ambedkar gave special importance to equality. He believed that equality is the foundation of true democracy. He also prioritized social democracy than political democracy. Political democracy (one man, one vote and one value) cannot last unless there lies at the base of it social democracy. According to him, social democracy means a way of life which recognizes liberty, equality and fraternity as the principles of life. He championed the anti-caste movements and stated that differences created by birth and social position are unfair. If society selects people for important positions only because they are born in a privileged family or caste, then talent and fairness are lost. Ambedkar therefore argued that society must remove social inequality and provide fair opportunities to everyone, especially those who have been historically oppressed. For him, equality was not only a political idea but a necessary condition for dignity, justice, and human development.

1.2.3 Basheer's Short Story: 'Oru Manushyan'

You roam about in distant lands without any clear plans. You have no money; you do not even know the local language. You can speak English and Hindustani, but very few people there understand them. So, you often face trouble and end up in strange situations.

And like that, I too once got into serious trouble. A stranger helped me then. Even today, whenever I remember that incident, I cannot forget that man. Why did he do what he did?

Let us assume that the person remembering this story is *me*. What I am going to tell you now is one of my own experiences. I have a vague understanding of the human community of which I am a part. Among people, there are good ones, thieves, and cruel ones. There are mad people, and there are those who carry dangerous diseases. In this world, one must live very carefully; it is mostly filled with evil. Yet we often forget this. We remember it only after something terrible happens.

This story is a very old one. Though it may seem simple, it is unforgettable.

The place was a large city, about fifteen hundred to two thousand miles away, situated in a valley among mountains. The people there were not known for kindness. They

were considered cruel and murders, robberies, and pickpocketing were daily events. Traditionally they were warriors. Many others worked as money-lenders in foreign countries or as gatekeepers in banks, offices, and factories. Money was everything there; people could even kill for it.

I lived in that city in a dirty little room on a filthy street. I had a job from 9:30 p.m. to 11:00 p.m. teaching English to some foreign labourers. My main work was to help them write their addresses. There, knowing how to write one's address was considered a big achievement. Many people sat in post offices just to write addresses for others and charged half a rupee for it. My students learnt it to avoid paying this fee.

Those days, I used to wake up only at four in the evening to save money by skipping morning tea and lunch. One day, as usual, I woke up, washed, and went out to eat. I wore a coat. In its pocket was a purse with fourteen rupees, my life's savings.

I pushed through the crowd and entered a hotel. I ate well, chapati and meat, and drank tea. The bill was three-fourths of a rupee. When I put my hand in my pocket to pay, cold sweat ran down my body. My wallet was gone! Someone had stolen it.

I told the hotel keeper, "I have been pickpocketed."

He burst into loud laughter, and everyone stared at me. He grabbed my coat pocket and shook me. "Do not play tricks here! Pay your bill or I will poke out your eyes."

I looked around. Not a single kind face, rather only cruel stares like hungry wolves.

"I will leave my coat here, go and bring the money," I pleaded.

He laughed again. "Take off your coat." I removed it. Then he asked me to remove my shirt. I removed it. Then my shoes. Then my trousers. His plan was clear; to strip me naked and gouge out my eyes.

Everyone laughed loudly. I imagined myself standing naked and blind on the road, among thousands of people. My hands trembled as I began unbuttoning my trousers.

At that moment, a deep voice said, "Stop. I will pay." Everyone turned. A tall young man stood there, fair-skinned, blue-eyed, wearing a red turban and black coat. He paid my bill and asked me to put my clothes back on. I did so gratefully.

I thanked him with deep emotion. "I have never seen such a good man."

He smiled slightly. Then asked my name and where I came from. I asked his name. He said, "I have no name." I replied, "Then let your name be Mercy." He did not smile.

We walked together until we reached a lonely bridge. He looked around to ensure nobody was watching.

"Go now. Don't look back. And if anyone asks whether you saw me, say you did not."

Suddenly I understood the truth. He took out five wallets from his pocket and one of them was mine.

"Which one is yours?" he asked.

I pointed. He told me to open it. All my money was safe. I put it back in my pocket.

"Go," he said. "May God protect you."

I replied, "May God protect you, me, and the whole world."

"Oru Manushyan" is a remarkable short story by Vaikom Muhammad Basheer that highlights the value of humanity in a touching way. The story shows that even in places where kindness is rare, and even in people who seem to lead immoral lives, human compassion can still be found. Basheer is known for using simple, everyday language and for bringing ordinary people including beggars, pickpockets, prostitutes, and others who are socially ignored to the centre of his stories. Through his writings, he reminds us that every human being carries a spark of goodness, and that love and care can appear even in the most unexpected situations.

The story is narrated in the first person. The protagonist lives in a distant city under very poor conditions. He speaks little of the local language and earns just enough money to survive. One day, after eating at a restaurant, he discovers that his wallet has been stolen. With no money to pay the bill, he is threatened by the cruel hotel owner and a crowd who are ready to strip and harm him. At that tense moment, an unknown young man steps forward, pays his bill, and saves him.

Later, the protagonist learns that the same man who helped him was the one who had stolen his wallet. The pickpocket secretly returns it to him, with all the money untouched. Although he lives by stealing, he cannot bear to see an innocent man suffer for his action. In that moment, he chooses compassion over crime.

Through this story, Basheer explores the deep and complex nature of the human mind. Even someone who commits wrong acts may still have a conscience and the ability to show mercy. The story teaches that humanity exists in every person, and sometimes a single act of kindness can change everything. The stranger refuses to reveal his name, so the narrator calls him "Mercy." This name becomes the answer to the central question: *Why did he help?* He did so out of mercy, that is, pure human compassion.

1.2.4 Human as Species: Jathilakshanam & Jatinirnayam

Sree Narayana Guru played a major role in shaping a humanistic philosophy in Kerala. At a time when society was deeply divided by caste and full of discrimination, he introduced ideas based on equality, dignity, and unity of all human beings. These thoughts were revolutionary and almost unthinkable in a caste-ridden society.

Guru expressed his views on caste and the true nature of human beings in works such as *Jathilakshanam* and *Jatinirnayam*. Through these writings, he argued that all human beings belong to one single species and that caste divisions are man-made and meaningless. For Guru, what truly defines a person is humanity, not birth, caste, or social status.

***Jatinirnayam* (A Critique of Jati)**

In *Jatinirnayam*, Sree Narayana Guru argues that the only true caste of human beings is humanity. Therefore, traditional caste divisions such as Brahmin, Kshatriya, Vaishya and Shudra have no real foundation. Just as the "caste" of a cow is *cowhood*, the "caste" of a human being is *humanhood*, that is, being human.

In the second verse of this work, Guru expresses one of his most powerful and famous ideas:

2. Of one kind, one faith, one God is human,

Of one womb, of one form

Difference herein is none.

("ഒരു ജാതി ഒരു മതം ഒരു ദൈവം മനുഷ്യന്
ഒരു യോനിയൊരാകാരമൊരു ഭേദവുമില്ലതിൽ.'')

Guru explains that all human beings belong to one single species, *humanhood*. Everyone is born in the same natural way. The physical body and structure of all human beings are the same. Therefore, there is no biological or natural difference that justifies caste superiority or inferiority. A Brahmin and a Shudra are equally human; there is no place for pride or discrimination based on birth. There are six slokas in Jatinirnayam written in 1914 by Sreenarayanaguru. The first verse is in Sanskrit and the remaining five are in Malayalam. Some excerpts from *Jatinirnayam* are following:

1.

Humanity marks out,

Of what species humans are.

Even as bovinity Does with cows.

Brahminhood and such Do not do so in this case

No one does realise, alas! This apparent truth.

(മനുഷ്യാണാം മനുഷ്യത്വം
ജാതിർഗോത്വം ഗവാം യഥാ
നബ്രാഹ്മണാദിരസ്ത്യേസ്യൈവം
ഹാ!തത്ത്വം വേത്തി കോടപിന.'')

3.

Within a species, does it not,

Offspring truly breed?

The human species, thus seen, to a single species belongs.

(ഒരു ജാതിയിൽ നിന്നല്ലോ
പിറന്നീടുന്നു സന്തതി
നരജാതിയിതോർക്കുമ്പോ-
ളൊരു ജാതിയിലുള്ളതാം.'')

***Jatilakshanam*:**

Jatilakshanam is an extended description of the idea brought forth in Jatinirnayam. In the first sloka, Guru says that all living beings which are capable to bring forth progenies by means of sexual intercourse belong to the same species. Two beings which cannot reproduce like this belong to different species. We also find the beings of the same species

in a class or group joining together. Each species is assigned their own physique, sound, smell, etc. The temperature and smell of these beings are common to that species. Their appearance would also be similar. We can recognise a species by means of all these characteristics. Applying this method we can come to the conclusion that all human beings, irrespective of their place and race, fall under a single category. In this way Sree Narayanaguru introduces a universal humanism on the basis of one species-theory.

He says that it is irrelevant to ask the caste of another man because her body itself is a perfect proof of the caste to which she belongs. So the ascertainment of name, place and occupation are the only matters that we are supposed to take consideration when we meet a stranger.

In the fifth sloka of the Jatilakshana Sree Narayanaguru emphasises this idea unequivocally. As the body of a living being is enough to tell the type to which she belongs to, a reasonable and perceptible person will not resort to ascertaining her caste.

He scorns that some people believe it is an inferior thing to admit that they belong to mankind. They believe it is superior to state that they belong to Brahminhood or Kshathriyahood. Narayanaguru says that admitting the fact that we belong to mankind is not an inferior thing. All people are expected to acclaim the manhood.

Excerpts from

Jatilakshanam

(Jati Defined)

1.

All that mate together and beget offspring
belong to one species;
Those that do not mate Together are not so.
Those of the same species
Are often seen in pairs as well.

("പുണർന്നു പെറുമെല്ലാമൊ-
രിനമാം പുണരാത്തത്
ഇനമല്ലിനമാമിങ്ങൊ-
രിണയാർന്നൊത്തു കാൺമതും'')

2.

Each species does have
Its own bodily form,
Its own way of sound-making,
Its own smell and taste,
Its own bodily temperature, please remember that.

("ഓരോ ഇനത്തിനും മെയ്യു-
മോരോ മാതിരിയൊച്ചയും
മണവും ചുവയും ചൂടും
തണുവും നോക്കുമോർക്കണം")

3.

Following all these,

There exists in each

Their own distinguishing features, therefore it is that

We know various things One different from another.

("തുടർന്നോരോന്നിലും വെവ്വേ-
റടയാളമിരിക്കയാൽ
അറിഞ്ഞീടുന്നു വെവ്വേറെ
പിതിച്ചോരോന്നുമിങ്ങു നാം")

4.

Ask for the name,

Place and calling

(Of someone you meet)

Do not ever ask "who you are by caste?"

Because the body itself tells you of that truth.

("പേരൂരു തൊഴിലീ മൂന്നും
പോരുമായതു കേൾക്കുക!
ആരു നീയെന്നു കേൾക്കേണ്ട
നേരു മെയ്തന്നെ ചൊല്കയാൽ")

1.2.5 Environmental Concerns: Gandhi, Thoreau, Deep Ecology

1.2.5.1 Environmental concern and Humanism in M.K. Gandhi

Gandhi's views on human existence are holistic. It is holistic in the sense that he sees human as a being that is both embedded in nature and transcendental in spirit and connected to everyone and everything on earth and related to the divine morally. Hence whatever one speaks about humans simultaneously turns to be the talk about all other beings in the nature also. This concept of interconnection is important in understanding Gandhi's vision of humanism. It means that, according to Gandhi, to speak about human being, one has to view human not only as a part of nature but also the guardian and trustee of the earth as a divine mission.

Environmental concern in Gandhi in connection with his vision of humanism can be summarised in his famous aphorism: "The world has enough for everybody's need, but not enough for one person's greed". Ramachandra Guha, famous Indian Historian, calls this exquisite phrase 'one-line environmental ethic'. To Gandhi, the concept of human person is closely knitted with the ideas of environmental concerns and responsibilities for others. Human beings become human persons only by their concern for others and care for environment. Gandhi writes: "I suggest that we are thieves in a way. If I take anything

that I do not need for my own immediate use and keep it, I steal it from somebody else. I venture to suggest that it is the fundamental law of nature, without exception, that nature produces enough for our wants from day today, and if only everybody took enough for himself and nothing more, there would be no pauperism in this world, there would be no more dying of starvation in this world. But so long as we have got this inequality, so long we are thieving." (Trusteeship, p.3).

Gandhian philosophy of humanism and environmental concerns are expressed clearly in his views on the concepts of Satyagraha, Ahimsa, Grama- swaraj (Village republic), Trusteeship, Sarvodaya (upliftment, betterment and strengthening of everyone) and the notion of Bread labour. By holding the truth or Satya (satyagraha) firmly, one can be morally strong to practice non-violence. It is an alternative code for human life. It is a voluntary life of simplicity. According to Gandhi, poverty of people is the result of violence by greedy.

Gandhi believed that we become true human beings only when we strengthen rural life, support the rural economy, and recognise ourselves as trustees of nature and resources. As trustees, we must use natural wealth responsibly and work for the welfare of others, especially the poor. His ideas on agriculture, village-based industries, recycling, organic farming, and the protection of nature contribute to modern discussions on sustainable development. Sustainability means using resources in a way that protects the environment and ensures a good life for both present and future generations, not only for human beings but for all of nature.

Gandhi's views on the environment and humanism can be summarised in the following three principles:

1. Simple living and self-reliance: Live a simple and content life, reduce unnecessary desires, and become self-reliant. This reduces over-consumption and helps protect natural resources for everyone.

2. Local production and Sarvodaya: Support small-scale, locally-based production using local resources to meet local needs. This encourages employment in villages and promotes Sarvodaya, the welfare and upliftment of all.

3. Trusteeship: Consider wealth and natural resources as a trust from society. Use them responsibly to earn a decent living while working for the welfare of others, especially the poor and disadvantaged.

1.2.5.2 Environmental Concerns in Henry David Thoreau (1817-1862)

Henry David Thoreau's impact on modern political thinking and environmentalism is beyond question. Critical opinions about this American philosopher have been varied in his own times. While some considered him "meddlesome trouble maker", others like R.L. Stevenson thought of him as a "sulker, dodging the responsibility of living". Ralph Waldo Emerson gives him the best tribute of being "the man of Concord", always in love with nature.

Mahatma Gandhi, the Father of Indian Nation, borrowed even the title and concept of "Civil Disobedience" from Thoreau. Strangely, Martin Luther King Jr, imbibed the

concepts of ahimsa and civil disobedience from Gandhi. There is no doubt that Thoreau has been highly influential in the great intellectual interaction between America and India.

Thoreau lived a simple and quiet life in communion with nature. His life in the woods by Walden Pond for nearly two years and two months is popularly called the Walden Experiment. His mission was to understand what nature had to teach to humanity. This had resulted in the publication of his literary masterpiece Walden or Life in the Woods. Undoubtedly, Thoreau is both a naturalist and a romantic.

Thoreau made brief journeys and wrote about them. Much of his writings are on nature. His fourteen volumes of journals reveal his observations of nature. Some of his writings were published posthumously. The volumes include Excursions (1863), The Maine Woods (1864), and A Yankee in Canada (1866). The works carry rustic charm, reveal poetic descriptions of nature, and abound in tender lyricism. Thoreau was fond of natural world. He identified himself as a natural philosopher. He believes that the living earth has a life of its own. It is above the biotic existence of animals and plants. The environment is rich with values. We can enrich our lives by recognising nature's value. It would be suicidal to invest nature with our own purposes or value-systems.

Unfortunately, human beings have distorted perceptions of nature. We consider ourselves as the center of the universe, and the roof and crown of creation. This anthropocentricism relegates nature to the margin. Exploitation of nature has resulted in untold miseries to all creatures on the earth. We can make a better world by restraining our consumption.

We live in a pluralistic universe with diverse and heterogeneous voices. One man's food is another man's poison. What may appear as bad for us may have positive aspects. Squirrels are not merely rodents; they play a vital role in the distribution of seeds. All the things in nature are harmoniously interrelated. They are interdependent and interlinked. To study nature is to study humanity.

Thoreau underscores that there is a spark of divinity in human beings. The primitive vigour of nature in us, if explored wisely, can make us infinitely potential. It is for the individual to ensure her/his infinitude. The materialistic concerns rob us off the inner power. There are close parallels between the ripening of a seed and the development of the human potential. Both the seed and the human contain universe in them. Careful and delicate nurturing and caring are needed for both.

Human being is an inhabitant, and a part and parcel of nature. It is a great irony that we are regarded as loafers if we are to spend time in the company of nature; and enterprising citizens if we destroy nature for making money. Human-Nature relationship is never consistent. Nature needs not be always benevolent to us. Sometimes, it turns violent and indifferent to us. Sometimes we see nature as a home and friend while at other times it becomes a threat and foe.

Thoreau believes that the representation of nature is great because nature itself is great. He provides us with a natural and empirical description of birds, trees, fish, woods etc. He never believes that increased wealth and economic consumption guarantee happiness. Artificial alternatives are inferior to pristine nature. Nature provides a wide variety of resources for us. Every creature in nature has a symbolic value. Nature's economy is extravagant.

Human beings should learn to find solace and comfort in the company of nature. We can make a heaven or hell out of nature. We should learn to take only what we need. We alone can appreciate the varied diversity of non-human life. Walden shows the benefits of recognising the importance of the values of nature. A close experience with nature can facilitate clear thinking. Thoreau reiterates the necessity for a personal and fulfilling relationship with nature.

1.2.6 Deep Ecology

Norwegian philosopher Arne Naess is considered as the founder of Deep Ecology. He coined the term "deep ecology" in 1973. "Deep Ecology" is deep because it questions fundamental assumptions in our philosophies and world view. It attempts to deduce principles of action from basic values and premises. Arne Naess provides his philosophical view which he calls Ecosophy. He says, by ecosophy, he means "a philosophy of ecological harmony or equilibrium". The following could be considered as examples of such deep questioning:

- What is an individual?
- What things have intrinsic value and moral standing?
- How should we understand nature?
- What is the relationship between people and nature?

Human beings are part of nature and not separate from it. According to deep ecologists, the notion of "individual" is vague. A person is no more of an individual than a cell, a species or an ecosystem. Individuals are formed and defined by their relationships with other entities. Relationships and processes are more real and lasting than individuals.

Deep Ecology focuses on two ultimate norms: self-realization and bio-centric equality:

a. Self-realisation

It is a process through which people come to understand themselves as existing in a thorough interconnectedness with the rest of nature. The ultimate good is self-realization. It is not egotistical focus on the individual but understanding the self as a large all-inclusive self including all lives, human, animal and vegetable. All of nature strives to realise its self, and to live in harmony with its parts. The flourishing of all of nature should be the goal,

b. Bio-centric equality

A sense of bio-centric equality is the recognition that all organisms and beings are equally members of an interrelated whole and therefore have equal intrinsic worth. According to the principle of bio-centric equality, all the species have intrinsic values independent of the instrumental values they hold for the human beings.

The following are the platform principles for the Deep Ecology social movement formulated by Arne Naess and George Sessions:

1. The well-being and flourishing of human and non-human life on earth have value in themselves. These values are independent of the usefulness of the non-human world for human purposes.
2. Richness and diversity contribute to the realisation of these values and are also values in themselves.
3. Humans have no right to reduce this richness and diversity except to satisfy vital needs.
4. Present human interference with the non-human world is excessive, and the situation is rapidly worsening.
5. The flourishing of human life and cultures is compatible with a substantial decrease of the human population. The flourishing of non-human life requires such a decrease.
6. Policies must therefore be changed to suit basic economic, technological, and ideological structures.
7. The ideological change is mainly that of appreciating life quality rather than adhering to an increasingly higher standard of living.
8. Those who subscribe to the foregoing points have an obligation directly or indirectly to participate in the attempt to implement the necessary changes.

Incontrast to the above principles, Shallow Ecology movement strives for mild reforms and gives priority to anthropocentric values. Nature is seen as having only instrumental value. Problems such as pollution and the need to preserve quality of environment are taken into account only so far as it adds to human wellbeing.

The deep ecology movement recognises that ecological balance will require profound changes in our perception of the role of human beings in the ecosystem. Shallow Ecology is concerned only with more efficient control and management of the natural environment, for the benefit of man. For example, in the case of pollution, the shallow ecological approach is that technology seeks to purify the air and water and to regulate pollution. Laws limit permissible pollution and so polluting industries are preferably exported to developing countries. But Deep Ecological approach is that pollution must be eliminated from a bio spheric point of view. Its focus is not on its effects on human health alone, but on life as a whole, including all species and the ecosystem. Deep Ecology gives priority to fight the deep causes of pollution and not merely focus on superficial short-term solutions.

Recap

- Nonviolence is a critical factor for social association
- All people have one caste, the humanhood
- Mahatma Gandhi related humanism with environment aspects
- Human being is part of nature but at the same time guardian and trustee of the earth
- The world has enough for everyone's needs but not enough for one person's greed
- Gandhian philosophy manifested in Sathyagraha, Ahimsa, Gramaswaraj, Trusteeship, sarvodhaya etc.
- Gandhi says that poverty of people is the result of violence by greedy
- Gandhian views on humanism has three principles; adopt a single life, encourage small scale production and adopt trustee ship and practice
- Henry David Thoreau believed that earth has a life of its own
- All things in nature are harmoniously interrelated
- We can make heaven or hell out of nature
- Learn to take only what we need
- Self-realisation in the nature is the ultimate good
- Bio-centric equality recognises equality amongst all bio centric grouping
- Deep ecology as a social movement is about the well-being of human and non-human life on earth
- Richness and diversity in nature needs to be maintained
- Flourishing of human and non-human life is necessary
- Shallow ecology focuses on human well being
- Deep ecology is bio-centric and anti-anthropocentric

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Objective Questions

1. Why does human social groups practice nonviolence?
2. Who were thrithankara?
3. How many thrithankara were there for the Jain religion?
4. Who was the first thrithankara?
5. Who was the last thrithankara?
6. Why do the Jains cover their own nose with a net like cloth?
7. Why do the Jains avoid dinner after lighting the lamp in the house?
8. Which are the major religions that advocated nonviolence?
9. What is equality means?
10. Does equality imply sameness?
11. Distributing justice denotes distribution of resources equally. Who wrote a theory of justice?
12. What is the major focus in the theory of justice of John Rawl?
13. What was the major emphasis of Amartya Sen on equality?
14. What was the focus of Ranciere on equality?
15. Who is the author of "Oru Manushyan"?
16. Who wrote "Jaathi Nirnayam"?
17. Where does Jathi lakashnam figure?
18. Who proposed 'one-line environmental ethic' for Gandhian concept of humanism?
19. Who opined poverty of people is the result of violence by greedy?
20. What is Thoreau's point on human-nature relationship?
21. Who coined the term deep ecology?
22. What is Ecosophy?
23. What are the projections of deep ecology?
24. What is shallow ecology movement?

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Answers

1. Nonviolence is critical factor for the integration of society
2. The teachers in the Jain tradition
3. 24
4. Rishabhdeva
5. Vardhamana Mahavira
6. To avoid small creatures accidently being inhaled through nose. \
7. To save small flies that may fall into food due to the light of lamp
8. Buddhism, Jainism, Hinduism, Christianity and Islam
9. Equality equivalence in relationship
10. No
11. John Rawl
12. It ignores social, economic and physical differentiation among people
13. Equal chance for autonomy and empowerment.
14. Everyone is equal of everyone else
15. Vaikom Muhammed Basheer
16. Sreenaryanaguru
17. Jaathi Niranayam
18. Rama Chandra Guha
19. Mahatma Gandhi
20. The necessity for perusal and fulfilling relationship with nature
21. Arne-Naess
22. Philosophy of Ecological harmony or equilibrium
23. Self Realisation and bio centric equality.
24. It tries for mild reforms and gives priorities of Anthropocentric values

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Assignments

1. Discuss the practice of non-violence in Jainism.
2. Explain Gandhi's views on environment and humanism.
3. Differentiate between Deep Ecology and Shallow Ecology movements.
4. Discuss the major principles of Deep Ecology.
5. Write a note on the role of anukampa/compassion in Narayanaguru's philosophy.

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BLOCK
02

Fundamentals of Traditional Logic

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Unit 1

Logic: An Introduction

Learning Outcomes

Upon successful completion of this unit, you will be able to:

- define logic and explain its core purpose
- identify and differentiate between various kinds of propositions (A, E, I, O)
- explain the concept of distribution of terms within propositions
- distinguish between premises and conclusions in simple arguments
- identify and articulate the core problem presented by the Liar's Paradox

Prerequisites

It is very common to associate logic with complex philosophical debates or intricate mathematical proofs. However, its principles are deeply embedded in our everyday reasoning and decision-making. This unit aims to equip with the foundational tools necessary to analyse and construct arguments, moving beyond mere intuition toward a more precise and critical evaluation of thought processes.

We will begin by clarifying what logic is- understanding it not as a collection of facts, but as a methodology for evaluating the connections between ideas. Our exploration will then move to the essential building blocks of all logical thought: propositions. These are statements that can be judged as either true or false, and recognising their different forms is crucial for logical analysis. Particular attention will be given to the distribution of terms within propositions, a subtle yet important concept that sharpens our understanding of the exact scope of what a statement affirms or denies. Following this, we will examine how these propositions are assembled into arguments, distinguishing between the supporting premises and the

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asserted conclusion. Finally, we will confront the intriguing challenges posed by logical paradoxes, focusing on the classic Liar's Paradox, which illuminates the inherent complexities and occasional limits of language and formal reasoning. This unit, possess a clearer framework for analytical thinking, enabling us to construct more robust arguments and critically appraise the reasoning presented by others.

Keywords

Inference, Argument, Proposition, Premise, Categorical Proposition, Subject Term, Predicate Term, Distribution of Terms, Logical Paradox, Liar's Paradox, Truth Value, Term (Logic), Quantifier, Copula

Discussion

2.1.1 Logic

To help you understand the concept of logic, consider the work of a forensic scientist. The scientist's job isn't to speculate about a suspect's motives or emotional state, but to methodically analyse the evidence—fingerprints, DNA, and ballistics—to determine if the facts logically connect to a conclusion. Logic operates in the same objective way. It provides a formal system for evaluating arguments based on their structure and the relationship between the premises and the conclusion. Just as a scientist follows a strict procedure to ensure a finding is valid, logic gives us the rules for constructing a sound argument, allowing us to assess whether a conclusion is justified by the information presented, regardless of how or why that belief was initially formed.

Logic is a discipline that, at its core, focuses on the principles of correct reasoning. It is not concerned with the psychological processes of thinking, such as how the brain generates thoughts or why it may hold certain beliefs on emotional grounds. Instead, logic provides a framework for evaluating arguments, asking whether they are sound, valid, or strong. In this sense it is best understood as a normative science: rather than merely describing how people actually reason, it sets standards for how reasoning ought to be conducted.

To grasp the essence of logic, consider its practical utility in distinguishing between compelling and unconvincing arguments. In daily life, we are constantly presented with information and encouraged to accept certain viewpoints. A news report claims that a new policy will reduce inflation. An advertisement asserts that a particular product will

enhance well-being. A friend insists that a certain film is the best of the year. In each instance, an attempt is made to persuade us, to lead us to a conclusion. Logic provides the tools to scrutinise these attempts at persuasion. It allows us to ask: Are the reasons provided adequate? Does the conclusion truly follow from what has been presented?

Let's illustrate this with a simple scenario. Suppose a weather forecaster states: "It is raining heavily; therefore the cricket match will be cancelled." An individual listening to this might immediately accept the conclusion. However, a logically aware individual would pause. While it is certainly plausible that heavy rain leads to cancelled matches, is it an absolute certainty? Are there other factors at play? Perhaps the stadium has excellent drainage, or the match has already been suspended for the day. Logic encourages us to examine the link between the initial statement (the premise) and the derived statement (the conclusion). It helps us to move beyond mere belief or intuition and to assess the structural integrity of the reasoning presented.

Another example can be drawn from detective work. A detective arrives at a crime scene and observes several details: a broken window, footprints leading away from the building, and a missing valuable item. From these observations, the detective might conclude: "Someone broke into the building and stole the item." This conclusion is an inference. Logic helps the detective to evaluate whether this inference is the most probable one, or even a necessary one, given the evidence. What if the broken window was accidental? What if the footprints belong to a resident? Logic compels a systematic approach to evidence, ensuring that conclusions are derived through robust, defensible pathways.

In academic pursuits, the role of logic becomes even more pronounced. In essay writing, students are required to construct arguments to support their theses. A strong academic essay is not merely a collection of facts; it is a carefully structured argument where evidence logically leads to a conclusion. For instance, a history student might argue that "The decline of the Roman Empire was primarily due to economic instability." To support this, they would present various pieces of historical data concerning trade, inflation, and resource management. Logic guides the student in selecting relevant data and arranging it so that the conclusion is not merely asserted, but demonstrated through a clear, reasoned progression. Without logical coherence, even well-researched essays can appear weak or unconvincing.

Furthermore, in scientific research, logic is indispensable. Scientists formulate hypotheses, design experiments to test these hypotheses, and then draw conclusions based on their experimental data. If an experiment consistently shows that a certain chemical reaction occurs under specific conditions, scientists use logical induction to infer a general principle about that reaction. If a theoretical model predicts a certain phenomenon, and observations confirm that prediction, deduction is used to affirm the model's explanatory power. The entire process of scientific discovery and validation is deeply rooted in logical principles, from forming testable questions to interpreting results and constructing theories.

In essence, logic equips with a vital intellectual toolkit. It sharpens our critical faculties, allowing us to dissect complex arguments, identify flaws in reasoning, and construct more persuasive and reliable arguments ourselves. It is a discipline that fosters clarity of thought, intellectual precision, and a rigorous approach to understanding the world.

Definition: Logic is the systematic study of the principles of valid inference and correct reasoning. It is the science that evaluates arguments, providing methods and standards to distinguish sound reasoning from unsound reasoning.

2.1.2 Propositions – The Building Blocks of Logic

At the heart of every argument lie fundamental statements known as propositions. Before we can evaluate the strength or validity of an entire argument, we must first understand the nature of its constituent parts. A proposition is not simply any sentence; it possesses a very specific characteristic that sets it apart in the realm of logic.

Consider the following collection of statements:

1. "The sun rises in the east."
2. "What time is the lecture?"
3. "Go and fetch that book!"
4. "Oh, dear!"
5. "All cats are nocturnal animals."
6. "This table is made of wood."

If we were to ask whether these statements are "true" or "false," we would find that only some of them can be assigned such a quality. Statement (1) is generally considered true. Statement (5) is false, as many cats are active during the day. Statement (6) could be true or false depending on the specific table in question. These statements have what logicians call a "truth value."

However, statements (2), (3), and (4) are different. "What time is the lecture?" is a question; it seeks information and cannot be labelled true or false. "Go and fetch that book!" is a command; it instructs an action and likewise lacks a truth value. "Oh, dear!" is an exclamation, expressing emotion, and it also falls outside the scope of truth or falsity.

This distinction is crucial for logic. Logic deals with claims about the world that can be assessed for their accuracy. Therefore, a proposition is precisely that: a declarative sentence that asserts or denies something, and by virtue of this assertion, it is capable of being either true or false. It is the raw material, the fundamental atomic unit, from which more complex logical structures like arguments are built.

Definition: A proposition is a declarative sentence that is either true or false, but not both. It is a statement that has a definite truth value.

2.1.3 Kinds of Propositions (Categorical Propositions)

When a grammarian looks at a sentence like, "The quick brown fox jumps over the lazy dog," they identify the subject as "The quick brown fox" (the noun doing the action) and the predicate as "jumps over the lazy dog" (the verb and everything else that describes the action). Logic works in a similar but more refined way. It takes the same kind of sentence and simplifies it into a standardised form to analyse its truth.

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For example, the statement “All dogs are mammals” is broken down into two main categories. The subject term (S) is “dogs”—the primary category you are talking about. The predicate term (P) is “mammals”—the category that is being related to the subject. By consistently breaking down statements into these two parts, traditional logic creates a clean framework to evaluate if the relationship being claimed between them is valid.

Traditional logic, largely influenced by the work of Aristotle, classifies propositions into four standard forms, known as categorical propositions. These forms simplify the vast array of human statements into a manageable structure for logical analysis. Each categorical proposition makes an assertion about the relationship between two categories or “terms”: a Subject Term (S) and a Predicate Term (P).

Every categorical proposition consists of four key components:

- **Quantifier:** This indicates the scope of the assertion, specifying how many members of the subject class are being referred to. The standard quantifiers are “All,” “No,” and “Some.”
- **Subject Term (S):** This is the class or group of things about which the proposition is making a statement.
- **Copula:** This is the linking verb (or verb phrase) that connects the subject term and the predicate term, usually “is,” “are,” “is not,” or “are not.” It establishes the relationship.
- **Predicate Term (P):** This is the class or group of things that the subject term is being related to.

Let’s break down the four standard forms, often designated by the vowels A, E, I, and O:

A-Proposition (Universal Affirmative)

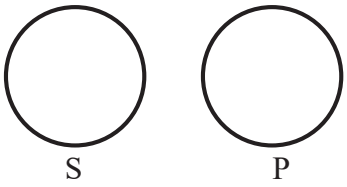
This proposition asserts that all members of the subject class are also members of the predicate class. The standard form is “All S is P.” It makes a full, positive claim about every member of the subject group. In 'A' - type proposition the “S” circle is entirely contained within the “P” circle.

'A' proposition

Example: “All cats are mammals.” This statement affirms that the entire group of cats is included within the group of mammals.

E-Proposition (Universal Negative)

This proposition states that no members of the subject class are members of the predicate class. The standard form is “No S is P.” It makes a complete, negative claim about the relationship between the two classes. In an 'E' - type proposition the two circles stand separately with no overlap.

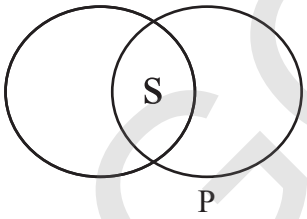


'E' proposition

Example: "No cats are fish." This statement denies any overlap between the group of cats and the group of fish.

I-Proposition (Particular Affirmative)

This proposition asserts that at least one member of the subject class is also a member of the predicate class. The standard form is "Some S is P." It makes a limited, positive claim, meaning it applies to only some members of the subject group. In an 'I' - type proposition, the two circles are overlapping and the overlapping region represents the 'some'.

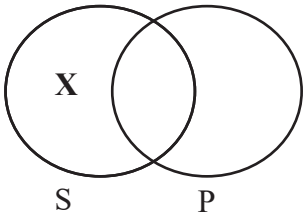


'I' proposition

Example: "Some cats are black." This statement affirms that there is at least one cat that is also a member of the group of black things.

O-Proposition (Particular Negative)

This proposition states that at least one member of the subject class is not a member of the predicate class. The standard form is "Some S is not P." It makes a limited, negative claim. In an O - type proposition, the two circles are overlapping, but with an 'X' in the part of the 'S' circle, that lies outside the 'P' circle.



'O' proposition

Example: "Some cats are not pets." This statement confirms that there is at least one cat that does not belong to the group of pets.

A-Proposition (Universal Affirmative)

- **Example:** "All songs are melodies." This statement claims that every single member of the "songs" category is also a member of the "melodies" category .

E-Proposition (Universal Negative)

- **Example:** "No songs are silent." This statement asserts a complete separation, claiming that there is no overlap between the category of "songs" and the category of "silent things."

I-Proposition (Particular Affirmative)

- **Example:** "Some songs are upbeat." This statement affirms that at least one member of the "songs" category is also a member of the "upbeat" category.

O-Proposition (Particular Negative)

- **Example:** "Some songs are not popular." This statement claims that at least one member of the "songs" category is excluded from the "popular" category.

Understanding these four forms is foundational because many logical operations and rules in traditional logic are built upon how these types of propositions interact. Learning to translate ordinary language statements into these standard forms is a crucial skill for logical analysis.

2.1.4 Distribution of Terms

The concept of "distribution" in logic is a subtle yet critically important aspect of understanding categorical propositions. It refers to whether a proposition makes an assertion about every single member of the class denoted by a term (either the Subject Term or the Predicate Term). When a proposition speaks about all members of a class, that term is said to be "distributed." If it speaks only about some members, or not explicitly about the entire class, the term is "undistributed."

This idea might seem abstract at first, but its practical application becomes clear when we begin to evaluate the validity of arguments, especially syllogisms. Errors in reasoning often arise from mistakenly assuming a term is distributed when it is not.

Let's consider the distribution of terms for each of the four standard categorical proposition types:

- **A-Proposition (All S is P):**
    - **Subject Term (S): Distributed**. The proposition clearly makes a claim about every single S.
    - **Predicate Term (P): Undistributed**. The proposition does not claim anything about all members of the P class.

♦ **E-Proposition (No S is P):**

- **Subject Term (S): Distributed.** This refers to all members of the "S" class.
- **Predicate Term (P): Distributed.** The statement makes a definitive claim about every single P in relation to the S class.

♦ **I-Proposition (Some S is P):**

- **Subject Term (S): Undistributed.** This only refers to at least one member of the S class, not all.
- **Predicate Term (P): Undistributed.** This does not make a claim about all members of the P class.

♦ **O-Proposition (Some S is not P):**

- **Subject Term (S): Undistributed.** This only refers to at least one member of the S class.
- **Predicate Term (P): Distributed.** The statement asserts that the "some S" are excluded from the entire class of P.

Table 2.1.1 Summary Table for Distribution

Type	Form	Subject Term	Predicate Term
A	All S is P	Distributed	Undistributed
E	No S is P	Distributed	Distributed
I	Some S is P	Undistributed	Undistributed
O	Some S is not P	Undistributed	Distributed

2.1.5 Argument

We frequently rely on inference or reasoning to comprehend how things work and make sense of what is happening around us. Inference is a valuable tool for problem-solving. In our daily lives, we make many inferences.

For example, 'when we observe dark, cloudy skies, we might predict that it will rain today'.

We conclude from the known fact that 'It looks cloudy, so perhaps it will rain'. Inference is a logical guess about what might occur based on known facts. The fundamental role of logic lies in the power of inference or reasoning, which involves drawing new conclusions from established known truths. Inference is the intellectual process of drawing something new from what we already know. It helps to infer things that are beyond our sensory experience. Thus, inference helps to expand our realm of knowledge. When this reasoning is expressed in linguistic form, it is called an argument. We frequently make use of arguments in our daily lives without always explicitly recognizing them.

All mammals give birth to live young.

Dogs are mammals.

Therefore, Dogs give birth to live young.

This is an example of an argument.

The primary way we reason is through the use of arguments. An argument consists of a sequence of propositions. It includes premises and a conclusion. Both premises and the conclusion of the argument are propositions. They are expressed linearly, with the conclusion separated from the premises by using a 'slash'. Premises provide support for deriving the conclusion and serve as evidence to substantiate the conclusion. The premises guarantee or establish the foundation for supporting the conclusion. The conclusion is the newly derived knowledge from the premises. 'Therefore' (∴) is a common indicator of the conclusion in an argument.

Premise 1

Premise 2

Premise 3

……

Premise n

∴ Conclusion

- Premise – the reason or evidence supporting the conclusion.
- Conclusion – the main point or statement being proved.

Example

Premise 1: All humans are mortal.

Premise 2: Socrates is a human.

Conclusion: Therefore, Socrates is mortal.

An argument is valid when the conclusion logically follows from the premises

2.1.6 Logical Paradoxes

Imagine a ship, the 'Ship of Theseus', which is displayed in a museum. Over time, as the wooden parts of the ship decay, they are replaced with new, identical parts. Eventually, every single part of the ship is replaced. Now, the question arises: Is the reconstructed ship still the Ship of Theseus?

Additionally, suppose someone gathered all the discarded original parts of the ship and used them to assemble another ship. Is this new ship also the Ship of Theseus? This is called a paradox; the 'Ship of Theseus paradox'. This paradox raises questions about identity, persistence, and the nature of objects over time. It challenges our perceptions about what makes an object, in this case, a ship, the same over different stages of its existence. It is a philosophical puzzle that invites contemplation on the concept of identity and the continuity of objects.

When we apply logical thinking and analyse situations, it often seems commonsensical. However, in certain situations, this may lead to a contradiction or go against the commonsensical view. This is known as a logical paradox. Have you heard about it? There are many types of paradoxes in logic that have puzzled even efficient logicians. They do not immediately strike as nonsensical; instead, it is upon deeper reflection that we uncover their inherent contradictions. A paradox is a statement that seems to contradict itself or appears to be both true and false simultaneously. In the above-given paradox, the Ship of Theseus, the statement that seems contradictory is whether the reconstructed ship is still the Ship of Theseus after all its parts have been replaced. It raises the question of identity – if every part has been changed, is it still the same ship? Paradoxes highlight instances where our logical reasoning appears faulty, despite our efforts to think rationally. The term 'paradox' means 'against opinion'. It can refer to many things, such as claims that go against common beliefs, statements that seem to contradict themselves, statements that involve genuine contradiction, and contradictory conclusions derived from sound reasoning. The main significance of logical paradoxes is that they help to identify the inconsistencies, limitations, and ambiguities that exist within logical frameworks.

2.1.7 The Liar's Paradox

This is truly the most 'classic of all classic' logical paradoxes. This is a perfect example of circular or self-referential reasoning. The Liar Paradox arises due to the contradiction by reasoning that centered around the sentence 'I am lying'. At first glance, it seems simple, but it leads to a huge problem. This sentence stands as the epitome of logical paradoxes due to its sheer simplicity. In just five words, it presents a contradiction: if the statement is true, then it is a lie, implying it is false. Yet, if it is false, it means it is a lie, thus making it true. The Liar paradox, credited to Eubilides, the philosopher of Miletus, poses a tricky question: is the statement 'I am lying' true? The issue here is that it is false if it is true and true if it is false. Some people think it is absurd or that it does not make sense as a true claim. Another way to look at it is as a meta-claim, meaning it involves statements at a different level of language or analysis.

Let us consider the Classical Liar Sentence, denoted as L. Assuming L to be true presents a confusing scenario:

- If L is true, it inherently asserts its falsehood, leading to a logical contradiction.
- Thus, the truth of L implies its falsity, engendering a paradox within its truth value.

This inherent contradiction arises from the self-referential essence of the Classical Liar Sentence, where its truth value negates itself, giving rise to a paradoxical loop. Conversely, considering L as false unveils another layer of complexity:

- The Liar Sentence proclaims 'L is false'.
- If L is indeed false, then its proclamation of falsity becomes true, necessitating L's truth.
- Consequently, accepting L as false paradoxically implies its truthfulness.

This intricate reasoning underscores the paradoxical and self-referential nature of the Classical Liar Sentence, where both truth values lead to logical absurdities. Thus, we confront a situation where L is true if, and only if, it is false, distorting the boundaries between truth and falsehood. In essence, the Liar Paradox leads us to grapple with the inherent limitations of language and logic, challenging conventional notions of truth and falsity. It serves as a testament to the intricacies of self-reference and logical reasoning, inviting contemplation on the nature of truth itself.

Recap

- Logic is the systematic study of valid reasoning, guiding us to distinguish sound arguments.
- The basic unit of logic is a proposition, a declarative sentence that is either true or false.
- Categorical propositions come in four standard forms (A, E, I, O), relating a Subject Term (S) and a Predicate Term (P).
    - A-form (All S is P): Universal, Affirmative.
    - E-form (No S is P): Universal, Negative.
    - I-form (Some S is P): Particular, Affirmative.
    - O-form (Some S is not P): Particular, Negative.
- Distribution of terms refers to whether a proposition makes a claim about all members of the class denoted by that term.
    - A-propositions distribute their Subject.
    - E-propositions distribute both Subject and Predicate.
    - I-propositions distribute neither.
    - O-propositions distribute their Predicate.
- An argument consists of one or more premises (reasons/evidence) leading to a conclusion (the main claim).
- Logical paradoxes are statements that lead to self-contradictory conclusions despite seemingly valid reasoning.
- The Liar's Paradox ("This statement is false") is a classic example, highlighting complexities in assigning truth values to self-referential statements.

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Objective Questions

1. What is the primary purpose of logic?
2. Which of the following is an example of a proposition ?
    - Which is this place?
    - Don't be late for the class.
    - The Earth is flat.
    - 4.Ouch! It hurts
3. In the proposition "All dogs are mammals," "dogs" is the:
4. Which type of categorical proposition is "No students are lazy people"?
5. In an 'I' proposition (Some S is P), which terms are distributed?
6. Which term is always distributed in an 'E' proposition (No S is P)?
7. In an argument, what provides the reasons or evidence for believing the conclusion?
8. Identify the conclusion in the following argument: "It's raining outside, so I should take my umbrella."
9. The statement "This statement is false" is a classic example of which concept?
10. What does a logical paradox primarily highlight?

Answers

1. To evaluate arguments and distinguish correct from incorrect reasoning
2. "The Earth is flat."
3. Subject Term
4. E - type proposition
5. Neither Subject nor Predicate
6. Both the Subject and Predicate terms

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7. Premise
8. “I should take my umbrella”
9. The Liar’s Paradox
10. Limitations or complexities within logical systems or language

Assignments

1. Proposition Identification and Classification:

♦ For each of the following statements, determine if it is a proposition. If it is, classify it as an A, E, I, or O proposition, and then identify the Subject Term, Predicate Term, and indicate whether each term is Distributed or Undistributed. If it is not a proposition, explain why.

- Some politicians are honest.
- No dogs can fly.
- All triangles have three sides.
- Study for your exam!
- Some metals are not magnetic.
- Are you feeling well?

2. Argument Analysis:

♦ For each of the following arguments, clearly identify all the premises and the conclusion. (Hint: Look for indicator words like “therefore,” “because,” “so,” etc., but be aware they are not always present).

- All cats like fish. My pet is a cat. Therefore, my pet likes fish.
- The car won’t start because the battery is dead.
- You should always carry an umbrella; it might rain.
- Since he is a student and all students have to register, he has to register.

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3. Paradoxical Thinking:

- Explain in your own words why the statement "I am lying" (also a form of the Liar's Paradox) leads to a logical contradiction. Your explanation should be no more than 150 words.

Reference

1. Hurley, P.J. (2014). *A Concise Introduction to Logic* (12th ed.). Cengage Learning.
2. Copi, I.M., Cohen, C., & McMahon, K. (2017). *Introduction to Logic*. Routledge.
3. Weston, A. (2017). *A Rulebook for Arguments* (5th ed.). Hackett Publishing Company.
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Suggested Reading

1. Hurley, P.J. (2014). *A Concise Introduction to Logic* (12th ed.). Cengage Learning.
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Unit 2

Inference

Learning Outcomes

Upon successful completion of this unit, the learner will be able to:

- distinguish between deductive, inductive, and abductive forms of reasoning
- identify and explain the characteristics of valid and sound deductive arguments
- recognise and analyse common formal and informal fallacies in arguments
- apply principles of logical reasoning to critically assess arguments encountered in academic, professional, and everyday contexts
- construct clear and logically coherent arguments, minimising the presence of fallacies

Prerequisites

Every day, from the moment you wake up, you are constantly making inferences. Why is the pavement wet? *Perhaps it rained*. Why is your phone battery low? *May be you forgot to recharge it.* These are ordinary acts of reasoning that quietly guide daily life. But what happens when the conclusions we draw are mistaken? What if the arguments we encounter, or even construct ourselves, rest on **shaky foundations**?

This unit, “Inference" isn not just about abstract logic; it is about equipping you with the vital skills to navigate a world brimming with information and persuasion. Here, examine the different ways one's minds build arguments, exploring the three main types of reasoning:

- Deductive Reasoning: The iron-clad logic where conclusions *must* follow from premises.

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- Inductive Reasoning: The art of drawing probable conclusions from observations.
- Abductive Reasoning: The detective's skill of finding the best explanation for a puzzle.

A significant part of our journey will involve identifying and dissecting formal and informal fallacies – those sneaky errors in reasoning that can mislead, distract, or simply make an argument crumble. By the end of this module, you'll not only understand *how* arguments are constructed but also *how* to construct more robust ones yourself and critically evaluate those presented by others, whether in academic texts, political debates, or everyday conversations. Get ready to sharpen your thinking!

Keywords

Deduction, Induction, Abduction, Fallacies

Discussion

2.2.1 Inference

Imagine you come home and find muddy footprints leading from the doorway to the living room. Now, you did not witness anyone entering, but you see these clues - the muddy footprints. Without being explicitly told, you start thinking about what might have happened. You might think these footprints were not here when I left this morning. It rained today, and the footprints are muddy. Someone probably came in with muddy shoes. You did not see the person, but you looked at the evidence (muddy footprints) and made a reasonable guess about what probably happened. That is what we call figuring things out by connecting the dots or putting puzzle pieces together. In everyday life, we often do not have all the information handed to us directly. We need to look at what we do know and make smart guesses about what might be true. This process, where you draw conclusions or make educated guesses based on the information you have, is a kind of logical thinking. It helps us understand the world around us and make decisions even when we do not have all the details.

Let us consider another example: you wake up in the morning and notice the ground is wet, you might think that it rained during the night. The wet ground serves as a clue or evidence to connect this observation with the likely cause - rain. In this scenario, the thought that you arrive at is based on the interpretation of the observed state of the

environment. In exploring these examples, we have encountered instances where our thoughts naturally connect observable clues and form conclusions about the environment. In both cases, our minds effortlessly engage in inference, utilising the available information to make reasonable assumptions about what likely occurred. This process of inference showcases our capacity to interpret the world around us, turning visible clues into meaningful conclusions.

In logic, we formally describe inference as a cognitive process that enables us to derive new insights and understanding from existing knowledge. It plays an important role in uncovering information that may not be immediately apparent through our senses. This critical thinking skill forms the foundation of logical arguments and serves as the cornerstone for expanding our knowledge. Inference involves starting with what we already know, called 'premises.' The premises act as the starting point, representing the foundation of our knowledge upon which we build further understanding. In the process of inference, the evidence supporting the derived conclusion is identified as premises, while the new understanding drawn from these premises constitutes the conclusion.

> To infer is to draw conclusions from premises.

Now let us reframe the example of rain in logical format:

What is already available (premise): Wet grass in the morning is often a result of rain during the night.

Logical thinking (inference): Seeing the wet grass, you use your inferential ability to reach a new conclusion - you infer that it probably rained overnight.

Conclusion: The new understanding you arrive at is that it likely rained during the night.

In this example, the wet grass serves as the evidence or premise. By applying logical thinking, you conclude that it rained based on your prior knowledge and observations. This simple example demonstrates how inference allows us to go beyond direct sensory experiences, helping us make sense of the world by connecting what we already know with new understandings.

Let us discuss one more example: You know that if students study well for an exam, they usually perform well. You observe your friend Nisar receiving an A grade.

What you already know (premise): Hard work usually leads to good performance in exams.

Logical thinking (inference): Seeing Nisar's A grade, you use your thinking to reach a new conclusion - you infer that Nisar worked hard for the exam.

Conclusion: The new understanding you arrive at is that Nisar probably studied well for the exam because he received an A grade.

In this example, the premise is the general knowledge that hard work leads to good performance. By observing the specific outcome (Nisar's A grade), you draw the conclusion

that he worked hard for the exam. This illustrates how inference in logic involves applying broader principles to make educated guesses about specific situations.

2.2.2 Types of Reasoning: Deduction, Induction, and Abduction

Reasoning is a crucial part of how we think and make choices every day. It is like a tool we use without even realising it, involved in everything from solving problems to making decisions. When we face a problem, we use reasoning to figure out what is going on, come up with solutions, and pick the best way to solve it. In decision-making, reasoning helps us look at our options, think about what might happen with each choice, and make smart decisions. When we talk to others or express our ideas, reasoning is like a guide that helps us make sense and explain things clearly. It is also linked to critical thinking, which is about analysing information and making sense of it in our studies and work.

Consider the scenario of choosing what to wear based on the weather, a common situation where reasoning is applied. Imagine waking up to a sunny day - your initial observation. Your brain processes this information, recalling that sunny days tend to be warm. Now faced with the decision of what to wear, you draw upon your past experiences and knowledge about weather patterns. Recognising the cause-and-effect relationship between sunny weather and warmth, you also consider the possibility of temperature changes throughout the day.

In applying your reasoning, you decide to wear a dress that suits the climate, based on the understanding of the cause-and-effect relationship between weather conditions and clothing choices. This decision-making process involves observation, information processing, knowledge application, and the flexibility to adapt to changing situations. Through this everyday example, it becomes clear that reasoning is not just a theoretical concept but an integral part of practical decision-making in our daily lives. Let us systematically apply logical reasoning to this scenario and derive arguments from it:

Premise 1: Sunny days tend to be warm (This statement establishes a general principle that applies to everyone).

Premise 2: Today is a sunny day (Introduces a specific case within the general category mentioned in Premise 1).

Conclusion: Therefore, today is likely to be warm (Drawing a specific conclusion based on the established premises).

We can also derive another argument from the same example:

Premise 1: In warm weather, wearing lighter clothing is comfortable (This statement establishes a general principle that applies to everyone).

Premise 2: Today is likely to be warm (Introduces a specific case within the general category mentioned in Premise 1).

Conclusion: Therefore, wearing lighter clothing today would be comfortable. (Drawing a specific conclusion based on the established premises).

In these two examples, we came across a general pattern

Let us also consider a common established example:

All Men are Mortal

Socrates is a man

Therefore, Socrates is Mortal

The first statement, 'All men are mortal,' is a general principle or premise that establishes a universal truth. It suggests that mortality is an inherent characteristic of all individuals classified as 'men.' This statement is based on the general understanding that human beings, as a species, share the common trait of being mortal, meaning they have a finite lifespan and will eventually die. The second statement, 'Socrates is a man,' introduces a specific case or individual, namely Socrates, and categorises him within the general group of 'men.' This statement connects a particular entity to the broader category established in the first premise.

The conclusion, 'Therefore, Socrates is mortal,' follows logically from the previous premises. Since the first premise asserts that all men are mortal, and the second premise establishes that Socrates is a man, it logically follows that Socrates must also be mortal. The conclusion derives from the application of the general principle to a specific case. This form of reasoning is deductive because it moves from general principles to a specific instance. It relies on the assumption that the premises are true, and if they are, the conclusion must also be true. Deductive reasoning provides certainty in its conclusions when the premises are accepted as valid.

> Deductive argument is an argument incorporating the claim that it is impossible for the conclusion to be false given that the premises are true.

In a deductive argument, you start with some statements that are assumed to be true, and you use logical reasoning to come to a specific conclusion. The key idea is that if the starting statements are true, then the conclusion must also be true. It is just like following a recipe for preparing a delicious food. If you follow the recipe correctly and all the ingredients are good, you can be confident that you will end up with delicious food.

In the case of induction, the case is different, and it can be explained in the following illustrations: Whenever you have looked up at the sky and spotted dark clouds swirling, felt the gust of wind picking up, and heard the distant rumble of thunder, it was like nature's signal, it is about to rain. This is not a one-time thing; it happens repeatedly. Because it has happened so many times in the past, you naturally start to think, 'Whenever I see dark clouds, feel the wind, and hear thunder, it usually means rain is coming.' It is like your own weather forecast based on what you have experienced before. When you see those familiar signs in the sky, your inferential ability says, 'Get ready for rain!' This is your everyday inductive reasoning at play - making predictions about the future based on the patterns you have noticed in the past.

Let us take another example to know how inductive reasoning works in our life without realising that you are using inductive reasoning. Imagine you are at a friend's house, and

they have a big bowl of candy on the table. You grab a handful, and every single piece is sweet. Each time you reach into the bowl of candy, your taste buds encounter sweetness. As you reach for the candy, your brain naturally begins to make a broader assumption based on this repetitive experience. This repetition creates a pattern in your mind that every piece of candy from that bowl is sweet. It starts connecting the dots, leading you to think, 'every candy in this bowl is sweet.' In this process, you are not relying on a strict rule or certainty but rather on a generalisation drawn from your repeated encounters with the same outcome.

> How do we arrive at generalisation? Generalisation is like forming a rule or making a statement that applies to a whole group based on what you observe in some members of that group.

From the two above instances, we comprehend that inductive reasoning is a way of predicting or assuming a general pattern based on specific instances consistently observed. This everyday occurrence illustrates how inductive reasoning allows us to make sense of the world by identifying patterns in our experiences. Let us do one more common example: Think about all the people you know or have heard about - your grandparents, famous historical figures, people in different countries and cultures. Every person you can think of, at some point, experiences death. This is something you have seen or heard about many times. After noticing this happening repeatedly, you start to form a pattern - a common thread among all these individuals, regardless of who they are or where they come from. They all share the experience of eventually passing away. Now, when you think about any man, including yourself, you may say, 'Based on what I have seen and heard about so many people, it seems like everyone has this in common. So, maybe all men are mortal, meaning they will eventually pass away.'

However, it is important to note that inductive reasoning does not guarantee certainty. The conclusion is based on the probability that what has been observed in the past will continue to hold true in the future. In this case, the generalisation 'All men are mortal' is a widely accepted and reasonable inference based on a vast array of observed instances of human mortality. There is always an 'inductive leap' in the process of inductive reasoning. This leap occurs when we go beyond the observed instances to make a broader claim, acknowledging that our conclusion may not be certain but is a reasonable and likely assumption based on the available evidence. For example, if you observe that every crow you have seen is black, you might make an inductive leap to the generalisation that 'all crows are black.' This conclusion extends beyond the observed instances to encompass a broader category.

Apart from deductive and inductive reasoning we also use abductive reasoning in our lives. For instance, imagine returning home after a long day, and as you approach your front door, you notice it is wide open. Your first observation is that the front door is open - an undeniable fact. Now, your mind starts to think of the possible explanations. Could it be that you absentmindedly left the door open, or is there another, more unexpected reason behind it? As you consider these instances, you are engaging in abductive reasoning, trying to find the most reasonable and straightforward explanation based on the available evidence.

Imagine you are the head of a company, and you have to decide things, but do not have all the information you want. In this situation, you find yourself needing to make choices without having all the facts. This is where abductive reasoning comes in place by which we choose the best option available from the alternatives. It is the way of navigating the uncertainties and making informed decisions, a bit like playing a strategic game where the outcome is not entirely clear. In other words, when faced with uncertainty, we use abductive reasoning to come up with educated guesses or hypotheses about what might happen. It is just like making smart predictions based on what they do know, even if it does not give complete information.

From the above instances, we can arrive at the conclusion that abductive reasoning is a process of making the best guess or finding the most likely explanation when you have incomplete information. It helps to make reasonable assumptions or educated guesses and fill in the gaps to understand things better. In other words, it makes the best inference based on available possibilities.

> According to Charles S. Peirce, deduction proves that something must be; induction shows that something actually is operative; abduction merely suggests that something may be.

2.2.3 Formal and informal Fallacies

When we engage in argumentation, whether in our daily conversations or in more formal debates, our goal is to present sound and valid reasoning. However, errors can arise due to faulty logic, misinterpretation of evidence, or the manipulation of language. In this context, logic has a crucial role by aiming to discern and highlight the various ways individuals might be prone to erroneous reasoning. An important aspect of logical analysis involves the identification and classification of defective arguments, commonly referred to as fallacies.

A fallacious argument arises when the provided premises fail to adequately support the conclusion, leading to an unsound line of reasoning. It is more like a collection of mistakes that go beyond just having wrong facts. It includes problems with the way someone thinks or the tricky use of words to create an illusion. This illusion makes a weak argument seem more convincing than it really is. These mistakes are not confined to a specific type of argument but can be found in both deductive and inductive reasoning. Whether someone is trying to prove something with clear steps (like in math) or making a generalisation based on examples can commit mistakes that lead to fallacy.

Fallacies are usually divided into two groups: formal and informal.

2.2.3.1 Formal Fallacies

A formal fallacy can be identified by scrutinising the form or structure of an argument. The formal fallacies are exclusive to deductive arguments that follow identifiable forms. For example, in a categorical syllogism (a three-step argument with a major premise, minor premise, and conclusion), if the rules of distribution, quality, or quantity are broken, a formal fallacy occurs. Some common types are:

1. Fallacy of Undistributed Middle: When the middle term is not distributed in either premise.
2. Fallacy of Illicit Major/Minor: When the major or minor term is distributed in the conclusion but not in the premise.
3. Existential Fallacy: When a conclusion about particular existence is drawn from purely universal premises.

Formal fallacies are purely technical errors in logical structure, and once identified, they can be corrected by reforming the syllogism properly.

2.2.3.2 Informal Fallacies

Informal fallacies represent errors in reasoning that can only be identified by examining the content of an argument. Unlike formal fallacies, which can be discerned by scrutinising the structure of an argument, informal fallacies rely on the substance of the argument and often involve flaws in the reasoning process or the use of language. Philosopher I.M. Copi grouped informal fallacies into four main categories:

1. Fallacies of Ambiguity
2. Fallacies of Relevance
3. Fallacies of Defective Induction
4. Fallacies of Presumption

1. Fallacies of Ambiguity

These fallacies occur when language is used in a confusing or unclear way. A word, phrase, or sentence may have more than one meaning, leading to false reasoning.

a. Equivocation: Using the same word with two meanings.

Example: 'John is a big writer because he is from a big city.' ('Big' means different things here.)

b. Amphiboly: Confusion due to ambiguous sentence structure.

Example: 'Kids make delicious dinners' - meaning unclear whether kids cook dinner or are food themselves!

c. Accent: Changing the meaning by wrongly emphasizing a word.

Example: 'Wife without her husband is nothing' changes meaning depending on stress.

d. Composition: Assuming what is true of parts is true of the whole.

Example: 'Each player is excellent; therefore, the team is excellent.'

e. Division: Assuming what is true of the whole is true of parts.

Example: 'India loves cricket; therefore, every Indian loves cricket.'

2. Fallacies of Relevance

In these fallacies, the premises seem related to the conclusion emotionally or psychologically but not logically. They distract from the main point.

a. Appeal to Emotion (Ad Populum): Persuading through emotions, not logic.

Example: 'If we send this man to jail, who will feed his children?'

b. Red Herring: Diverting attention from the main topic.

Example: 'A child changes the subject to avoid going to bed'.

c. Straw Man: Misrepresenting someone's argument to easily attack it.

Example: 'Twisting a suggestion for social service into opposition to all fun activities'.

d. Argument Against the Person (Ad Hominem): Attacking the person instead of the argument.

Example: 'He is a leftist, so his opinion is wrong.'

e. Appeal to Force (Ad Baculum): Using threats to gain agreement.

Example: 'Support this proposal, or you'll lose your job.'

f. Missing the Point (Ignoratio Elenchi): Drawing a conclusion different from the one intended.

Example: 'The object of war is peace, so soldiers are the best peacemakers.'

3. Fallacies of Defective Induction

These occur when the evidence provided is too weak to support the conclusion, even though it might be relevant.

a. Argument from Ignorance (Ad Ignorantiam): Assuming something is true because it hasn't been proven false.

Example: 'No one has proved aliens don't exist, so they must exist.'

b. Appeal to Inappropriate Authority (Ad Verecundiam): Depending on an expert who is not qualified in the relevant field.

Example: 'A film star endorsing a medical product'.

c. False Cause (Non Causa Pro Causa): Mistaking coincidence for causation.

Example: 'The sun was shining when the fire started; therefore, the sun caused it.'

d. Hasty Generalization: Drawing a broad conclusion from limited examples.

Example: 'One dog bit me, so all dogs are dangerous.'

4. Fallacies of Presumption

These fallacies assume something as true without sufficient proof or wrongly apply a general rule to a specific case.

a. Fallacy of Accident: Applying a general rule to an exceptional case.

Example: 'Lying is always wrong, even to save a life.'

b. Begging the Question (Petitio Principii): Assuming the conclusion in the premises - circular reasoning.

Example: 'He studies hard because he's a good student; he's a good student because he studies hard.'

c. Complex Question: Asking a question that hides an unproven assumption.

Example: 'Have you stopped being careless?' (Assumes the person was careless before.)

In everyday reasoning, fallacies often go unnoticed because they sound persuasive. Knowing about formal and informal fallacies helps us think more critically, recognize errors in reasoning, and construct arguments that are both logical and fair. Clear reasoning requires both correct logical form and relevant, strong, and unambiguous premises.

- Inference is the mental process of drawing a conclusion from given evidence, serving as a fundamental cognitive skill for navigating the world.
- Deductive Reasoning is a type of reasoning that moves from general principles to specific conclusions, where the conclusion is guaranteed to be true if the premises are true.
- Inductive Reasoning is the process of moving from specific observations to a probable generalisation, where the conclusion is likely but not guaranteed.
- Abductive Reasoning (or inference to the best explanation) is a type of reasoning that starts with an observation and seeks the simplest and most likely explanation for it.
- Deductive reasoning offers certainty, inductive reasoning offers probability, and abductive reasoning offers the most plausible explanation.
- Fallacies are errors in reasoning that undermine an argument's validity, making it crucial to understand them for critical evaluation.

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- Formal Fallacies are errors in the logical structure of a deductive argument, meaning the conclusion does not necessarily follow from the premises.
- Informal Fallacies are errors that arise from the content or context of an argument, often relying on psychological persuasion or irrelevant information.

Objective Questions

1. What is the cognitive process of drawing a conclusion from given premises?
2. What is the name for reasoning that moves from general principles to specific conclusions?
3. What is the term for reasoning that moves from specific observations to a probable generalisation?
4. Which type of reasoning is also known as "inference to the best explanation"?
5. What is an error or trick in reasoning that undermines an argument?
6. An argument that is valid and has all true premises is called what?
7. What is the Latin term for the fallacy of attacking a person instead of their argument?
8. What is the fallacy of assuming the conclusion within the premises?
9. What type of fallacies are errors in the logical structure of an argument?
10. What is the type of fallacies that arise from the content or context of an argument?

Answers

1. Inference
2. Deductive Reasoning
3. Inductive Reasoning
4. Abductive Reasoning
5. Fallacy

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6. Sound Argument
7. ad Hominem
8. Begging the Question (Petitio Principii)
9. Formal Fallacies
10. Informal Fallacies

Assignments

1. Critically examine the process of inference as the foundation of logical reasoning and analyse how it enables the transition from known premises to new knowledge. Discuss its cognitive and epistemological significance with reference to its operation in both everyday life and formal logic.
2. Evaluate deduction, induction, and abduction as distinct modes of reasoning that shape human understanding, comparing their logical structures, purposes, and degrees of certainty. Discuss how each operates within science, philosophy, and everyday decision-making, and assess how these reasoning methods together contribute to the pursuit of knowledge.
3. Analyse the nature of fallacious reasoning and evaluate its impact on critical thinking and rational judgment. Discuss the distinction between formal and informal fallacies, explaining how language, emotion, and assumptions lead to flawed arguments, and illustrate these with examples from everyday discourse to highlight their philosophical significance for truth and reasoning.

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Unit 3

Syllogism Rules & Fallacies

Learning Outcomes

After completing this unit, the learner will be able to:

- identify the structure of a syllogism and its roles
- understand the rules of a syllogism
- detect common formal fallacies
- Know about categorical syllogism
- judge when a conclusion does not follow from the premises
- test everyday arguments for validity and correct them by rewriting premises or conclusions

Prerequisites

A systematic way to test the correctness of reasoning is very important. Syllogism helps us do this by showing how conclusions follow logically from given premises. It makes our thinking more organized and reliable. Syllogism originated from Aristotle's formalization of logic, which laid the foundation for Western philosophy and science for millennia. In contemporary life, the syllogism remains a powerful, though often unconscious, tool for critical thinking. It provides a reliable mental framework for evaluating the validity of arguments, ensuring that a conclusion genuinely follows from its premises rather than resting on an assumption. Moreover, breaking down complex issues into simple, verifiable statements supports rational decision-making and clear, persuasive communication. In short, the syllogism serves as the essential blueprint for ensuring that our thoughts and arguments are not only expressed but also logically coherent and sound. In short, syllogism provides a clear method to identify valid and faulty reasoning, which is valuable in philosophy, science, and everyday life.

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Keywords

Categorical syllogism, Major premise, Minor premise, Deductive reasoning, Fallacy of four terms, Ambiguous major, Fallacy of illicit minor, Exclusive premises, Existential fallacy

Discussion

2.3.1 Syllogism: Rules and Fallacies

Have you ever encountered the term 'syllogism' in your daily life? While it may initially appear foreign and somewhat distant from our everyday conversations, it operates subtly behind the scenes, influencing our thoughts and decisions. Syllogistic reasoning is something we do naturally, even if we are not aware of the term itself. Like a mental puzzle where the pieces fit together to reveal new insights, syllogistic reasoning connects what we know to what we can infer. It provides a structured way to draw conclusions based on established facts.

You observe certain facts or know specific information in daily life, and from that, you naturally infer or deduce additional information. The same is the process with syllogism, in which a systematic connection is formed with what we know (premises) to draw logical conclusions. This mirrors the natural way we make inferences in our daily lives, but with a structured and formalised framework. For instance, if you know Statement A and Statement B to be true, syllogism provides a systematic way to logically infer Statement C.

For instance, you know that every man eventually passes away. That is the general rule or the general principle. Socrates, the ancient philosopher, was a man. That is the individual instance, and when we logically combine these pieces together, and we say, 'Well, if all men, in general, do not live forever, and Socrates was a man, then logically, Socrates, too, must be mortal'. When you connect the general idea (all men are mortal) to a specific case (Socrates is a man), leading to the logical conclusion that Socrates must be mortal too.

In syllogistic reasoning, we can find a mediation process that involves reasoning from two premises (only two premises) to reach a conclusion. The term 'mediate' in this context indicates that the conclusion is reached through an intermediate step, which involves the logical connection between the premises. In other words, in a syllogism, premises provide the necessary information, and the conclusion is a result of deducing the logical consequences of those premises.

A syllogism consists of exactly two premises. These premises are statements or propositions that provide information. From these two premises, a logical conclusion is derived. That is, information provided in the two premises, when considered together, leads to a logical conclusion. The relationship between the premises and the conclusion is such that if the premises are true, the conclusion must also be true. This implies a form of deductive reasoning.

Syllogisms are classified as categorical or non-categorical. In a categorical syllogism, all statements involved are categorical propositions. If at least one of the statements in the syllogism is not a categorical proposition, it is classified as a non-categorical syllogism. Non-categorical syllogisms can involve different types of statements, including conditional statements.

2.3.2 Structure of a Categorical Syllogism

The structure of a categorical syllogism is based on the arrangement of terms and the relationship between them. The three terms in a categorical syllogism are the major term, the minor term, and the middle term. Each term occurs twice in a syllogism. The major term is the predicate term of the conclusion and is represented by the letter 'P'. The major premise is where the major term is present. The minor term is the subject term of the conclusion and is represented by the letter 'S'. The minor premise is where the minor term is present. The term which appears only in the premises and not in the conclusion is called the 'Middle term' and is represented by the letter 'M'. The structure of a categorical syllogism can be represented in standard form, in which the major premise comes first, then the minor premise comes, and the conclusion comes in the end. A syllogism may not always be in a standard form. The premises and conclusion may not be in the right order.

Major Term: The predicate term of the conclusion.

Minor Term: The subject term of the conclusion.

Middle Term: The term that appears in both premises but not in the conclusion.

Major Premise: The premise containing the major term.

Minor Premise: The premise containing the minor term.

Let us take a common example to illustrate the structure of a categorical syllogism:

All men are mortal. (Categorical premise)

Socrates is a man. (Categorical premise)

Therefore, Socrates is mortal. (Categorical conclusion)

In this example, the major term is 'mortal.' It is represented by the letter 'P.' The major premise is where the major term is present. In this case, the major premise is 'All men are mortal.'

The minor term is the subject term of the conclusion. In this example, the minor term is 'Socrates,' represented by the letter 'S.' The minor premise is where the minor term is present. Here, the minor premise is 'Socrates is a man'.

The middle term is the term that appears in both premises but not in the conclusion. In this example, the middle term is 'man,' represented by the letter 'M.' It connects the major and minor terms. The middle term is essential for drawing the logical conclusion.

2.3.3 Rules of Categorical Syllogism

Rule 1: A valid standard-form of categorical syllogism must contain exactly three terms, each of which is used in the same sense throughout the argument.

A categorical syllogism must involve three terms: the major term, the minor term, and the middle term. Each term plays a specific role in connecting the premises and forming a logical conclusion. Each term must maintain its intended meaning throughout the syllogism. Using a term in different senses could introduce confusion and lead to logical errors. The following fallacies can occur when this rule is violated.

The fallacy of four terms: This fallacy occurs when there are more than three terms present in a syllogism. If an argument introduces an additional term, it can complicate the logical relationships and undermine the validity of the syllogism.

Example:

All men are mortal. (Major Premise)

Socrates is a philosopher. (Minor Premise)

Therefore, Socrates is mortal. (Conclusion)

This syllogism contains 4 terms: Men, mortal, Socrates, Philosopher, and commits the fallacy of four terms.

Fallacy of Ambiguous Major: The fallacy of ambiguous major occurs when the major term is employed with one meaning in the major premise and a different meaning in the conclusion.

Example:

No courageous creature flies

Eagle is a courageous creature

Therefore, Eagle does not fly

In this case, the ambiguity arises from the different interpretations of the term 'flies.' In the major premise, 'flies' is interpreted as avoiding or running away from a situation. However, in the conclusion, 'flies' is interpreted as the physical act of flying. This inconsistency in the interpretation of the major term (flies) leads to the fallacy of an ambiguous major.

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Fallacy of Ambiguous Minor: The fallacy of ambiguous minor occurs when the minor term is employed with one meaning in the minor premise and a different meaning in the conclusion.

Example:

No man is made of paper

All pages are men

Therefore, No pages are made of paper

The ambiguity happens because the meaning of the word 'pages' changes between the minor premise and the conclusion. In the minor premise, 'pages' means young workers in a hotel, but in the conclusion, 'pages' is understood as the sheets in a book. This use of different meanings for the same word in the premise and conclusion creates ambiguity and commits the fallacy of ambiguous minor.

Fallacy of Ambiguous Middle: The fallacy of ambiguous middle occurs when the middle term is employed with one meaning in the major premise and a different meaning in the minor premise.

Example:

Sound travels 1120 feet per second

My knowledge of philosophy is sound

Therefore, my knowledge of philosophy travels 1120 per second

In this syllogism, the ambiguity arises from the term 'sound' (the middle term), which is used in different senses in both premises. In the major premise, 'sound' refers to the physical phenomenon of vibrations traveling through a medium, like air, at a speed of 1120 feet per second. In the second premise, 'sound' is used metaphorically to indicate that one's knowledge of philosophy is reliable, well-founded, or free from error, and thus commits the fallacy of ambiguous middle.

Rule 2: Distribute the middle term in at least one premise.

A term is considered distributed in a proposition when the proposition includes all the members of the class indicated by that term. In other words, it includes every individual or element within that category. If the middle term, which connects the premises to reach a conclusion, is not distributed in at least one of the premises, the logical connection needed for the conclusion to follow cannot be established.

Example:

All Russians were revolutionists.

All anarchists were revolutionists.

Therefore, all anarchists were Russians.

In this argument, 'revolutionists' serves as the middle term, and is undistributed in both premises. The first premise does not encompass all revolutionists, and the second premise has a similar limitation. The fallacy committed by this syllogism is known as the 'fallacy of the undistributed middle.'

Rule 3: Any term distributed in the conclusion must be distributed in the premises.

A syllogism typically consists of two premises and a conclusion. The premises present certain information, and the conclusion logically follows from these premises. In valid arguments, it is essential that the conclusion does not introduce extra information beyond what is initially stated in the premises. If the conclusion goes beyond the scope of the information provided in the premises, introducing an element that was not part of the original argument, then it commits fallacies such as,

- Fallacy of illicit major
- Fallacy of illicit minor

The fallacy of illicit major occurs when the major term in the conclusion is distributed, which is undistributed in the major premise.

Example:

All students in the math club enjoy solving complex problems.

No athletes are members of the math club.

Therefore, no athletes enjoy solving complex problems.

In this syllogism, the fallacy of illicit major occurs because the conclusion makes a statement about all athletes, including their enjoyment of solving complex problems, without this being explicitly mentioned in the premises. The premises only provide information about students in the math club and athletes not being members of the math club, but the conclusion goes beyond these premises, making a broad statement about all athletes.

The fallacy of illicit minor occurs when the minor term in the minor premise is undistributed, which is distributed in the conclusion.

Example:

All roses in the garden are red.

All roses in the garden are plants.

Therefore, all plants are red.

In this syllogism, the fallacy of illicit minor occurs because the conclusion makes a statement about all plants being red, even though this information was not explicitly mentioned in the premises. The premises only provide information about roses in the garden being red and being plants, but the conclusion goes beyond these premises, making a broad statement about all plants.

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Rule 4: From two negative premises, no conclusion is possible

When both premises are negative, it becomes challenging to establish a valid argument because there is no clear link between the minor and major terms. Hence, we cannot draw a reliable conclusion from such premises. This fallacy is known as the fallacy of exclusive premises.

Rule 5: If either premise is negative, the conclusion must be negative.

For an affirmative conclusion to be valid, it must be derived from two affirmative premises. This is because only affirmative propositions can clearly articulate the relationships between classes. The fallacy arises when someone draws an affirmative conclusion based on a negative premise. In other words, if we want to say something positive about the connection between two classes, we need positive statements in the premises that explicitly establish the existence of relationships between these classes. Drawing affirmative conclusions from negative premises is a mistake known as the fallacy of drawing an affirmative conclusion from the negative premise.

Example:

No poets are accountants.

Some artists are poets.

Therefore, some artists are accountants

The fallacy here lies in the attempt to draw an affirmative conclusion about the relationship between artists and accountants based on the negative premise that no poets are accountants. The conclusion goes beyond the information provided in the premises. While the premises establish a connection between artists and poets, they do not provide any direct information about the relationship between artists and accountants.

Rule 6: A syllogism having both universal premises must have a universal conclusion.

A syllogism having both universal premises and a particular conclusion is invalid, having the fallacy called existential fallacy. The concept of existential import is crucial in understanding the existential fallacy. Existential import refers to the idea that certain terms or propositions within an argument imply the existence of something. In other words, when we make statements, some of them inherently suggest the existence of certain things. The existential fallacy occurs when the premises of an argument do not assert the existence of anything, yet the conclusion somehow implies the existence of something. This is considered a mistake because, logically, a conclusion should not introduce existence if it was not present in the premises.

Example:

Unicorns have one horn.

Mermaids have fish tails.

Therefore, mythical creatures exist.

In this example, the premises provide characteristics or attributes of mythical creatures (unicorns and mermaids) without explicitly asserting their existence. However, the conclusion erroneously implies the existence of mythical creatures in general. Thus, the syllogism becomes fallacious because the conclusion goes beyond the scope of the premises. While the premises discuss specific features of mythical creatures, they do not state that such creatures actually exist. The conclusion, on the other hand, makes a broad claim about the existence of mythical creatures, introducing information not present in the premises.

Recap

- Syllogism has two premises and one conclusion.
- The three terms consist; major, minor, and middle terms.
- Terms must keep the same meaning.
- Wrong use of terms causes fallacies.
- Two negative premises give no conclusion.
- Two universal premises give a universal conclusion.
- Fallacies like four terms or ambiguity make reasoning wrong.
- Syllogism teaches how to find valid and invalid arguments.
- The middle term must be distributed in one premise.
- Any term distributed in the conclusion must be distributed in the premises.
- If a premise is negative, the conclusion must also be negative.
- If both premises are universal but the conclusion is particular, it is an existential fallacy.
- If more than three terms are used, it commits the fallacy of four terms.
- Wrong or changing meanings of terms cause ambiguity fallacies.
- If the middle term is not distributed, it causes the fallacy of undistributed middle.
- If the major or minor term is wrongly distributed, it causes illicit fallacies.
- Syllogism helps test the validity of reasoning and avoid mistakes.

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Objective Questions

1. How many premises are there in a syllogism?
2. What type of reasoning does syllogism use?
3. How many terms are there in a valid syllogism?
4. Name the three terms of a syllogism.
5. Which term appears in both premises but not in the conclusion?
6. What does Rule 1 of syllogism state?
7. What fallacy occurs when more than three terms are used?
8. What is the fallacy of ambiguous major?
9. What is the fallacy of ambiguous minor?
10. What happens if the middle term is not distributed in any premise?
11. What is the fallacy of illicit major?
12. What is the fallacy of illicit minor?
13. What is the fallacy called when both premises are negative?
14. What fallacy occurs when an affirmative conclusion is drawn from a negative premise?
15. What is the fallacy called when both premises are universal but the conclusion is particular?

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Answers

1. Two premises
2. Deductive reasoning
3. Three terms
4. Major term, Minor term, and Middle term
5. Middle term

6. A syllogism must have exactly three terms used in the same sense
7. Fallacy of four terms
8. When the major term changes meaning between premise and conclusion
9. When the minor term changes meaning between premise and conclusion
10. Fallacy of undistributed middle
11. When the major term is distributed in the conclusion but not in the premise
12. When the minor term is distributed in the conclusion but not in the premise
13. Fallacy of exclusive premises
14. Fallacy of drawing an affirmative conclusion from a negative premise
15. Existential fallacy

Assignments

1. Rule Violation and Fallacy Identification:

For each of the following invalid syllogisms, identify which rule of validity is violated and state the name of the formal fallacy committed.

a. All P is M. (e.g., All doctors are professionals.)

All S is M. (e.g., All lawyers are professionals.)

Therefore, All S is P. (e.g., Therefore, All lawyers are doctors.)

b. No M is P. (e.g., No students are lazy.)

No S is M. (e.g., No athletes are students.)

Therefore, No S is P. (e.g., Therefore, No athletes are lazy.)

c. All M is P. (e.g., All dogs are mammals.)

Some S is M. (e.g., Some animals are dogs.)

Therefore, All S is P. (e.g., Therefore, All animals are mammals.)

2. Discuss the main rules of a valid categorical syllogism and explain how they ensure logical reasoning and prevent fallacies.

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3. Identify and explain any two major fallacies that occur in a syllogism with suitable examples.

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BLOCK
03

Fundamentals of Symbolic Logic

Unit 1

Introduction to Symbolic Logic

Learning Outcomes

Upon successful completion of this unit, you will be able to:

- define symbolic logic and differentiate it from traditional Aristotelian logic
- explain the primary advantages of symbolic logic over ordinary language
- recognize the key components and notation used in symbolic logic such as variables for propositions, symbols for connectives
- translate simple natural language sentences into symbolic form
- articulate the principles of logical consistency and validity within a symbolic framework

Prerequisites

A basic understanding of the fundamental concepts of logic is beneficial. Students should be familiar with the ideas of arguments, premises, conclusions, and the distinction between formal validity and material truth, as covered in the "Logic: An Introduction" and "Syllogism Rules & Fallacies" units.

Keywords

Symbolisation, Formalisation, Logical Symbols, Logical Connectives, Ambiguity, Vagueness, Emotional Connotation, Consistency, Validity, Clarity, Precision, Truth-Functionality

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Discussion

Introduction to Symbolic Logic: Moving Beyond Ordinary Language

Symbolic logic, offers us a new and powerful toolkit. It is, at its heart, a method of analysis that replaces ordinary language statements with precisely defined symbols and variables. This shift from words to symbols is not merely for the sake of complexity; it is a strategic move to eliminate the very problems that plague natural language and to bring a new level of clarity, precision, and efficiency to our reasoning. Symbolic logic allows us to examine the form of an argument without being distracted by the content of its propositions. It is the language of pure reason, designed to be unambiguous and mathematically rigorous. This unit will focus on the key advantages that symbolic logic provides, illustrating why this abstraction is so crucial for advanced logical reasoning.

3.1.1 The Advantage of Clarity and Precision

One of the most significant advantages of symbolic logic is its unparalleled clarity and precision. Natural language, with its vast vocabulary and grammatical rules, is rich in expressive power but poor in logical consistency. The same word can have multiple meanings, and the same grammatical structure can be used to express different logical relationships. This inherent imprecision often makes it difficult to ascertain the exact logical structure of an argument.

3.1.1.1 Eliminating Ambiguity

Ambiguity occurs when a word or phrase has more than one meaning. In everyday communication, context usually resolves this problem. For example, the word "bank" can refer to the side of a river or a financial institution. We know which meaning is intended based on the surrounding words. However, in a complex logical argument, such ambiguities can lead to errors. A fallacy known as the "fallacy of equivocation" specifically exploits this ambiguity by using a word in two different senses within the same argument to make it appear valid when it is not.

Symbolic logic sidesteps this issue entirely. In symbolic logic, each symbol represents a single, well-defined concept. For example, the symbol for "and" ($\wedge$) has only one meaning: a conjunction where both propositions must be true for the compound proposition to be true. It cannot be confused with the other uses of "and" in natural language, such as sequential actions (e.g., "She got up and went to the shops") or a causal link. By replacing ambiguous words with unambiguous symbols, symbolic logic ensures that we are always analysing the exact same logical relationships, removing a major source of error.

3.1.1.2 Eliminating Vagueness and Emotional Connotation

Related to ambiguity is vagueness, where the boundaries of a term's meaning are unclear. Terms like "tall," "rich," or "old" are vague. While we can agree that a 7-foot person is tall, and a 5-foot person is not, what about a 6-foot person? The vagueness

of the word "tall" makes it unsuitable for a rigorous, formal system where every term needs a clear, defined boundary.

Symbolic logic deals with propositions as whole, indivisible units of thought that are either true or false. It does not analyse the content of the propositions themselves. The proposition "The chair is red" is simply represented by a single variable, say 'P'. The vagueness of "red" is irrelevant to the logical analysis of how 'P' connects to other propositions. The symbolic system is concerned solely with the truth value of 'P', not the nuanced meaning of its terms.

Furthermore, symbolic logic is free from the emotional connotations of language. Words in natural language often carry emotional weight or persuasive force that can cloud our judgement. For example, a lawyer might use emotionally charged language to appeal to a jury. In symbolic logic, propositions are stripped of this emotional baggage. The statements "The defendant is a cold-blooded killer" and "The defendant is a person who has taken a life" could both be represented by the same propositional variable 'K', and the symbolic system would treat them identically. This forces us to focus on the logical structure of the argument itself, rather than being swayed by rhetoric.

3.1.2 The Advantage of Efficiency and Simplicity

The use of a symbolic language also brings remarkable efficiency and simplicity to logical analysis. Imagine trying to solve a complex algebraic equation without using symbols for numbers and operations. It would be nearly impossible. Similarly, symbolic logic provides a shorthand, a kind of "logical algebra," that allows us to manipulate and evaluate complex arguments with much greater ease.

3.1.2.1 A "Logical Shorthand"

Symbolic logic provides a concise notation for complex ideas. Instead of writing out "If it is raining outside, then I will take my umbrella," we can simply write 'R $\Rightarrow$ U', where 'R' stands for "It is raining outside," 'U' stands for "I will take my umbrella," and '$\Rightarrow$' (called the 'horseshoe') is the standard symbol for material implication, representing "if... then...". This notational efficiency allows us to express complex logical relationships in a compact and easily readable form.

For example, a series of complex premises that might take a paragraph to write out in English could be reduced to a few lines of symbolic notation, making the argument's structure immediately visible. This visual simplicity is a powerful aid in identifying patterns and errors in reasoning.

Because symbolic logic replaces ambiguous sentences with a precise symbolic notation, it makes the process of evaluating arguments far more manageable. The rules of inference and the laws of logic, which we will explore in later units, can be applied with mathematical precision. We do not need to worry about the content of the propositions, only their truth values and how they are connected by the logical operators. This concept is called truth-functionality.

In propositional logic, all logical operators are truth functional. This means that the truth value of a compound proposition is determined solely by the truth values of its

simple component propositions. For example, the truth of 'P ∧ Q' (P and Q), the logical operator ∧ stands for conjunction ("and"), depends only on whether P is true and whether Q is true. It is true if both P and Q are true, and false in all other cases. This allows us to use simple tools like truth tables to systematically test the validity of an entire argument, a task that would be virtually impossible to perform with the same level of certainty using natural language.

3.1.3 The Advantage of Consistency and General Applicability

Symbolic logic offers the advantage of a high degree of consistency and general applicability. The rules we learn for symbolic manipulation apply universally, regardless of the subject matter of the argument itself.

3.1.3.1 Formal Validity vs. Material Truth

Symbolic logic helps us to make a clear distinction between formal validity and material truth.

- Material truth refers to the factual accuracy of a proposition about the world. For example, the proposition "All birds can fly" is factually false.
- Formal validity, in contrast, refers to the structural integrity of an argument. An argument is formally valid if its conclusion necessarily follows from its premises, regardless of whether the premises or conclusion are factually true.

Consider this argument:

1. All P are M.
2. All S are P.
3. Therefore, All S are M.

This argument form is formally valid. We can replace 'P', 'M', and 'S' with any terms we like, and if the premises are true, the conclusion must be true.

- **Example 1 (True Premises):**
    1. All dogs are mammals.
    2. All poodles are dogs.
    3. Therefore, all poodles are mammals.

This argument is both formally valid and factually sound.

- **Example 2 (False Premises):**
    1. All men are green.
    2. Socrates is a man.
    3. Therefore, Socrates is green.

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This argument is formally valid, even though both its premises and its conclusion are factually false. The conclusion necessarily follows from the premises. The symbolic form allows us to see this validity immediately, without being distracted by the absurdity of the content.

This ability to abstract away from the content is a core advantage of symbolic logic. It allows us to analyse the logical form of arguments and develop a universally applicable set of rules of inference that work for any topic, from mathematics to law to everyday reasoning. The consistency of the symbolic system guarantees that if we apply the rules correctly, we will always be able to determine an argument's validity, a task that is far more difficult and prone to error when using the fluid and imprecise medium of natural language.

In summary, symbolic logic is not a replacement for natural language but a powerful tool for logical analysis. It provides us with a language of perfect clarity, precision, and efficiency, allowing us to focus on the structure of arguments rather than being misled by their content or emotional impact. This shift is crucial for building a solid foundation in rigorous, formal reasoning.

Recap

- Symbolic logic replaces natural language with precise symbols to eliminate ambiguity and vagueness.
- The primary advantages are clarity, precision, efficiency, and a focus on formal structure.
- Ambiguity and vagueness inherent in ordinary language are major sources of logical error that symbolic logic avoids.
- Logical shorthand makes complex arguments easier to write, read, and manipulate.
- Symbolic logic is truth-functional, meaning the truth of a compound proposition is determined solely by the truth of its components.
- It clearly separates formal validity (the structure of an argument) from material truth (the factual accuracy of its statements).
- The universal and consistent nature of symbolic logic allows for a systematic and objective evaluation of argument structures.

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Objective Questions

1. What is the primary goal of symbolic logic?
2. Which of the following is considered a disadvantage of natural language for logical reasoning?
    a. Its reliance on a shared vocabulary
    b. Its emotional connotations
    c. Its use of complex grammar
    d. Its ability to express nuance
3. What does it mean for a logical operator to be "truth-functional"?
4. The symbolic notation 'P ∧ Q' represents which natural language concept?
5. What is the main benefit of separating formal validity from material truth?
6. The use of a single symbol like '∧' to represent "and" helps to eliminate which problem of natural language?
7. Which of the following is an example of an ambiguous term in natural language?
    a. Bottle
    b. Nitrogen
    c. Writing
    d. Bank
8. In symbolic logic, an argument with false premises but a valid structure is considered:
9. What is the symbolic representation of the phrase "if... then..."?
10. Symbolic logic is often compared to a form of algebra because it:

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Answers

1. To create a precise, unambiguous language for logical analysis.
2. Its emotional connotations.
3. The truth of the compound proposition is determined solely by the truth values of its components.
4. ~~"P and Q."~~ Conjunction ("and")
5. It allows for the analysis of the logical structure of an argument regardless of its factual content.
6. Ambiguity
7. Bank
8. Valid
9. →
10. Replaces words with symbols for manipulation and analysis.

Assignments

1. Explanation of Advantages:

- In your own words, write a short paragraph (no more than 150 words) explaining why the clarity and precision of symbolic logic are crucial for avoiding logical errors in complex arguments. Provide one original example of an ambiguous or vague statement that would be difficult to analyse without symbolic notation.

2. Symbolisation Exercise:

- Translate the following sentences into symbolic logic, using the provided variables.
    - **Variables:**
        a. P: "The sun is shining."
        b. Q: "It is warm outside."

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c. R: "I will go for a walk."

- **Sentences:**

  a. The sun is shining and it is warm outside.

  b. If it is warm outside, then I will go for a walk.

  c. It is not the case that the sun is shining.

  d. It is not the case that I will go for a walk, but it is warm outside.

  e. If the sun is shining, then it is warm outside, and I will go for a walk.

3. Argument Analysis:

♦ Consider the following argument in natural language: "All successful people work hard. John works hard. Therefore, John is successful."

a. Is this argument valid? Explain your answer.

b. How would a symbolic logician approach this argument differently from a logician using traditional methods? Explain the benefit of the symbolic approach for this particular example.

Reference

1. Hurley, P. J. (2018). *A Concise Introduction to Logic* (13th ed.). Cengage Learning.
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Unit 2

Simple and Compound Statements

Learning Outcomes

By the end of this unit, you'll be able to:

- distinguish between simple statements and compound statements
- explain the function of the four main logical connectives: and, not, or, and if–then
- translate everyday English sentences into symbolic logical form
- construct and interpret basic truth tables
- evaluate whether a given compound statement is true or false

Prerequisites

In the study of logic, our primary goal is to analyse and evaluate arguments in order to determine whether they are sound and valid. At the heart of this process lies the ability to break down complex arguments into their most fundamental components. This is where the distinction between simple and compound statements becomes crucial. It is the logical equivalent of a chemist identifying individual elements before they can understand a complex molecule, or a linguist parsing a sentence into its subject and verb before analysing its meaning. A logical statement is not merely a string of words; it is a proposition that carries a definitive truth value, it is either true or false.

The world is rarely straightforward, and our everyday language mirrors this complexity. We seldom communicate through isolated, simple facts. Instead, we weave facts together to express more nuanced ideas. By connecting different pieces of information, we form arguments, explain cause-and-effect relationships, and

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describe the intricate connections that structure our experiences and understanding. This is why understanding how simple statements combine to form more complex compound statements is a crucial first step in developing critical thinking and effective reasoning. By identifying both the basic building blocks and the connectives that link them, we can reduce ambiguity and apply a systematic method to evaluate the logical structure of any claim. Such a foundation enables us to move beyond merely accepting or rejecting a statement, toward grasping why it holds its truth value—or why it may not. In this sense, it serves as the groundwork for all further logical inquiry

Keywords

Simple Statement, Compound Statement, Logical Connective, Conjunction, Negation, Disjunction, Implication, Truth Table, Truth Value

Discussion

A simple statement is a basic thought that can be either true or false. For example, "The sun is hot." It's just one idea.

A compound statement takes two or more simple statements and links them together with a logical connective. For example, "The sun is hot, and the sky is blue." The word "and" is the connective here.

In this unit, we'll focus on the four main logical connectives. Each one is a simple rule for how to combine ideas. We'll use a tool called a truth table to map out all the possibilities.

The Simple Statement: A Fundamental Unit

A simple statement is an atomic proposition. This means it is a single, indivisible declaration that makes a claim about reality and, as a result, has one and only one truth value: it is either true or false. . It cannot be both. The example "The car is red" is a perfect illustration. To a logician, this isn't just a sentence; it's a proposition whose truth can be verified. You look at the car, and if it is indeed red, the statement is true. If it's blue, the statement is false. The crucial point is that it contains no internal logical operators or connectives like "and," "or," "if," or "not." It is a self-contained unit of information.

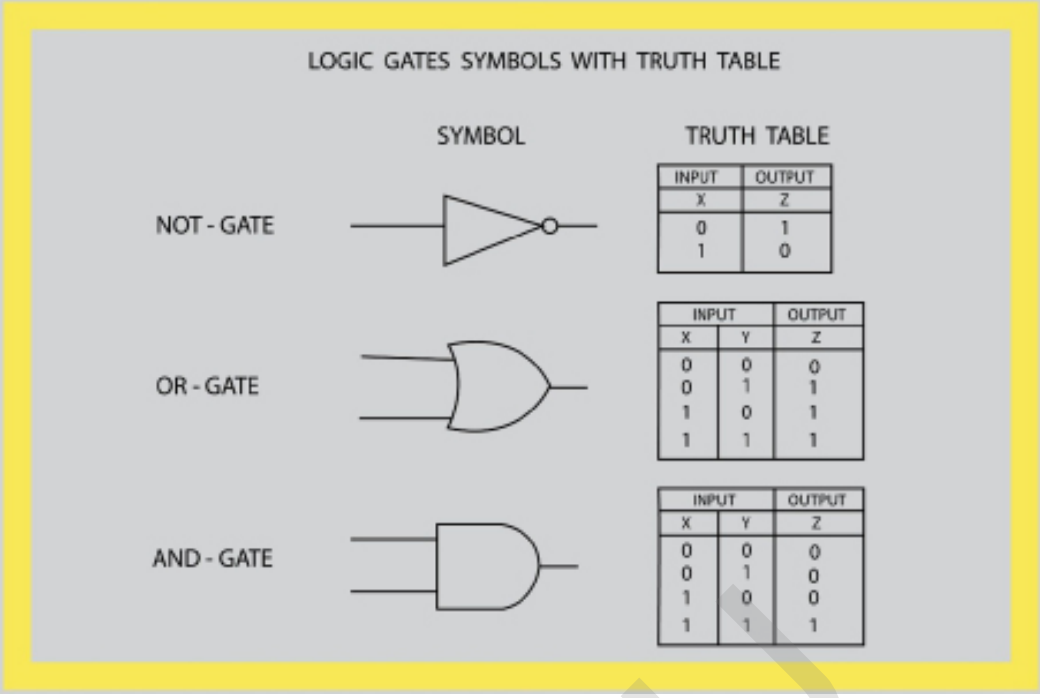

Fig. 3.2.1 Logic gates symbols with truth table

The Compound Statement: A Logical Construction

A compound statement is a molecular proposition, built by combining two or more simple statements using logical connectives. These connectives act as the glue, dictating how the truth of the overall statement is determined from the truth of its individual parts. The example "The car is red and it is parked in the driveway" is a conjunction. The "and" connector signifies that the entire compound statement is true only if both of its simple components are true. If the car is red but it's parked in the garage, the overall statement is false. The truth value of a compound statement is therefore truth-functional, meaning it is a direct function of the truth values of its simple parts and the type of connective used. This principle allows us to systematically analyse and evaluate complex arguments, breaking them down into their simple components to see how their truth values interact.

3.2.1 The Four Logical Connectives

Let's look at the four building blocks we use to make compound statements. We'll use 'P' and 'Q' to stand in for our simple statements.

3.2.1.1 The AND Statement (∧)

This is called a conjunction. It's the logical way of saying "and." We use the symbol '∧' or '.' for that.

- Rule: The statement P and Q is only true if both P and Q are true. If even one of them is false, the whole thing is false.

Think of it like a recipe: "You need flour and sugar to make this cake." If you only have flour but no sugar, the statement is false; you can't make the cake.

Truth Table for AND (P∧Q)

This table shows all four possible situations for P and Q.

P	Q	P∧Q
T	T	**T**
T	F	F
F	T	F
F	F	F

3.2.1.2 The NOT Statement (¬)

This is called a negation. It's the logical way of saying "not." We use the symbol ¬ for it.

- Rule: The statement not P just has the opposite truth value of P. If P is true, then not P is false. If P is false, then not P is true.

This is the simplest connective. It just flips the truth value.

Truth Table for NOT (¬P)

P	¬P
T	F
F	T

3.2.1.3 The OR Statement (∨)

This is called a disjunction. It's the logical way of saying "or." We use the symbol ∨ for it.

- Rule: The statement P or Q is true if at least one of the statements is true. The only time the whole thing is false is if both P and Q are false.

In logic, we use an "inclusive or." This means that "P or Q" is true even if both P and Q are true.

Truth Table for OR (P∨Q)

P	Q	P∨Q
T	T	T
T	F	T
F	T	T
F	F	F

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3.2.1.4 The IF-THEN Statement (⇒)

This is called an implication. It's the logical way of saying "if P, then Q." We use the symbol '⇒' or '⊃' (horseshoe) for that.

- Rule: This statement is a promise. It says that if the first part (P) happens, then the second part (Q) must also happen. The only way this promise is broken (and therefore the statement is false) is if the first part (P) is true and the second part (Q) is false.

Think of a parent saying, "If you clean your room (P), then you can watch TV (Q)." The only time the parent is lying is if the child cleans their room (P is true) but isn't allowed to watch TV (Q is false).

Truth Table for IF-THEN (P⇒Q)

P	Q	P⇒Q
T	T	T
T	F	F
F	T	T
F	F	T

3.2.2 How to Use Truth Tables

A truth table is like a logic calculator. It shows us the final truth value of a compound statement for every possible situation. It's especially useful for longer statements.

Steps to create a simple truth table:

1. **Count the simple statements.** If you have 2 statements (like P and Q), your table will have 4 rows. If you have 3 statements (P, Q, R), you'll need 8 rows. The rule is 2n, where 'n' is the number of statements.
2. **Make columns for each part.** Start with the simple statements, then add columns for any negations, then columns for the connectives that link them.
3. **Fill it out, step by step.** Use the rules from Section 1 to fill in each column. The last column you fill out will be the final answer for the whole compound statement.

Example: Let's find the truth value of the statement: (¬P∧Q)

1. We have 2 statements, P and Q, so we need 4 rows.
2. We'll make a column for P, Q, ¬P, and then the final statement (¬P∧Q).
3. Fill out the table using the rules for ¬ and ∧

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P	Q	¬P	(¬P∧Q)
T	T	F	F
T	F	F	F
F	T	T	T
F	F	T	F

The final column shows us that this compound statement is only true in one situation: when P is false and Q is true.

Recap

- Simple statements are one idea, while compound statements link multiple ideas.
- Conjunction (∧) means "and." It's only true if both parts are true.
- Negation (¬) means "not." It just flips the truth value.
- Disjunction (∨) means "or." It's only false if both parts are false.
- Implication (⇒) means "if-then." It's only false if the first part is true and the second part is false.
- A truth table is a chart that helps you systematically figure out if a compound statement is true or false.

Objective Questions

1. Which symbol means "or"?
2. A statement like "The car is red" is a:
3. If a statement "P" is true, what is the truth value of "not P"?
4. How many rows are in a truth table for a statement with two simple parts?
5. The only time the statement "If P, then Q" is false is when:
6. Which connective is only true if both parts are true?
7. What do we call the first part of an "if-then" statement?
8. The phrase "P and Q" is written symbolically as:

9. If P is true and Q is false, what is the truth value of (P∨Q)?

10. A statement that links two simple statements is called a:

Answers

1. ∨
2. Simple statement
3. False
4. 4
5. P is true and Q is false.
6. Conjunction
7. The antecedent
8. P∧Q
9. True
10. Compound statement

Assignments

1. Translate into Symbols:

- Using the variables below, translate the English sentences into symbolic logic.
    - P: "It is sunny."
    - Q: "I will go to the park."
    - R: "I will wear a hat."
- It is sunny and I will go to the park.
- If it is sunny, then I will wear a hat.
- I will not go to the park, or I will wear a hat.

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♦ If I will wear a hat, then it is sunny.

2. Truth Table Practice:

♦ Create a complete truth table for the following compound statement:

- $(P \Rightarrow Q) \wedge \neg P$

3. Find the Truth Value:

♦ If P is False, Q is True, and R is False, what is the final truth value for these statements?

- $(P \wedge Q) \Rightarrow R$
- $\neg P \vee \neg R$
- $P \Rightarrow (Q \vee R)$

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1. Hurley, P. J. (2018). *A Concise Introduction to Logic* (13th ed.). Cengage Learning.
2. Copi, I. M., Cohen, C., & McMahon, K. (2018). *Introduction to Logic* (15th ed.). Routledge.
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Unit 3

Statement Forms

Learning Outcomes

By the end of this unit, you'll be able to:

- define and identify a tautology as a statement that is always true
- define and identify a contradiction as a statement that is always false
- define and identify a contingent statement as a statement that can be either true or false
- use a truth table to classify any compound statement as a tautology, contradiction, or contingent statement
- explain the logical significance of each of the three statement forms

Prerequisites

In the previous section, we established the crucial distinction between simple and compound statements, recognising them as the fundamental building blocks of logical reasoning. While our examples used everyday language—like "The car is red"—this approach quickly becomes unwieldy when analysing complex arguments. Just as a mathematician uses symbols like 'x' and 'y' to represent numbers in an equation, logicians use symbols to represent entire statements and the connectives that link them. This move from natural language to a symbolic system is not merely a matter of shorthand; it is a critical step toward achieving absolute precision and clarity.

This is where the concept of a Statement Form comes into play. A statement form is a blueprint or a template for a logical statement. Instead of writing out "It is not the case that the dog is barking," we can represent this using symbols. This

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abstraction allows us to focus purely on the structure of an argument, stripping away the specific content and any potential ambiguity of language. For instance, the statement "The apple is red and the banana is yellow" and "The sun is hot and the moon is cold" share the same underlying form: "P and Q." By analyzing this form, we can determine the validity of a whole class of arguments, regardless of the subject matter. This systematic approach transforms logic from a descriptive art into a rigorous, mathematical discipline. It is the very foundation upon which truth tables, logical proofs, and complex logical systems are built.

You should have a solid grasp of the concepts from the previous unit, "Simple and Compound Statements." This includes:

- Recognising simple and compound statements.
- Understanding the four main logical connectives ($\wedge$, $\vee$, $\neg$, $\Rightarrow$).
- Knowing how to build and read a truth table for a basic compound statement.

Keywords

Tautology, Contradiction, Contingent Statement, Truth Table, Truth Value, Logical Truth, Logical Falsehood

Discussion

3.3.1 Tautology

A tautology is a statement that is always true, no matter what the truth values of its simple parts are. A tautology is a logical truth. It is true because of its logical structure alone, not because of any facts about the world.

A good way to think about a tautology is that it's a statement that tells you nothing new. It's so obviously true that it doesn't give you any new information. For example, the statement "It is raining or it is not raining" is a tautology. We know this statement is true even without looking outside. Why? Because it covers all possible scenarios. Either one thing is true, or its opposite is true. There is no other option.

In symbolic logic, we can prove a statement is a tautology by building a truth table. If the entire final column, which represents the complete statement, is filled with 'T's, then it's a tautology.

Example 1: The Law of Excluded Middle

Let's look at the classic tautology: P∨¬P. This statement is called the "Law of Excluded Middle." It means "P is true or P is false." There's no middle ground.

Here is its truth table:

P	¬P	P∨¬P
T	F	**T**
F	T	**T**

As you can see, the final column for the full statement P∨¬P is all 'T's. This means that no matter if P is true or false, the entire statement is always true. It's a logically necessary truth.

Example 2: A more complex Tautology

Let's try a slightly more complex statement: (P∧Q)⇒P. In English, this means "If P and Q are true, then P is true." This is also obviously a tautology, because the first part of the statement already assumes P is true. Let's prove it with a truth table.

P	Q	P∧Q	(P∧Q)⇒P
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	T

The final column is all 'T's, so this statement is a tautology.

3.3.2 Contradiction

A contradiction is a statement that is always false, no matter what the truth values of its simple parts are. It is a logical falsehood. It's false because of its logical structure alone, and it's impossible for it to ever be true.

A contradiction is the opposite of a tautology. An example in English would be: "It is raining and it is not raining." This statement can never be true. The two parts of the statement are mutually exclusive; they can't both be true at the same time.

In symbolic logic, a statement is a contradiction if the entire final column of its truth table is filled with 'F's.

Example 1: The Law of Non-Contradiction

Let's look at the classic contradiction: P∧¬P. This is known as the "Law of Non-Contradiction." It means "P is true and P is false."

Here is its truth table:

P	¬P	P∧¬P
T	F	F
F	T	F

The final column is all 'F's. This statement is a contradiction. It is logically impossible.

Example 2: A more complex Contradiction

Let's try this statement: (P⇒Q)∧¬(Q∨¬P). Don't worry about what it means in English. Let's just build the truth table to see what it is.

P	Q	P⇒Q	¬P	Q∨¬P	¬(Q∨¬P)	(P⇒Q)∧¬(Q∨¬P)
T	T	T	F	T	F	F
T	F	F	F	F	T	F
F	T	T	T	T	F	F
F	F	T	T	T	F	F

The entire final column is 'F's, so this statement is a contradiction.

3.3.3 Contingent Statement

A contingent statement is a statement that is sometimes true and sometimes false. The truth of the statement depends on the truth values of its simple parts and on the facts of the world.

Most statements we use every day are contingent statements. For example, "It is raining" is a contingent statement. It might be true right now, but it could be false tomorrow. Its truth value changes depending on the situation.

In a truth table, a statement is contingent if its final column has a mix of 'T's and 'F's.

Example: A Simple Contingent Statement

Let's examine the statement P∧Q, which means "P and Q."

Here is its truth table:

P	Q	P∧Q
T	T	T
T	F	F
F	T	F
F	F	F

The final column has a mix of 'T's and 'F's. The truth of the statement "P and Q" depends entirely on whether P and Q are true in a particular instance. Therefore, this is a contingent statement.

Let's look at another contingent statement you are already familiar with the implication P⇒Q.

P	Q	P⇒Q
T	T	T
T	F	F
F	T	T
F	F	T

Since the final column contains both 'T's and 'F's, we know that P→Q is a contingent statement.

Summary and Practice

This table summarises the three statement forms:

Statement Form	Final Column of Truth Table	Logical Status
Tautology	All 'T's	Logically True
Contradiction	All 'F's	Logically False
Contingent	Mix of 'T's and 'F's	Depends on the facts

How to Classify a Statement

1. Write the statement in symbolic form.
2. Set up a truth table with enough rows for all the simple statements.
3. Fill in the truth values for the simple statements.
4. Work from the inside out, calculating the truth values for each part of the statement.
5. Look at the final column for the entire statement.
    - If all entries are 'T', it's a tautology.
    - If all entries are 'F', it's a contradiction.
    - If there's a mix of 'T's and 'F's, it's a contingent statement.

Practice Exercise (with Solution)

Classify the following statement: P∧(P⇒Q)

Step 1: Build the table. We have two simple statements (P, Q), so we need 4 rows. We'll need a column for P→Q and then the final statement.

P	Q	P⇒Q	P∧(P⇒Q)
T	T	T	T
T	F	F	F
F	T	T	F
F	F	T	F

Step 2: Look at the final column. It has a mix of 'T's and 'F's.

Step 3: The statement is a contingent statement.

Recap

- A tautology is a statement that is always true due to its logical form. Its truth table's final column is all 'T's.
- A contradiction is a statement that is always false due to its logical form. Its truth table's final column is all 'F's.
- A contingent statement is a statement whose truth depends on the facts of the world. Its truth table's final column is a mix of 'T's and 'F's.
- The only way to know for sure which type a statement is is to build a truth table and check the final column.

Objective Questions

1. What is a statement called if its truth table's final column is entirely 'T's?
2. A statement that is always false, regardless of the truth values of its parts, is known as a:
3. Which of the following statements is a contradiction?
    a. $P \vee \neg P$
    b. $P \Rightarrow P$
    c. $P \wedge \neg P$
    d. $P \vee Q$
4. Most statements used in everyday conversation and scientific research are:
5. The truth table for a contingent statement will have:
6. The statement "If all dogs are cats and all cats are birds, then all dogs are birds" is an example of a:

7. How would you classify the statement "The sky is green"?
8. Which of the following would make a good truth table for a tautology?
9. What is the logical status of a contradiction?
10. A statement that is not a contradiction and not a tautology must be a:

Answers

1. A tautology
2. Contradiction
3. P∧¬P
4. Contingent statements
5. At least one 'T' and at least one 'F' in the final column.
6. Tautology (This is a form of a valid deductive argument, so its conditional statement is a tautology).
7. Contingent statement (It's false, but its falseness depends on the facts of the world, not on its logical structure).
8. T, T, T, T
9. Logically false
10. Contingent statement

Assignments

1. Truth Table and Classification:

- For the following statement, create a complete truth table and then classify it as a tautology, a contradiction, or a contingent statement.

  a. $(P \wedge \neg P) \Rightarrow Q$

  b. $(P \vee Q) \wedge \neg(P \wedge Q)$

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c. $(P \Rightarrow Q) \vee \neg Q$

2. Symbolic Proof:

- Consider the statement: "If I am happy and I am a student, then I am a student."

  a. Translate this statement into symbolic form. Use H for "I am happy" and S for "I am a student."

  b. Without a full truth table, explain why this statement must be a tautology.

3. Logical Status:

- Explain in your own words what makes a statement a contradiction. Provide an example in both a simple English sentence and its symbolic form.

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BLOCK
04

Basics of Reasoning

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Unit 1

Types of Reasoning

Learning Outcomes

Upon the completion of this Unit, the learner will be able to:

- differentiate clearly between Verbal and Non-Verbal Reasoning
- identify the application of Quantitative principles in problem-solving
- explain the function of Spatial Reasoning in visualization tasks
- analyze how Ethical Reasoning informs value-based judgment

Prerequisites

Since the earliest philosophical inquiries, humanity has sought to systematize thought, recognizing that the ability to reason is what separates conjecture from certainty. We have always built our world on premises—from the simple realization that water flows downhill to the complex economic models that govern our markets. The skill that underlies all human progress is not mere intelligence, but the focused, structured process we call reasoning. Before diving into the specifics of formal logic systems, one must first appreciate the breadth of this cognitive landscape. Reasoning is not a single tool; it is a versatile toolkit, with specialized instruments for every kind of data. A deep appreciation for this prerequisite structure is vital because the modern world demands agility: we shift daily from interpreting linguistic nuances in contracts (Verbal) to calculating risks in investments (Quantitative), or from orienting ourselves in unfamiliar cities (Spatial) to navigating moral dilemmas (Ethical). This unit, therefore, serves as the essential navigational map of thought, moving beyond the simple 'good idea' versus 'bad idea' to an analytical classification of how conclusions are reached. We begin by dissecting Verbal Reasoning, where logic is exclusively channeled through language, requiring meticulous attention to meaning, syntax, and argument construction. Next, we pivot to the abstract, exploring Non-Verbal

Reasoning, which tests our capacity to perceive and manipulate patterns, shapes, and figures—the silent language of data and visualization. The discussion then sharpens its focus on Quantitative Reasoning, the realm of numbers, data analysis, and mathematical principles, which provides the bedrock for empirical evidence. Moving beyond pure data, we examine Spatial Reasoning, the mental gyroscope that allows us to visualize, rotate, and assemble objects in three-dimensional space, an indispensable skill in engineering and design. Finally, the unit culminates in Ethical Reasoning, arguably the most critical and complex, where judgment is guided not by cold calculation or visible patterns, but by a framework of morality, values, and right/wrong principles. This comprehensive overview is designed to solidify the understanding that effective critical thinking is not monolithic, but a dynamic application of the right logical type to the right context.

Keywords

Reasoning, Verbal, Non-Verbal, Quantitative, Spatial, Ethical, Cognitive

Discussion

4.1.1 Introduction to Reasoning

Reasoning is the cognitive process of drawing conclusions, making judgments, or arriving at decisions based on a set of facts, evidence, or premises. It is the fundamental mechanism through which humans solve problems, learn new things, and make sense of the world around them. Simply put, reasoning is thinking for a purpose.

In the context of this course, understanding different types of reasoning is crucial, as it forms the bedrock for critical thinking and logical decision-making in various aspects of life, from academic studies to professional careers and personal ethics. Reasoning can be broadly classified based on the nature of the information (data) and the method used to arrive at a conclusion.

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Type of Reasoning	Core Focus	Example (Simple)
Verbal Reasoning	Language, words, and meaning	*If 'Happy' means joyful, then 'Sad' means sorrowful.*
Non-Verbal Reasoning	Images, figures, patterns, and shapes	*Completing a sequence of geometric shapes.*
Quantitative Reasoning	Numbers, data, and mathematical principles	*Calculating the interest on a loan.*
Spatial Reasoning	Visualization and manipulation of objects in space	*Assembling a piece of furniture using an instruction diagram.*
Ethical Reasoning	Morality, values, and right/wrong principles	*Deciding whether to report a friend who cheated on an exam.*

This unit will explore each of these key types of reasoning, illustrating their unique characteristics, applications, and methods.

4.1.2 Verbal Reasoning

Verbal reasoning involves understanding and working with language, words, and concepts expressed in a verbal (written or spoken) format. It is the ability to derive meaning, relationships, and logical conclusions from text or dialogue. This type of reasoning is deeply intertwined with linguistic comprehension and vocabulary. It tests how well an individual can analyze information and draw conclusions from it, often under time constraints.

4.1.2.1 The Nature of Verbal Reasoning

The core of verbal reasoning lies in the capacity to discern logical relationships between words and meaning within sentences or paragraphs. It requires not only a strong vocabulary but also an understanding of grammar, syntax, and logical structure.

- **Comprehension:** The ability to grasp the main idea and supporting details of a passage.
- **Analysis:** Breaking down complex textual information into its constituent parts.
- **Inference:** Drawing conclusions that are not explicitly stated but are logically implied by the text.
- **Analogy:** Recognizing the relationship between two concepts and applying that same relationship to a different pair of concepts.

4.1.2.2 Components and Applications

Verbal reasoning is essential in fields that require extensive reading, report writing, communication, and debate, such as law, journalism, management, and academia.

Syllogisms:

A syllogism is a form of deductive reasoning where a conclusion is drawn from two or more premises. It's a structured way to test the validity of an argument based purely on its form.

Example 1: Classical Syllogism

- Premise 1 (Major): All students are intelligent.
- Premise 2 (Minor): John is a student.
- Conclusion: Therefore, John is intelligent.

In verbal reasoning exercises, you are asked to determine if the conclusion necessarily follows from the premises.

Analogies:

Verbal analogies require identifying a relationship between two given words and then selecting a pair of words that shares the same relationship.

Example 2: Verbal Analogy

- **Word Pair 1:** DOCTOR : HOSPITAL :: ____ : ____
- **Question:** Which pair has the same relationship? (a) TEACHER : STUDENT (b) ACTOR : STAGE (c) CAR : ROAD (d) BOOK : SHELF

Explanation: A DOCTOR works *in* a HOSPITAL. Similarly, an ACTOR performs *on* a STAGE. The relationship is 'Person : Place of Work/Performance'.

- **Correct Answer:** (b) ACTOR : STAGE

Reading Comprehension:

This is perhaps the most common form, where a passage of text is presented, followed by questions about its content, main idea, tone, and inferences that can be logically drawn from it. It tests the ability to read critically and analyze information.

Example 3: Comprehension

- **Passage Snippet:** 'While solar power is a clean source of energy, its intermittent nature, depending on sunlight, presents a challenge for continuous, large-scale power grid integration. Battery storage is one proposed solution to mitigate this intermittency.'
- **Question:** What is the main challenge of solar power mentioned in the text?
- **Answer:** Its intermittent nature (it's not always available).

Verbal reasoning skills are foundational for many standardized tests and are indicative of strong analytical and communication abilities.

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4.1.3 Non-Verbal Reasoning

Non-verbal reasoning is the ability to understand and analyze visual information and solve problems using shapes, diagrams, figures, and patterns, rather than words. It focuses on abstract visual concepts and the capacity to identify logical relationships, differences, and structures within visual data.

4.1.3.1 The Essence of Non-Verbal Reasoning

This type of reasoning is often considered a culture-fair measure of intelligence because it relies less on language skills or specific cultural knowledge. It assesses innate problem-solving abilities and the capacity for abstract thinking and visual spatial processing.

- **Pattern Recognition:** Identifying sequences, repetitions, and underlying rules in a series of figures.
- **Visual Analysis:** Breaking down complex figures into simpler components.
- **Transformation:** Mentally rotating, folding, or manipulating shapes.
- **Classification:** Grouping figures based on shared characteristics.

4.1.3.2 Components and Illustration

Non-verbal reasoning is critical in fields like engineering, architecture, design, and science, where the manipulation of visual and spatial concepts is necessary.

Series Completion:

In a figure series, you are shown a sequence of images and must determine the pattern of change to select the next logical image in the sequence. The changes can involve rotation, reflection, addition/subtraction of elements, or changes in shading/size.

Example 4: Non-Verbal Series

- Sequence: A square with a small circle inside, followed by the square with two circles, followed by the square with three circles.
- Pattern: One circle is added in each step.
- Next Figure: The square with four circles.

Analogies (Figure Based):

Similar to verbal analogies, figure analogies present two figures with a specific relationship, and you must apply that same relationship to a new figure to find its corresponding match.

Example 5: Figure Analogy

- Relationship: Figure 1 (A large black circle) ● becomes Figure 2 (A small white circle) ◯.
- Task: If Figure 3 is a (large white square) □, what is the corresponding Figure 4?

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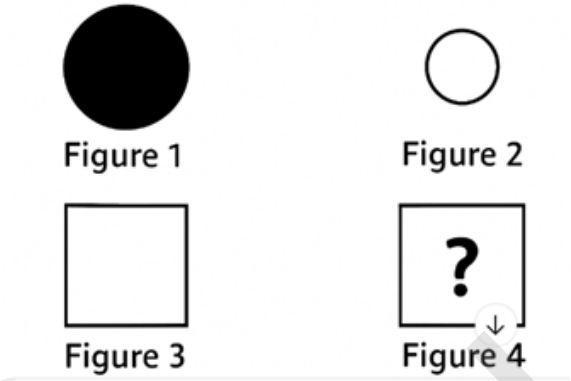
- Analysis of Relationship: The shape remains the same (circle to circle), the size is reduced (large to small), and the color is inverted (black to white).
- Applying the Relationship to Figure 3: A large white square should become a small black square ■.

The pictorial illustration of the above analogy is given below:

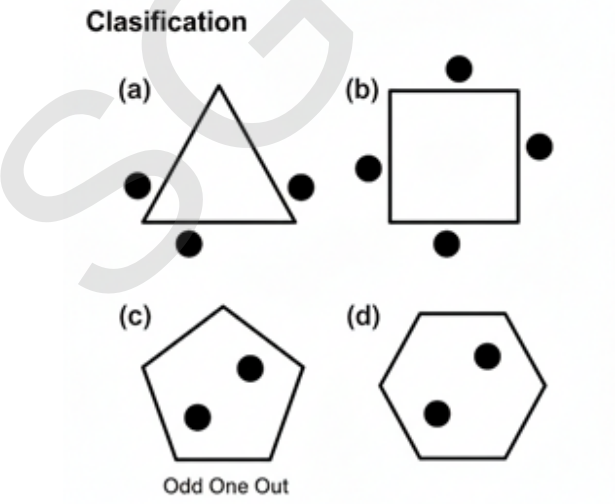


Classification (Odd-One-Out):

This involves being presented with four or five figures and identifying the one that does not share the common characteristic or rule with the others.

Example 6: Classification

- Set of Figures:



(a) A triangle with two dots outside. (b) A square with two dots outside. (c) A pentagon with two dots inside. (d) A hexagon with two dots outside.

- Analysis: Figures (a), (b), and (d) are polygons with two dots *outside* the boundary. Figure (c) is a polygon with two dots *inside* the boundary.
- Odd One Out: (c) A pentagon with two dots inside.

Non-verbal reasoning assesses a person's ability to think visually and perceive logical relationships between shapes and patterns, which is a powerful indicator of abstract intelligence.

4.1.4 Quantitative Reasoning

Quantitative reasoning (QR) is the ability to use, interpret, and apply basic mathematical concepts and methods to analyze and solve problems in real-world contexts. It is more than just computation; it involves understanding numerical data, drawing logical inferences from it, and communicating the results effectively.

4.1.4.1 Distinguishing QR from Pure Mathematics

While pure mathematics focuses on abstract mathematical concepts (like calculus or number theory), quantitative reasoning focuses on the practical application of mathematics in scenarios drawn from daily life, business, science, or public policy.

- **Focus of Mathematics:** Theoretical concepts, proof, and abstract structures.
- **Focus of Quantitative Reasoning:** Data interpretation, problem-solving in context, estimation, and logical thinking using numerical information.

4.1.4.2 Core Skills in Quantitative Reasoning

QR problems often require a blend of numerical proficiency and logical deduction.

Data Interpretation:

This involves analyzing data presented in various formats, such as tables, charts (bar, pie, line), and graphs, to extract meaningful information and answer specific questions.

Example 7: Data Interpretation

- **Scenario:** A table shows the sales of four products (A, B, C, D) for the year.

Product	Sales (in thousands)
A	25
B	40
C	30
D	15

- **Question:** What percentage of total sales does Product B account for?

- **Calculation:** Total Sales = 25 + 40 + 30 + 15 = 110 . Percentage of B = (40 / 110) × 100 ≈ 36.36%.
- **Reasoning/Conclusion:** Product B accounts for approximately 36.36% of the total sales, indicating it is the best-selling product.

Problem Solving (Arithmetic and Algebra in Context):

This involves setting up and solving problems related to concepts like percentages, ratios, averages, time and distance, profit and loss, etc.

Example 8: Time and Work Problem

- Problem: If A can complete a task in 10 days and B can complete the same task in 15 days, how long will it take for them to complete the task if they work together?

- **A's daily work rate:**
  $\frac{1}{10}$ of the task per day
- **B's daily work rate:**
  $\frac{1}{15}$ of the task per day
- **Combined daily work rate:**

$$\frac{1}{10} + \frac{1}{15} = \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$$

So, together they complete $\frac{1}{6}$ of the task per day.

Conclusion

If A and B together complete $\frac{1}{6}$ of the work each day,
they will finish the **whole task in 6 days**.

Number Series:

Similar to figure series in non-verbal reasoning, number series require identifying the pattern (addition, subtraction, multiplication, division, squares, cubes, etc.) to determine the next number in the sequence.

Example 9: Number Series

Problem: Identify the next number in the series.

- **Series:** 2, 5, 10, 17, 26, ?

Pattern: The differences between consecutive numbers are: 5-2=3, 10-5=5, 17-10=7, 26 -17=9.

- The pattern of differences is an increasing odd number sequence: 3, 5, 7, 9.

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- The next difference should be 11.
- Next Number: 26 + 11 = 37.

Quantitative reasoning is critical for managing personal finance, analyzing market trends, and making evidence-based decisions in any data-driven environment.

4.1.5 Spatial Reasoning

Spatial reasoning is the ability to visualize, understand, and remember the spatial relationships between objects. It involves mentally manipulating two-dimensional (2D) and three-dimensional (3D) objects, understanding movement, orientation, and relative position. Simply put, it's the internal 'mental mapping' that allows us to navigate the world and solve problems that require visualization.

4.1.5.1 The Importance of Spatial Awareness

Spatial reasoning is a critical skill, not limited to academic exercises. It is essential for everyday tasks like reading a map, packing a suitcase efficiently, giving directions, or assembling a piece of furniture. It is the core competency required for success in fields such as architecture, engineering, surgery, aviation, and graphic design.

4.1.5.2 Key Components of Spatial Reasoning

Spatial reasoning is composed of several distinct, yet interconnected, abilities:

Spatial Visualization:

Spatial visualisation refers to the ability to mentally imagine, manipulate, and transform objects or shapes in space, even when they are not physically present. In simple terms, it means being able to picture something in your mind and understand how it would look if you changed its position, shape, or arrangement.

Illustrative Example of Mental Rotation (Bullet Points)

- Consider a picture of the capital letter "L" shown in its normal upright position.
- Now imagine another picture showing the same "L," but this time it appears turned to the right.
- To check whether both shapes represent the same letter, you mentally rotate the first "L" by 90 degrees clockwise.
- As you visualize this rotation, the upright "L" gradually turns in your mind and finally takes the shape of the rotated figure.
- When the mentally rotated image matches the second picture, you understand that both shapes are identical, only presented in different orientations.
- This ability to visualize and mentally turn the object is known as mental rotation.

Spatial Orientation:

This is the ability to determine the position of oneself or objects in space relative to a fixed point or environment. It's crucial for navigation.

Example 11: Direction Test (A form of Spatial Orientation)

Problem: A person walks 5 km East, then turns left and walks 3 km, then turns right and walks 5 km. How far and in which direction is he from the starting point?

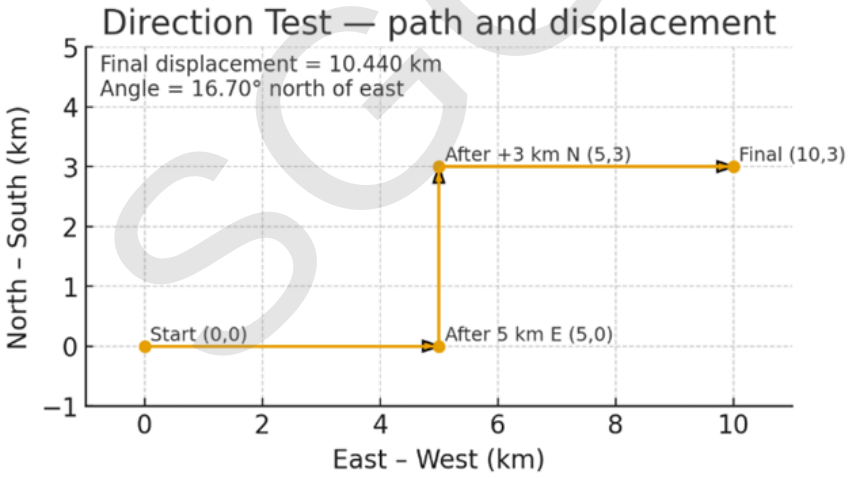
Theory (Using Pythagorean Theorem):
Let the starting point be the origin (0,0). We use coordinates to represent each leg of the journey: Step 1: 5 km East → (5, 0) Step 2: Turn left (North) and walk 3 km → (5, 3) Step 3: Turn right (East) and walk 5 km → (10, 3) The total displacement vector is therefore R = (10, 3).

Using the Pythagorean theorem:
$R = \sqrt{(x^2 + y^2)} = \sqrt{(10^2 + 3^2)} = \sqrt{109} \approx 10.440$ km.

Direction (Angle north of east):
$\theta = \tan^{-1}(y/x) = \tan^{-1}(3/10) \approx 16.70°$ north of east.

Final Result:
Distance from starting point = 10.44 km
Direction = 16.70° north of east (towards the North-East).

Illustrative Explanation:
Plot the path on a coordinate system: From (0,0) to (5,0) → 5 km East From (5,0) to (5,3) → 3 km North From (5,3) to (10,3) → 5 km East The line joining (0,0) and (10,3) forms the hypotenuse of a right triangle where the base = 10 and height = 3.



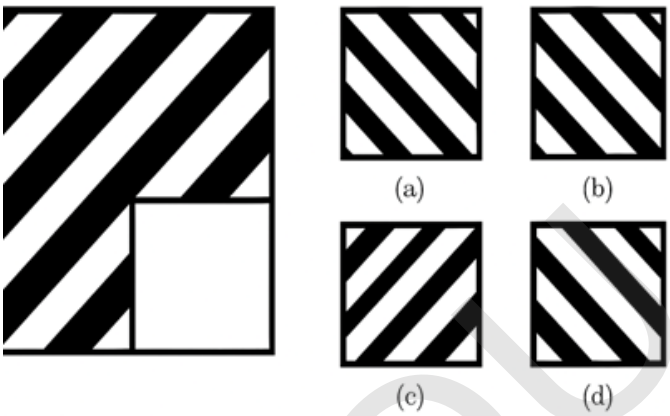
Summary: The person is 10.44 km away from the starting point in a direction 16.70° north of east, as determined using the Pythagorean theorem.

Figure Analysis and Completion:

These tasks often involve identifying patterns in incomplete figures or analyzing how different parts of a figure relate to the whole.

Example 12: Pattern Completion

- **Scenario:** A large square is shown with a quarter of it missing. The pattern in the square is a series of alternating black and white diagonal lines.
- **Task:** Select the correct missing piece from four options.
- **The Logic:** You must visualize the continuation of the diagonal lines, ensuring they connect logically with the existing lines across the boundary and maintain the alternating color pattern to complete the whole figure.



Answer : c

Cubes and Dice Problems:

These are classic spatial reasoning exercises that test the ability to visualize unseen sides of a cube or dice based on two or three visible views.

Example 13: Dice Visualization

- **Information:** Two positions of a single standard dice are shown. In Position 1, the faces showing are 1, 2, and 3. In Position 2, the faces showing are 3, 4, and 5.
- **Question:** Which number is on the face opposite to 6?
- **Logic:**
    1. The number 3 is common to both positions.
    2. The numbers adjacent to 3 are 1, 2, 4, and 5.
    3. A dice has six sides (1, 2, 3, 4, 5, 6).
    4. The only number not adjacent to 3 must be the one opposite 3, which is 6.
- **Conclusion:** The number opposite to 6 is **3**.

Spatial reasoning is deeply linked to creativity and problem-solving as it allows individuals to explore solutions that are not immediately apparent through verbal or numerical methods.

4.1.6 Ethical Reasoning

Ethical reasoning is a systematic process of thinking about right and wrong, morality, and justice, used to determine the best course of action in a moral dilemma. Unlike the previous types of reasoning which focus on factual or spatial logic, ethical reasoning deals with normative judgments about what ought to be done.

4.1.6.1 The Nature of Moral Dilemmas

Ethical reasoning comes into play when a situation involves a moral dilemma, where two or more moral imperatives conflict, and no matter what choice is made, some ethical principle is violated or some undesirable consequence ensues.

- **Example:** A doctor must choose between telling a terminally ill patient the full, difficult truth (respect for autonomy/honesty) or withholding some details to protect the patient's immediate peace of mind (beneficence/non-maleficence).

4.1.6.2 Core Principles and Frameworks

Ethical reasoning does not rely on calculating the 'correct' answer in the way quantitative reasoning does. Instead, it involves applying established moral frameworks to justify a decision. Three foundational frameworks dominate ethical reasoning:

Consequentialism (Utilitarianism):

- **Focus:** The outcomes or consequences of an action.
- **Principle:** The morally right action is the one that produces the greatest good for the greatest number of people (or the least harm).
- **The Logic:** Requires calculating the potential benefits and harms for all affected parties.
- **Example:** In a public health crisis, a consequentialist might argue for mandatory lockdowns because, while they restrict individual freedom (harm), they prevent widespread disease and save thousands of lives (greatest good).

Deontology (Duty-Based Ethics):

- **Focus:** The duties, rules, and obligations governing the action itself, regardless of the outcome.
- **Principle:** Certain actions are inherently right or wrong, and we have a duty to follow universal moral laws (e.g., never lie, never steal).
- **The Logic:** Requires checking if the action adheres to a universal moral rule or duty.
- **Example:** A deontologist would argue that lying is always wrong, even if telling the truth leads to a bad outcome, because the duty to be honest is a universal, non-negotiable moral law.

Virtue Ethics:

- **Focus:** The character and motivations of the moral agent (the person acting).
- **Principle:** The right action is what a virtuous person would do. It emphasizes developing morally good habits and character traits (e.g., honesty, courage, compassion).
- **The Logic:** Requires asking: 'What would a person of high moral character do in this situation?'
- **Example:** If a colleague who is not easy to work with needs help, a virtue ethicist would still offer support. They would do this because being kind, patient, and helpful are good character traits that a virtuous person should show.

4.1.6.3 Steps in Ethical Decision-Making

A structured approach to ethical reasoning ensures all facets of a dilemma are considered:

1. **Identify the Ethical Issue:** Clearly define the moral problem, including who is affected and what ethical principles are in conflict.
2. **Gather the Facts:** Collect all relevant, non-subjective information. Distinguish between facts and assumptions.
3. **Identify Stakeholders:** Determine all individuals or groups who have a stake in the outcome.
4. **Evaluate Options:** Brainstorm alternative courses of action and evaluate each option through the lens of the ethical frameworks (Consequentialism, Deontology, Virtue Ethics).
5. **Make a Decision and Justify:** Choose the option that provides the most compelling ethical justification. This justification must reference the principles or duties that support the choice.

Example 14: The Whistleblower Dilemma

- **Scenario:** An employee discovers that her company is secretly dumping toxic waste into a local river, which is harming the community's health. Reporting this to the authorities (whistleblowing) will save lives but will result in the company's closure, causing all employees (including herself) to lose their jobs.
- **Ethical Reasoning Application:**
    - Deontology: The employee has a duty to uphold the law and prevent harm. The action of dumping waste is inherently wrong, so reporting it is the right duty-bound action, regardless of the financial outcome.
    - Utilitarianism (Consequentialism): The benefit of saving the health and lives of the entire community (greatest good) outweighs the harm of all employees losing their jobs (a lesser, though still significant, harm).

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- Conclusion: Both frameworks strongly support the action of whistleblowing, providing a robust ethical justification for a difficult decision.

Ethical reasoning is not merely about having feelings about a situation; it is about providing a logical, consistent, and justifiable argument for a moral choice.

Recap

- Reasoning is thinking for a specific purpose.
- Verbal logic analyzes language and meaning.
- Non-Verbal logic uses patterns, shapes, and figures.
- Quantitative logic relies on data and math principles.
- Spatial logic involves visualization in space.
- Ethical logic assesses morality and right/wrong.
- Effective critical thinking requires using the appropriate type of reasoning.

Objective Questions

1. If all teachers are readers, and all readers are thinkers, which of the following conclusions is valid?
   a. All teachers are thinkers
   b. Some readers are not thinkers
   c. All thinkers are teachers
   d. None of the above
2. Find the next figure in the sequence:

   ▨, ▨□, ▨□□,

   a. ▨□□□
   b. ▨□□□□
   c. □▨□□
   d. ▨□□▨

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3. If a train travels 60 km in 1.5 hours, what is its average speed?
    a. 30 km/h
    b. 40 km/h
    c. 45 km/h
    d. 50 km/h
4. A student scores 70, 80, and 90 in three subjects. What is the average score?
    a. 75
    b. 80
    c. 85
    d. 82
5. In a direction test, if a person walks 3 km north, then 4 km east, how far is he from the starting point?
    a. 5 km
    b. 6 km
    c. 7 km
    d. 4 km
6. Which of the following is the *odd one out*?
    a. Circle
    b. Square
    c. Triangle
    d. Cylinder
7. If the series is 2, 6, 12, 20, 30, what is the next number?
    a. 36
    b. 40
    c. 42
    d. 56
8. If "honesty" is to "virtue" as "knowledge" is to:
    a. Skill
    b. Power
    c. Learning
    d. Education

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9. A manager must choose between firing an underperforming worker or giving them extra training. Which type of reasoning is most relevant?

    a. Quantitative

    b. Verbal

    c. Ethical

    d. Spatial

10. If a cube is painted on all sides and cut into 64 smaller cubes, how many of them will have paint on only one face?

    a. 8

    b. 12

    c. 24

    d. 36

Answers

1. All teachers are thinkers
2. ▨□□□ (One white square is added each step)
3. 40 km/h
4. 80
5. 5 km (Using Pythagoras theorem: $\sqrt{(3^2 + 4^2)} = 5$)
6. Cylinder (Only 3D shape)
7. 42 (Pattern: +4, +6, +8, +10 → next +12)
8. Power (Knowledge leads to power, as honesty leads to virtue)
9. Ethical reasoning
10. 24 (Cubes on faces but not on edges or corners: 6 faces × 4 per face = 24)

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Assignments

1. A news report states that "All citizens who pay taxes are law-abiding, and some citizens who are law-abiding are government employees." Using this information, determine whether the conclusion "All government employees pay taxes" is logically valid. Explain your reasoning.
2. You are given a sequence of geometric patterns where each step rotates 45° and adds a small circle to the center. Predict the next two figures and explain the reasoning behind your choice.
3. A company's sales grew from ₹2,50,000 to ₹3,00,000 in one year. Calculate the percentage growth and discuss how this information can be used in business decision-making.
4. An architect is designing a new building and needs to visualize how different rooms connect. Describe how spatial reasoning helps in this process and provide a sketch or explanation showing mental rotation or visualization.
5. You are a team leader who discovers that one of your employees has copied work from another source without acknowledgment. Explain how you would use *virtue ethics*, *deontology*, and *consequentialism* to decide what to do.

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Unit 2

Verbal Reasoning

Learning Outcomes

Upon the completion of this Unit, the learner will be able to:

- apply deductive logic to solve Syllogism problems
- analyze text to infer meaning and draw conclusions
- map positional relationships using Direction and Seating Tests
- identify complex relationships between concepts through Analogies

Prerequisites

Language, from the moment it evolved, became the primary vessel for human logic and structure. Before one can master the specialized applications of verbal reasoning, one must first recognize that every sentence, every paragraph, and every conversation is an exercise in structured thought. Our ability to communicate complex ideas, persuade others, or simply follow instructions hinges on interpreting the logic embedded within words. This unit serves as the rigorous training ground for that interpretation, building directly upon the foundational understanding that different types of reasoning exist (Unit 1), by focusing on the type we use most often: the verbal. The modern world is saturated with verbal data, from detailed legal contracts and dense academic research to persuasive marketing campaigns and complex policy documents. A failure to dissect the logic of language is a failure to navigate this world effectively. This mastery is not merely about reading speed or vocabulary size; it is about the systematic application of logical principles to linguistic constructs. The challenge is to consistently translate complex verbal information into concrete, visual structures—a family tree for Blood Relations, a diagram for Seating Arrangements, or Venn circles for Syllogisms. The unit begins with Situation-Based Reasoning, plunging the learner into scenarios that demand

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practical, ethical, and effective decision-making under constraint. It then addresses Comprehension, training the vital skill of textual extraction and inference, which is the cornerstone of academic research. Following this, we shift to mapping abstract space, utilizing Direction Tests and Seating Arrangements to translate words describing location and proximity into visual structures. The core of formal deductive logic is explored through Syllogisms, demanding precision in identifying valid necessary conclusions. Finally, the unit explores the cognitive flexibility required for Analogy, which relies on recognizing shared relationships between disparate concept pairs. This holistic training ensures the learner moves beyond passive reading to active, structured problem-solving, equipping them with the fundamental tools for academic success, professional clarity, and effective public discourse.

Keywords

Syllogism, Analogy, Comprehension, Deduction, Relationship, Situational, Seating

Discussion

4.2.1 Introduction to Verbal Reasoning

Verbal Reasoning is the cognitive skill that enables us to comprehend, analyze, and logically process information presented in language. It is essentially logic applied through words. Unlike purely mathematical or visual problem-solving, verbal reasoning delves into the subtleties of meaning, the structure of arguments, and the implied relationships within a text. It is the ability to read a passage, grasp its central theme, deduce unstated conclusions (inferences), and identify how different concepts relate to one another. Mastering this unit provides the essential tools for effective communication, critical evaluation of texts, and sound decision-making in any field where language is the medium of information exchange, which is practically everywhere.

4.2.2 Situation-Based Reasoning (Decision-Making)

Situation-Based Reasoning, often categorized under critical thinking or decision-making, plunges the learner directly into realistic or hypothetical scenarios where they must analyze a complex set of facts, identify ethical or practical constraints, and choose the most logical and effective course of action. This form of reasoning is vital because it moves beyond theoretical knowledge and tests the application of judgment under

pressure, demanding quick processing of incomplete information and an understanding of priorities. The challenge lies in distinguishing between crucial facts, minor details, and potential biases while focusing on the core problem to ensure the selected solution is both feasible and ethically sound within the given context.

The Narrative of Dilemmas:

Imagine being a project manager facing a tight deadline: a crucial supplier has just defaulted on a delivery, and the entire project timeline is now at risk. Your team is overworked, and the client is already anxious. The situation demands a swift and reasoned response, moving beyond panic to a calculated strategy. This is the essence of situation-based reasoning: navigating a real-world dilemma. The process requires not just logic, but also an understanding of hierarchy, resource allocation, and interpersonal dynamics. The correct reasoning process involves: first, diagnosing the root cause (the supplier's default); second, generating alternatives (finding a new supplier, re-negotiating the deadline, outsourcing part of the work); and finally, evaluating each alternative against key criteria like cost, time, and quality.

Step in Reasoning	Action	Focus
Fact Gathering	Identify who, what, where, when, why	Data Accuracy
Problem Identification	Define the central conflict or issue	Clarity of Goal
Option Generation	Brainstorm multiple plausible solutions	Creativity & Feasibility
Evaluation	Assess solutions based on Consequences and Ethics	Judgment & Priorities
Decision	Select and justify the optimal path	Accountability

Illustrative Example of Situation-Based Reasoning:

Scenario: You are the head of the IT department. One of your most talented and long-serving employees, Clara, has been frequently late over the past month. You know she is dealing with a serious family illness, but her tardiness is now impacting team meetings and project coordination. You need to address the situation without losing a valuable asset or compromising team discipline.

The Reasoning Process:

1. **Identify Constraints & Goals: Goal:** Maintain team productivity and discipline while retaining Clara and supporting her. **Constraint:** The policy states repeated tardiness can lead to warnings/termination.

2. **Options:** (A) Strict adherence to policy: Issue a formal warning immediately. (B) Informal flexibility: Ignore the tardiness due to the situation. (C) Consultative approach: Meet with Clara privately to discuss flexible working hours or temporary work-from-home options until the family crisis subsides.

3. **Evaluation:** Option (A) ensures discipline but risks losing Clara and is low on compassion. Option (B) maintains morale but risks setting a bad precedent for team discipline. Option (C) balances the need for discipline with humanistic consideration. It respects the policy (by addressing the issue) but seeks a mutually beneficial, temporary accommodation, embodying ethical leadership.

4. **Decision:** Choose Option (C). The justification is that a temporary adjustment is a reasonable accommodation for a high-performing employee during a verifiable crisis, aligning humanism (support) with logical management (retaining talent, setting temporary, clear expectations).

4.2.3 Comprehension-Based Exercises

Comprehension-Based Exercises are designed to test the learner's ability to read, understand, and interpret a given passage of text and then extract, analyze, or infer information based only on the content provided. This is the most direct test of verbal acuity, focusing on whether one can accurately locate the main idea, identify supporting details, understand the author's tone, and draw logical conclusions that are implied but not explicitly stated. The challenge is to separate personal knowledge or external assumptions from the information strictly contained within the text, ensuring that all answers are textually grounded and logically derived from the given passage, making it a pure test of reading and linguistic analysis.

4.2.3.1 The Process of Critical Reading

A common mistake is reading too quickly or relying on memory. Effective comprehension involves a two-stage process: Skimming (a rapid first read to grasp the main subject and overall tone) and then Scanning (a focused re-read, looking for specific keywords and details to answer the questions). Critical reading requires active engagement, where the reader asks questions like: 'What is the author trying to prove?' or 'How do these two paragraphs relate?' The answers often hinge on understanding nuances in vocabulary (e.g., words like however, consequently, similarly which signal changes in logic or relationship) and the structure of the argument (e.g., distinguishing between a general statement and a specific example).

Example: Passage Analysis

- **Passage Snippet:** 'While many believe that the invention of the printing press was the primary driver of the Renaissance, historians now agree that the earlier rediscovery of classical Greek and Roman texts, facilitated by trade routes and translation efforts, provided the intellectual foundation. The press merely accelerated the dissemination of this already established knowledge.'

- **Question 1 (Direct):** According to the passage, what was the primary driver of the Renaissance?

    - **Answer:** The earlier rediscovery of classical Greek and Roman texts. (Directly stated).

- **Question 2 (Inference):** What role did the printing press play, as per the author?

- **Answer:** It served as an accelerator or facilitator, increasing the speed at which the pre-existing intellectual foundation (the texts) was spread. (Inferred from the phrase 'merely accelerated the dissemination').

Comprehension tests your discipline to stay confined within the verbal boundary of the given passage and demonstrate that you have truly absorbed and processed the stated information.

4.2.4 Jumbled Sentence (Para-Jumbles)

The Jumbled Sentence or Para-Jumbles exercise presents a set of sentences that belong to a single, coherent paragraph but have been scrambled out of order. The task is to rearrange them into a logical and meaningful sequence. This exercise uniquely tests the ability to recognize the flow of ideas and the structural coherence of a written argument, which are crucial skills for both effective writing and analytical reading. The logical connection between sentences is often signaled by specific linguistic cues, and the successful resolution of a para-jumble often reveals a deep understanding of narrative structure.

4.2.4.1 Identifying the Structural Cues

To reassemble the paragraph, one must look for clear structural markers:

1. **The Opening Sentence (Topic Sentence):** This sentence introduces the main topic, often lacks connecting words (like *therefore, however, this*), and presents a broad, general statement.
2. **Connecting Sentences (Transitional Devices):** Look for pronouns (*it, they, this*), demonstrative adjectives (*these, those*), and transitional phrases (*consequently, in addition, for example*). A pronoun like 'it' must follow the noun it refers to.
3. **The Closing Sentence (Concluding Sentence):** This sentence often summarizes the argument, provides a final conclusion, or shifts the perspective, frequently beginning with words like *finally, thus, therefore*.

Example: Reordering Sentences

- **(A)** These efforts have significantly improved the visibility of Indian culture globally.
- **(B)** Cultural diplomacy is a key component of India's foreign policy strategy.
- **(C)** For instance, the annual celebration of International Yoga Day is a prominent example of this push.
- **(D)** It focuses on leveraging soft power through shared heritage and arts.

The Reasoning/Sequence:

1. **Starting Sentence (B):** It introduces the main topic Cultural diplomacy in India.
2. **Follow-up to (B) is (D):** (D) uses the pronoun 'It' to refer back to 'Cultural diplomacy' (from B) and defines the policy.

3. **Elaboration/Example (C):** (C) uses the phrase 'For instance' to provide a specific example (Yoga Day) of the soft power push mentioned in (D).

4. **Conclusion/Result (A):** (A) uses the phrase '**These efforts**' (referring to the Yoga Day and soft power strategies) to state the result improved visibility.

Correct Logical Sequence: B → D → C → A

This exercise is a microscopic view of argument construction, demanding an understanding of how sentences link together to form a cohesive whole.

4.2.5 Alphabet Test

The Alphabet Test assesses a learner's quick ability to work with the English alphabet series, often involving sequences, positions, and changes. While seemingly simple, these tests require instant recall of the letter order and their corresponding numerical positions (A=1, B=2, Z=26) to solve puzzles involving shifts, reversals, and specific counting rules. The core skill here is the ability to apply a logical rule (often mathematical) to a set of non-numerical entities (letters) quickly and accurately. This tests fundamental pattern recognition applied to a linguistic sequence.

4.2.5.1 Mastering the Positions

Success in Alphabet Tests hinges on instantly knowing the positions. A useful technique is remembering key anchor points, such as the widely used mnemonic **E J O T Y** (E=5, J=10, O=15, T=20, Y=25). This allows for rapid calculation of any other letter's position. For instance, if asked for the position of R, you mentally calculate: O (15) + 3 = 18. The test is about algorithmic application: taking an instruction and executing it on the fixed sequence of the alphabet.

Letter	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**
Position	1	2	3	4	5	6	7	8	9	10	11	12	13
Letter	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Position	14	15	16	17	18	19	20	21	22	23	24	25	26

Illustrative Example: Sequence Shift

Problem: If the English alphabet is written in reverse order (Z to A), which letter will be the 10th letter to the right of the 5th letter from the left end?

The Reasoning:

1. **Identify the Left End:** In the reversed alphabet (Z...A), the left end is **Z**.

2. **Find the 5th letter from the Left:** Counting 5 from Z (Z, Y, X, W, V), the 5th letter is **V** (which is position 22 in the standard alphabet).

3. **Find the 10th letter to the Right of V:** The 'right' direction in the reverse alphabet moves towards 'A'. You need to move 10 positions towards A from V.

4. **Calculation:** The position of V is 22. Moving 10 steps towards A means finding the letter at position 22 - 10 = 12 in the standard alphabet.

5. **Conclusion:** The letter at standard position 12 is **L**.

The complexity here lies in tracking both the sequence's reversal and the directional shifts, demanding clear, step-by-step logic.

4.2.6 Seating Arrangement

The Seating Arrangement problems are fundamental verbal reasoning exercises that test the learner's ability to logically deduce the position of individuals based on a set of positional and relational clues. These problems demand a keen sense of spatial visualization and the methodical, step-by-step application of logical constraints. The core challenge is integrating multiple pieces of conditional information (e.g., 'A is next to B,' 'C is opposite D,' 'E is three places left of F') into a single, cohesive arrangement, often under a time constraint. Successful resolution relies on identifying definite information first, then using that anchor to resolve the relative information, systematically eliminating possibilities until a unique configuration is established. These arrangements can be linear (a straight line), circular, square, or involve two parallel rows.

4.2.6.1 The Circular Arrangement Method

The circular arrangement method is a mathematical and logical approach used to arrange people or objects around a circle rather than in a straight line. Since a circle has no fixed starting point, arrangements are counted differently compared to linear arrangements.

When objects or people are arranged in a circle, their relative positions can be described in two directions:

1. Clockwise (CW)

- ♦ Clockwise means moving in the same direction as the hands of a clock.
- ♦ If you start at any point on the circle and follow the movement of a clock's hour or minute hand, you are moving clockwise.
- ♦ In circular arrangement problems, if we say: "B is sitting to the right of A", it usually means B is clockwise from A.
- ♦ Anticlockwise (ACW / Counterclockwise)
    - Anticlockwise means moving in the opposite direction to the hands of a clock.
    - It is the reverse direction - if you move backward from the direction in which the clock's hands rotate.

Example

Problem: Six people — P, Q, R, S, T, U — sit around a circle facing the centre.

Clues:

Q is second to the left of P.

1. R is third to the left of Q.
2. S is not a neighbor of P or R.
3. U is sitting opposite T, whose is the neighbour of R.

Solve this step-by-step.

Step-by-step deduction (use positions 0…5 clockwise; place P at 0)

- Orientation: facing centre → left = anticlockwise (i.e., decreasing index).
- Anchor: Place P at position 0.

Clue (1): Q is second to the left of P.

- Second to left = two places anticlockwise = position (0 - 2 \equiv 4).
- So Q = 4.

Clue (2): R is third to the left of Q.

- Third to left = three places anticlockwise = (4 - 3 \equiv 1).
- So R = 1.

Clue (3): S is not a neighbor of P or R.

- Neighbors of P (pos 0) are positions (5) and (1).
- Neighbors of R (pos 1) are positions (0) and (2).
- Forbidden positions for S: (5, 1, 0, 2).
- Available positions are (3) (and 4, but 4 is already Q). So S must be at position 3.

Clue (4): U is opposite T.

- Remaining empty seats are positions (2) and (5). They are opposite each other (since opposite = +3 mod 6).
- So U and T occupy positions (2) and (5) in some order. (Clue (4) only says they are opposite, not which is which — both assignments satisfy all clues, but we can choose one to give a concrete arrangement.)

Pick U = 2 and T = 5 to complete the seating.

Final arrangement (clockwise from position 0)

Positions (index : person):

- 0 : P

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- 1 : R
- 2 : U
- 3 : S
- 4 : Q
- 5 : T

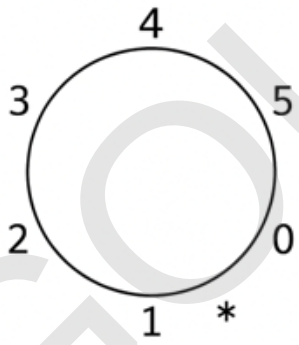
Clockwise order starting at P:

P → R → U → S → Q → T

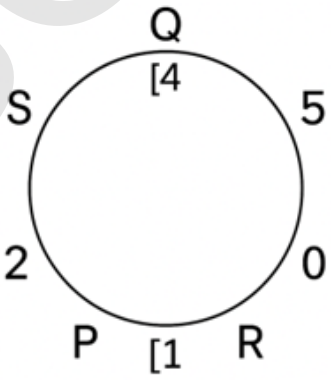
(You could also swap U and T — i.e., U at 5 and T at 2 — and all original clues would still hold, because clue (4) only states they are opposite.)

Illustrative diagrams

Numbered seats (clockwise) — small circle showing indices:



Better to show with labels (positions 0..5 clockwise, P at 0):



Or linear clockwise list (more explicit):

Clockwise from P (pos 0): P (0) → R (1) → U (2) → S (3) → Q (4) → T (5)

4.2.7 Direction Test

The Direction Test assesses the ability to determine the final position of a person or object relative to a starting point, after a series of movements involving different distances

and turns. This requires strong spatial visualization skills coupled with an understanding of basic geometry, particularly the concepts of the cardinal directions (North, South, East, West) and their intermediates (NE, NW, SE, SW). The narrative style of these problems often involves tracking a journey, making it a practical application of vector addition. The key to solving these lies in accurately sketching the path and then using the Pythagorean theorem $\left(a^2 + b^2 = c^2\right)$ to calculate the shortest distance between the start and end points when the path is not a straight line.

4.2.7.1 Mapping the Movement

Every movement in a Direction Test is a vector (a step with magnitude/distance and direction). A common pitfall is confusing 'left' and 'right' after a turn; a person facing North who turns right will face East, and a person facing South who turns left will face East. Always draw a small compass rose (North up, South down, East right, West left) for reference. The shortest distance is always the hypotenuse of the right-angled triangle formed by the net movement North-South and the net movement East-West. By breaking down the journey into its North-South and East-West components, complex, multi-turn paths can be simplified into a single final vector.

Example : Distance and Direction Calculation

- **Journey:**
    - A man walks 10 meters East from point A.
    - He turns left and walks 10 meters.
    - He turns right and walks 5 meters.
    - He finally turns right and walks 10 meters to reach point B.
- **Deduction:**
    1. **East Movement:** 10m (from i) + 5m (from iii) = 15m East.
    2. **North-South Movement:** 10m North (from ii) and 10m South (from iv). Net N-S movement is 10 - 10 = 0.
    3. **Final Position:** Point B is directly East of Point A.
    4. **Final Distance from the Starting Position:** 15 meters.

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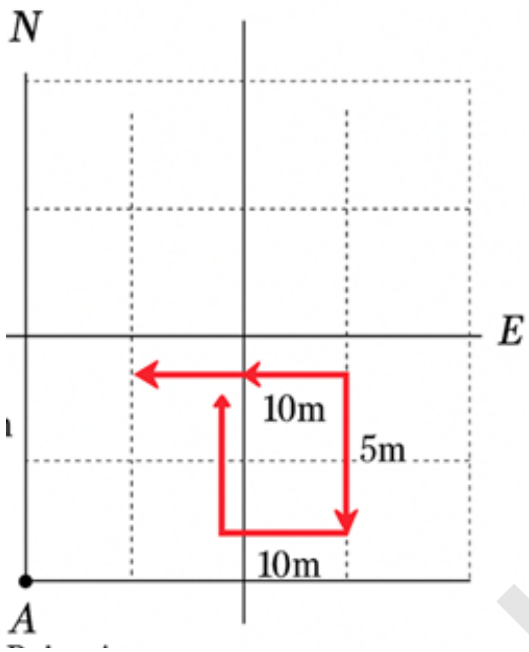


♦ **Conclusion:** The final position is 15 meters East of the starting point A.

These exercises train the mind to convert narrative into spatial data, a crucial skill for navigation, planning, and logistics.

4.2.8 Blood Relation

Blood Relation problems, also known as relationship puzzles, require the learner to decipher the familial relationship between two or more individuals based on a series of stated connections, often involving complex chains of relationships (e.g., 'The mother of my father's only sister's husband'). This tests the capacity for indirect logical inference and the ability to maintain clarity across multiple generations and lines of descent. The most effective approach is to use a Family Tree Diagram to visually represent the relationships, which greatly reduces confusion and the chance of error.

4.2.8.1 The Family Tree Method

A standard convention for drawing a family tree is essential for clarity:

♦ **Vertical Lines** (↓): Connect different generations (e.g., parent to child).

♦ **Horizontal Lines** (-): Connect same-generation relations (e.g., siblings).

♦ **Double Horizontal Lines** (=): Indicate a marriage relationship (husband and wife).

♦ **Symbols:** Use simple symbols to denote gender (e.g., + for Male, – for Female).

By starting with a key individual (usually 'I' or 'My' in the statement) and building the tree outwards, the complex verbal description is transformed into a manageable visual map. This visual process aids in rapidly identifying the path linking the two people in question.

Relationship Type	Definition	Family Tree Notation
Parent/Child	One generation apart	Parent ↓ Child
Sibling	Same generation, same parents	$Sibling_1$ $Sibling_2$
Spouse	Married couple	Husband = Wife

Example : Decoding a Blood Relation Statement

- **Statement:** 'Introducing a man, a woman said, 'He is the only son of my father's only sister.''
- **Task:** Determine the relationship between the man and the woman.
- **Step-by-Step Deduction (from the Woman's perspective):**
    1. **'My father's only sister':** This is the woman's **Aunt** (Paternal Aunt).
    2. **'The only son of my father's only sister':** This is the Aunt's only son, which is the woman's **Cousin**.
- **Visual Check (Simplified Tree):**
    1. (Father) ↔ (Aunt)
    2. (Father) ↓ (Woman)
    3. (Aunt) ↓ (Man)
- **Conclusion:** The man is the woman's Cousin. The complexity of blood relation problems lies in correctly establishing the intermediary relationships before concluding the final link.

4.2.9 Logical Venn Diagram

Logical Venn Diagrams are visual tools used to represent the relationship between different groups or classes of items based on their properties and common elements. This form of reasoning translates verbal categories into geometric representations (circles, triangles, etc.) to show inclusion, exclusion, or partial overlap. It is a powerful method for testing the understanding of set theory principles in a logical context. The challenge is choosing the single correct diagram that perfectly captures the relationship described by the given words or categories, demonstrating a clear grasp of universal, specific, and mutually exclusive classes.

4.2.9.1 Interpreting the Overlap

A Venn diagram can show three main types of logical relationships between two sets (A and B):

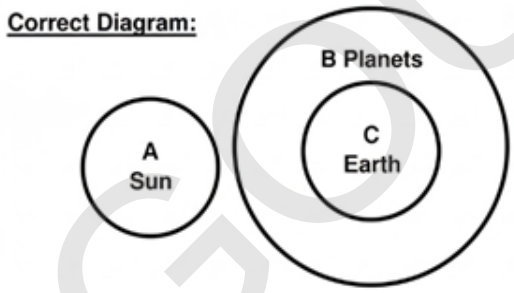
1. **Universal Inclusion (All A is B):** One circle is entirely inside the other. **Example:** *Dogs, Mammals.* (All dogs are mammals).
2. **Complete Exclusion (No A is B):** Two circles are entirely separate. **Example:** *Trees, Fish.* (No tree is a fish).

3. **Partial Overlap (Some A is B):** Two circles intersect. **Example:** *Students, Athletes.* (Some students are athletes, some are not).

Complex problems involve three or more sets, requiring the learner to correctly combine these basic relationships. For instance, the relationship between Teachers, Women, and Doctors would be represented by three overlapping circles, as a person can belong to all three categories.

Example : Choosing the Correct Diagram

- **Categories:** (A) Sun, (B) Planets, (C) Earth.
- **The Reasoning:**
    1. **Earth and Planets:** Earth is a type of Planet. (Universal Inclusion: C inside B).
    2. **Sun and Planets/Earth:** The Sun is a Star and is separate from the Planets. (Complete Exclusion: A separate from B and C).
- **Correct Diagram:**



Logical Venn diagrams make abstract categorical relationships concrete, providing a visual proof of logical structure.

4.2.10 Syllogistic Exercises: The Logic of Necessity

Syllogistic exercises are logical problems where conclusions must be drawn strictly from the given premises, without relying on personal beliefs, external facts, or real-world assumptions. They train the mind to think formally, meaning that the truth of a conclusion depends only on whether it logically follows from the statements provided.

Consider the example:

- *All people who own cats love fish.*
- *Some scientists own cats.*

A common intuition might suggest that "Some scientists love fish" is automatically true. However, in syllogistic logic, we must check whether this conclusion is logically necessary, not just plausible. Here, the structure of the statements does allow the conclusion, because if some scientists own cats, and all cat-owners love fish, then those scientists

who own cats must also love fish. But in many other cases, our real-world assumptions may not hold, and what appears "obvious" may actually be logically invalid.

Syllogistic exercises therefore sharpen analytical thinking by teaching learners to:

- Distinguish between what might be true and what must be true,
- Avoid common logical fallacies rooted in assumption or intuition,
- Understand the internal structure of arguments, and
- Develop precision in evaluating deductive relationships.

4.2.10.1 The Structure and Rules of Syllogisms

The classic syllogism, a cornerstone of Aristotelian logic, is a logical argument that draws a conclusion from two related premises. It involves three distinct terms: the Major Term (the predicate of the conclusion), the Minor Term (the subject of the conclusion), and the Middle Term (the common link in the premises, which disappears in the conclusion). To solve these, the best tool is the Venn Diagram. By visualizing the relationships between the three terms (like overlapping circles for 'Cats,' 'Scientists,' and 'Fish lovers'), you draw every scenario permitted by the premises. The final conclusion is considered valid only if it holds true in every single possible diagram. If the conclusion is false in even one permitted visualization, it is deemed logically invalid. The core skill here is translating the verbal statements like 'All A are B' or 'Some A are not B' into spatial constraints on these diagrams.

Statement Type	Verbal Form	Venn Diagram Implication
Universal Affirmative	All P are Q.	P circle is drawn entirely inside the Q circle.
Particular Affirmative	Some P are Q.	P and Q circles are drawn with a shared, overlapping area.
Universal Negative	No P are Q.	P and Q circles are drawn entirely separate.

Example : Testing for Necessary Conclusions

- **Premises:**
  - All doors are windows.
  - No windows are bricks.
- **Conclusions:**
  - (I) No doors are bricks.
  - (II) Some bricks are doors.
- **Deduction using Venn Diagrams:**
  1. **Premise 1:** The 'Doors' circle is entirely contained within the 'Windows' circle.

2. **Premise 2:** The 'Windows' circle is entirely separate from the 'Bricks' circle.

3. **Visualization:** Since the 'Doors' circle is inside the 'Windows' circle, and the 'Windows' circle has no overlap with the 'Bricks' circle, the 'Doors' circle can never overlap with the 'Bricks' circle.

4. **Conclusion Analysis:** Conclusion (I) 'No doors are bricks' must necessarily follow from the premises. Conclusion (II) 'Some bricks are doors' is necessarily false.

Syllogistic logic is the ultimate training in deductive certainty, teaching the learner to prove necessity rather than assume possibility.

4.2.11 Analogy: The Power of Relationship Mapping

Think of the word 'Analogy' as a blueprint for a relationship. If a Pilot relates to a Cockpit, then the relationship is 'Worker and Place of Work.' The job in an analogy question is to find another pair of words that follows this exact same blueprint. This form of reasoning is central to learning and innovation, as it is how we transfer understanding from a known concept to an unknown one. When an engineer designs a prosthetic limb, they use the analogy of the human skeleton. When you solve verbal analogies, you are performing this same high-level cognitive function: dissecting the original relationship and precisely mapping its structure onto a new set of terms.

4.2.11.1 Decoding the Link: Identifying Relationship Types

The complexity of analogy lies in defining the relationship between the first pair of words (A:B) with precision. It is not enough to say they are 'related'; you must define how they are related. Is it a cause-and-effect relationship (THIRST : DRINK), a degree relationship (MIST : FOG), or a use relationship (SHOVEL : DIG)? By classifying the relationship, you create a rigid rule that filters the available options, leaving only the perfect structural match. This disciplined approach prevents falling for tempting but structurally flawed distractors.

Relationship Type	Descriptive Statement	Example Pair
Intensity (Degree)	A is a weaker form of B.	WET : SOAKED
Tool/Action	A is used to perform B.	RULER : MEASURE
Product/Raw Material	A is made from B.	WINE : GRAPE
Inclusion (Type of)	A is a specific instance of B.	SHARK : FISH

4.2.11.2 The Logical Steps in Solving Analogies

The analytical method for solving analogies should be systematic:

1. **Formulate the Bridge Sentence:** Describe the relationship of A : B in a concise sentence. For example, for OVEN: BAKE, the sentence is: 'An OVEN is used to BAKE.'

2. **Maintain Order and Grammar:** Apply that exact sentence structure, including the order of the terms, to the options. 'Is a [Option C] used to [Option D]?'

3. **Select the Perfect Parallel:** The correct option will maintain the same grammatical and logical relationship as the original pair, ensuring the logical bridge is flawlessly transported.

Example : Applying the Relationship Bridge

- **Given Pair:** SCALPEL : SURGEON ::
- **Task:** Find the pair with the same relationship.
- **Analysis of Given Pair (A:B):** The relationship is '**The primary tool used by a SURGEON is a SCALPEL**' (Tool : Worker). *Note the strict order.*
- **Options:**
    a. CHISEL : SCULPTOR
    b. PEN : WRITER
    c. MUSIC : COMPOSER
- **Testing the Options (Using the reverse order: Tool is used by Worker):**
    a. Is a SCALPEL used by a CHISEL? (No) - Incorrect Order/Relationship.
    b. Is a SCALPEL used by a PEN? (No) - Incorrect.
    c. Is a SCALPEL used by MUSIC? (No) - Incorrect.
- **Re-testing the Options (Using the correct order: Worker uses Tool):**
    a. Is the primary tool used by a SCULPTOR a CHISEL? (Yes) - Correct Match.
    b. Is the primary tool used by a WRITER a PEN? (Yes, also correct).
    c. Is the primary tool used by a COMPOSER MUSIC? (No) - Incorrect.
- **Refining the Choice:** Both (a) and (b) show Worker: Tool. However, in (a), the chisel is a necessary and specialized tool for the sculptor's craft, analogous to the surgeon's scalpel. In (b), a writer might use a pen, but often uses a computer, making the pen less 'primary' or 'exclusive.' In standardized tests, the most specific and necessary relationship is usually the correct answer. Thus, (a) CHISEL : SCULPTOR is the best fit.

Analogical reasoning is vital for demonstrating cognitive flexibility and the ability to generalize specific examples into universal patterns.

To conclude this unit, it is essential to recognize that the strength of verbal reasoning lies in its holistic nature. It is the integration of all these skills that produces an articulate

and critically thinking individual. From the Syllogisms that demand the precise logic of necessity to the Analogies that require flexible, relational thinking, the entire unit serves as a rigorous training program for linguistic analysis. By consistently translating complex verbal information into concrete, visual structures be it a family tree for Blood Relations or a diagram for Seating Arrangements the learner moves beyond passive reading to active, structured problem-solving. This mastery of logical communication is not just for examinations; it is the fundamental tool for academic success, professional clarity, and effective public discourse.

Topic	Type of Logic	Application
Situation-Based Reasoning	Practical/Ethical Judgment	Choosing the optimal professional action.
Comprehension	Textual Extraction/ Inference	Understanding research papers and reports.
Direction Test/Seating	Spatial Translation	Mapping instructions and visualizing organizational structures.
Syllogisms	Deductive Validity	Identifying flaws in arguments and advertising claims.
Analogy	Relational Thinking	Learning new concepts by comparing them to known concepts.

Recap

- Verbal Reasoning applies logic through words.
- Situation-Based reasoning involves ethical judgment in scenarios.
- Comprehension tests require textual inference and extraction.
- Blood Relations problems map family connections.
- Syllogisms test deductive validity of arguments.
- Analogies identify relational thinking between terms.
- Mapping instructions is key for Direction and Seating Tests.
- The above skills are vital for critical evaluation and communication.

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Objective Questions

1. Clara has been late for a month due to a family crisis. As IT head, what is the most balanced action? (Choose: Warning / Ignore / Private meeting)
2. In a passage, the author states that the rediscovery of classical texts initiated the Renaissance. What is this type of question—direct or inferential?
3. If a passage uses the phrase 'however', what does it signal?
4. In a jumbled set of sentences, which type of sentence usually appears first — Topic / Example / Conclusion?
5. In para-jumbles, what does the pronoun 'it' generally indicate?
6. What is the 12th letter of the alphabet?
7. In the reversed alphabet (Z–A), what is the 5th letter from the left?
8. In a circular arrangement facing centre, "left" means which direction?
9. If two people sit opposite each other in a 6-seat circle, how many seats apart are they?
10. A person walks 10 m North and then 10 m South. What is the net vertical displacement?

Answers

1. Private meeting
2. Direct
3. Contrast
4. Topic
5. Reference
6. L
7. V
8. Anticlockwise
9. 3
10. Zero

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Assignments

1. Your team member performs exceptionally well but has recently become irregular in submitting reports. You learn he is caring for a sick parent. Outline the steps of reasoning you would follow and choose the most ethical and effective decision. Justify your answer.
2. Create a short paragraph (4–5 sentences) about the impact of digital media on reading habits. Then write:
    a. One direct question,
    b. One inference question,
    c. One vocabulary question (meaning-based).

Provide the answers.

3. Four jumbled sentences are given below. Rearrange them into a coherent paragraph and explain the reasoning:
    a. These skills are essential for workplace success.
    b. Communication is more than speaking fluently.
    c. It also includes listening and interpreting non-verbal signals.
    d. Effective communicators tend to perform better in teams.
4. Six friends—A, B, C, D, E, F—sit around a circle facing the centre. Clues:
    1. B sits second to the left of A.
    2. C is opposite B.
    3. D is not a neighbour of A.
    4. E sits to the immediate right of F.

Draw the circular diagram and write the final arrangement.

5. Premises:
    1. All engineers are graduates.
    2. Some graduates are artists.

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Tasks:

a. Draw the logical Venn diagram.

b. Decide whether the conclusion "Some engineers may be artists" is possible, necessary, or not possible.

c. Explain your reasoning using the rules of syllogism.

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Suggested Reading

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Unit 3

Non-Verbal Reasoning

Learning Outcomes

Upon the completion of this Unit, the learner will be able to:

- decipher transformation rules in Coding-Decoding problems
- calculate positional values using Ranking and Series tests
- solve time and angle problems using Calendar and Clock logic
- identify hidden figures and complete Incomplete Patterns geometrically

Prerequisites

The world is not just a collection of words; it is a tapestry of patterns, spatial relationships, and visual data. Long before written language, early humans relied on the silent, visual logic of non-verbal reasoning to navigate their environment—tracking subtle shifts in animal trails, interpreting celestial movements, or planning the construction of shelter. This unit represents a pivot from the linguistic analysis of Unit 2 to the pure, abstract analysis of structure and transformation. Non-Verbal Reasoning is often considered a direct test of cognitive agility, as it minimizes reliance on learned vocabulary and cultural knowledge, instead demanding that the learner deduce universal rules governing visual information. The modern environment, dominated by dashboards, data visualizations, complex machinery, and architectural blueprints, requires a highly refined non-verbal toolkit. A deep understanding of this visual logic is therefore essential for fields like engineering, graphic design, physics, and computer science, where abstract concepts must be mentally manipulated and spatial problems solved without the aid of language. The unit begins with Coding-Decoding, training the essential skill of identifying a hidden cipher or rule that governs the transformation of symbols—a critical ability in systems analysis and security. We then apply positional arithmetic through Ranking

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and Series Tests, which require deducing linear and sequential relationships. The discussion moves into the quantitative precision of geometry and time with the Calendar and Clock Tests, where angular and modular arithmetic rules are applied visually. Completion of Incomplete Patterns demands the spatial intelligence to infer the missing piece of a geometric whole, leading to Figure Matrix problems that require simultaneous application of multiple rules across rows and columns. Finally, Embedded Figures sharpen the skill of disembedding, training the eye to extract a required shape from its confusing background. This comprehensive suite of analytical skills, centered on the logic of patterns and space, moves the learner beyond passive observation to active, structured visual problem-solving, a skill increasingly vital in a data- and image-rich world.

Keywords

Pattern, Visual, Spatial, Series, Coding, Figure, Embedded

Discussion

Introduction to Non-Verbal Reasoning

Non-Verbal Reasoning is the cognitive ability to interpret and analyze visual information and solve problems using shapes, patterns, figures, and abstract data, rather than words or numbers alone. It's often called the 'language of visual logic,' as it assesses how well one can identify underlying rules, relationships, and sequences in non-linguistic forms. Imagine looking at a complex machine or a blueprint; your ability to understand its function and predict its next movement, solely from the visual arrangement of its parts, is non-verbal reasoning in action. This form of logic is considered a purer measure of analytical and problem-solving skills because it minimizes dependence on language proficiency or specific cultural knowledge. It is essential for success in fields like engineering, design, and architecture, where the manipulation of spatial and abstract concepts is a daily necessity

4.3.1 Coding-Decoding (Number & Alphabet)

Imagine you are a spy receiving a secret message: the word 'SUN' is transmitted as 'RTN'. To understand the message, you must first crack the cipher; the rule which governs the transformation. Coding-Decoding exercises test your analytical skill in identifying the hidden rule (the code) used to convert a set of characters (words or numbers) into

another set. Once the rule is deciphered, you must apply it precisely to decode a new, unseen message. This type of problem requires pattern recognition across multiple domains: the alphabet sequence, number sequences, and often a combination of the two. It requires both inductive reasoning (identifying the pattern from examples) and deductive reasoning (applying the pattern to a new case). This skill is crucial for data security and information processing, as it relies on speed and accuracy in manipulating fixed data sets.

4.3.1.1 Alphabet-Based Coding

Alphabet coding primarily uses the position of letters in the standard 26-letter English alphabet as its mathematical base, where A=1, B=2, …, Z=26. Codes often involve a constant numerical shift (e.g., plus 3 for every letter), a positional reversal (e.g., the first letter and last letter swap), or a combination of operations. A common type is the 'Opposite Letter' code, where a letter is replaced by its counterpart equidistant from the opposite end of the alphabet (e.g., A is opposite to Z, B is opposite to Y). Successful decoding requires instantly accessing these positional values and applying arithmetic operations mentally. [Table showing A-Z positions]

Letter	**A**	**B**	**C**	**D**	**E**	**F**	**...**	**M**	**N**	**...**	**X**	**Y**	**Z**
Position	1	2	3	4	5	6	...	13	14	...	24	25	26

Example 1: Constant Shift Code

- **Code:** If TRAIN is coded as UQCLQ, how will BUS be coded?
- **Analysis:**
    - T → U (T+1)
    - R → Q (R-1)
    - A →C (A+2)
    - I →L (I+3)
    - N →Q (N+3)
- **The Rule is complex/variable:** $+1, -1, +2, +3, +3$. Wait, let's re-examine the positions: T(20) →U(21) (+1); R(18) → Q(17) (-1); A(1) → C(3) (+2); I (9) → L(12) (+3). The rule appears to be a sequential increment: **+1, -1, +2, +3, +4,** … But the fifth letter, N (14) to Q (17) is (+3), not +4. This highlights the need for careful rule extraction. Let's assume the rule is simpler, perhaps based on the word itself. Let's try to assume a simplified, more common pattern.
- **Simplified (Common) Rule Example: Alternating Shift**
    - If TRAIN is coded as VTCKP.
    - T(20) →V(22) (+2); R(18) →T(20) (+2); A(1) →C(3) (+2); I(9) →K(11) (+2); N(14) →P(16) (+2).

- **Rule:** Constant shift of +2 for every letter.
- **Application:** B(2) →D(4), U(21) →W(23), S(19) →U(21).
- **Answer:** BUS is coded as **DWU**.

4.3.1.2 Number-Based Coding

Number coding is the replacement of words or letters with numerical values. This can range from the straightforward assignment of positional value (e.g., A=1, B=2) to more complex arithmetic operations like summing the positions of all letters in a word, or multiplying positions, sometimes with a constant added or subtracted. The key is to find the mathematical operation that connects the letters to the given number. For instance, if 'CAT' is coded as 24, the process is C(3) + A(1) + T(20) = 24. If the code is much larger, the operation might be multiplication or squaring of the positional values. The method of attack is always to try the simplest arithmetic logic first, then graduate to more complex rules.

Example 2: Summation Code

- **Code:** If BAT is coded as 23 and MAN is coded as 28, how will SIT be coded?
- **Analysis:**
  - BAT: B(2) + A(1) + T(20) = 23.
  - MAN: M(13) + A(1) + N(14) = 28.
  - Rule: The code is the sum of the positional values of all letters in the word.
  - Application: SIT: S(19) + I(9) + T(20).
  - Calculation: 19 + 9 + 20 = 48.
  - Answer: SIT is coded as 48.

4.3.2 Series Test

Imagine a line of dominoes where each piece changes slightly as it falls, following an invisible, consistent rule perhaps increasing in size, rotating, or losing a dot. The Series Test challenges the learner to identify this evolutionary rule by analyzing a sequence of numbers, letters, or, most commonly in non-verbal reasoning, figures, and then predicting the next term in the sequence. It is the purest form of inductive reasoning observing specific instances to infer a general rule. In the context of non-verbal reasoning, this involves analyzing the simultaneous movement, transformation, addition, or subtraction of multiple elements within the figures presented. The success in this test relies on the ability to isolate and track each variable independently.

4.3.2.1 Figure Series: Tracking Multiple Changes

In a figure series, you are often presented with four or five figures and asked to find the sixth. These figures usually contain multiple elements, such as a large shape, a small

internal element (dot, star), and possibly a shaded area. The rule for the sequence must account for the change in each element across the frames. The key is to break down the complex figure into its simple components and assign a rule to each:

1. **Rule for the Main Shape:** Does it rotate? Flip? Change color?
2. **Rule for the Internal Element:** Does it move a fixed number of steps (e.g., one corner clockwise)? Does its color/shading alternate?
3. **Rule for Added/Subtracted Elements:** Is a new line segment added in each step? Is a corner removed every second step?

Example 3: Figure Rotation and Element Change

- **Sequence:** (1) A square with a diagonal line from top-left to bottom-right, and a black dot in the top-right corner. (2) The square is rotated 90 degrees clockwise. The line is now horizontal, and the dot is now in the top-left corner. (3) The square is rotated another 90 degrees. The line is now diagonal from bottom-left to top-right. The dot is now in the bottom-left corner.
- **Analysis of Rules:**
  - **Square:** Rotates 90^0 clockwise in each step.
  - **Line:** Follows the rotation of the square.
  - **Dot:** Follows the rotation of the square.
- **Prediction for Figure (4):** The square and its elements must rotate another 90^0 clockwise. The line will become vertical. The dot will move to the bottom-right corner.

By isolating the variables, a seemingly complex visual progression is reduced to a set of simple, predictable geometric transformations.

4.3.3 Ranking Test

Imagine waiting in a long queue for a ticket, and you are told you are the 12th person from the front and the 8th person from the back. The Ranking Test requires you to determine the total number of people in that queue, or the position of a specific person relative to another, using only the given rank data. This exercise tests the ability to handle positional data and apply simple arithmetic logic to linear arrangements. It demands meticulous attention to whether the person being counted is included or excluded in the calculation (the 'overlap' factor). The fundamental principle here is that the total number of items is the sum of the positions from both ends, minus one (to avoid counting the common item twice).

4.3.3.1 The Positional Formula

The core of all ranking problems is derived from the simple idea of a straight line. If an individual's rank is known from the left (L) and the right (R) of the line, the total number of individuals (T) is calculated using the formula: T = L + R - 1. This formula

explicitly manages the overlap: when you count from the left to that person, and then count from the right to that same person, they have been counted twice, so the deduction of '1' corrects this error. More complex scenarios involve finding the number of people between two individuals, which requires calculating the total number up to each person and subtracting the smaller total from the larger one, again ensuring no individual is counted or excluded improperly.

Example 4: Calculating Total Strength

- **Problem:** In a row of students, Ravi's position is 18th from the left end and 15th from the right end. What is the total number of students in the row?
- **Analysis:**
    - Position from Left (L) = 18
    - Position from Right (R) = 15
    - Total Students (T) =L + R - 1
- **Calculation:** T = 18 + 15 - 1 = 33 - 1 = 32.
- **Conclusion:** There are **32** students in the row.

Example 5: Calculating Position between Two People

Problem:

In a class of 50 students, Suresh is 10th from the top, and Mohan is 25th from the bottom. How many students are there between Suresh and Mohan?

Analysis:

- Total students (T) = 50
- Suresh's rank from the top = 10
- Mohan's rank from the top = 50 - 25 + 1 = 26
- To find the number of students between two ranks, use the formula:

$$\text{Students between} = |(\text{Rank}_1 - \text{Rank}_2)| - 1$$

- **Calculation:** |10 - 26| - 1 = 16 - 1 = 15
- **Conclusion:** There are 15 students between Suresh and Mohan.

4.3.4 Calendar Test

Imagine an old calendar, its pages filled with days, months, and years. The Calendar Test involves logical calculations to determine the day of the week for a specific, often distant, date (e.g., 'What day was India's independence day in 1947?'). This test is an elegant application of modular arithmetic, focusing on the concept of odd days the number

of days remaining after dividing the total number of days by seven (the number of days in a week). Since the day of the week repeats every 7 days, the problem is reduced to counting the accumulated 'remainder' days across years and months. Mastery requires internalizing the fixed set of odd days for each month and year type (normal vs. leap).

4.3.4.1 The Concept of Odd Days

The entire system rests on the fact that:

- A normal year (365 days) has 365÷7 = 52 weeks and 1 odd day. Thus, the day of the week shifts forward by one day next year.
- A leap year (366 days) has 366÷7 = 52 weeks and 2 odd days. The day of the week shifts forward by two days next year.

To solve a complex date, one calculates the total odd days from a fixed reference point (usually the year 0 AD or 1900) up to the day before the target date. The total number of odd days corresponds to the day of the week: 0 = Sunday, 1 = Monday, 2 = Tuesday, and so on.

Key Odd Day Values:

Time Period	Odd Days
100 years	5
200 years	3
300 years	1
400 years	0
Normal Year	1
Leap Year	2

Example 6: Finding the Day of the Week

- **Problem:** What was the day of the week on March 12th, 2005?
- **Step 1: Reference Year:** Calculate odd days up to the year 2004.
  - 2004 = 2000 years + 4 years.
  - Odd days in 2000 (multiple of 400) = 0.
  - Odd days in 4 years = (1 Leap year: 2004) × 2 (odd days) + (3 normal years) × 1 (odd day) = 2 (1x2)+ 3 (3x1)= 5 odd days.
- **Step 2: Odd Days in 2005 (up to March 12):**
  - January (31 days) →31 ÷ 7 = 3 odd days.
  - February (28 days) →28 ÷ 7 = 0 odd days.
  - March (12 days) →12÷7 = 5 odd days.

- **Step 3: Total Odd Days:** 5 (from 2004) + 3 + 0 + 5 = 13 odd days.
    - **Step 4: Final Day:** 13÷7 = 1 week and 6 odd days.
    - **Conclusion:** 6 odd days corresponds to Saturday (0=Sunday, 6=Saturday).

4.3.5 Clock Test

The ticking of a clock is a visible measure of time, but the Clock Test uses the positions and movements of the hands to pose geometrical and numerical puzzles. This test requires the learner to translate time (hours and minutes) into angular measurement (degrees), as the key problems involve calculating the angle between the hour and minute hands at a specific time, or determining when the hands will coincide, be opposite, or be perpendicular. The non-verbal reasoning lies in visualizing the circular movement and applying the fixed rates of rotation for each hand.

4.3.5.1 Rates of Angular Movement

The solution to all clock problems depends on two fixed rates of angular movement:

1. **Minute Hand Rate:** It completes a full circle (360^0) in 60 minutes. Rate = 360^0/ 60 min = 6° per minute.
2. **Hour Hand Rate:** It completes a full circle (360^0 in 12 hours (720 minutes). Rate = 360^0 / 720 min = 0.5° per minute.

The standard formula for finding the angle (θ) between the hands at H hours and M minutes is: θ = |30H - 11/2 M|. This formula efficiently calculates the absolute difference between the positions of the two hands relative to the 12 mark.

Example 7: Calculating the Angle

- **Problem:** What is the angle between the hour hand and the minute hand at 4:40?
- **Analysis:**
    - Hours (H) = 4
    - Minutes (M) = 40
    - Formula: θ = |30H - 11/2 M|
- **Calculation:**
    - $\theta = (30 \times 4) - \left(\frac{11}{2} \times 40\right)$
    - θ = |120 - (11 × 20)|
    - θ = |120 - 220|
    - θ = |-100|
- **Conclusion:** The angle between the hands at 4:40 is **100^0**.

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These tests are excellent measures of mathematical precision applied to a dynamic visual system.

4.3.6 Completion of Incomplete Pattern

Imagine a section of a beautiful mosaic is missing, and your task is to choose the single piece that perfectly completes the design, matching both the internal pattern and the boundary lines. The Completion of Incomplete Pattern exercise is precisely this it tests your ability to visualize patterns, symmetry, and geometric continuity. The figure is typically a large square or circle, divided into four quadrants, with one quadrant left blank. The non-verbal reasoning required here is the ability to perceive the rule of the whole (the main design principle: rotation, reflection, or progressive change) and then apply that rule to accurately fill the missing part. It is a critical skill for design, spatial planning, and quality control, where an eye for detail and pattern consistency is paramount.

4.3.6.1 Principles of Pattern Completion

To successfully complete an incomplete pattern, one must first identify the relationship between the three given parts. The relationship often follows one of these rules:

1. **Symmetry (Mirror Image):** The missing part is the mirror image of the adjacent or opposite part.
    - Example: If the top-left quadrant is a filled triangle, and the rule is vertical symmetry, the top-right quadrant should be the reflection of that triangle.
2. **Rotation (Rotational Symmetry):** The missing part is derived by rotating an existing part by 90^0 or 180^0.
    - Example: The second quadrant is a 900c clockwise rotation of the first; the missing fourth quadrant must be a 900 clockwise rotation of the third.
3. **Combination/Progressive Change:** The missing part completes a sequence or a combination rule (e.g., adding a line segment in each part, or combining features from the parts above and to the left).

The strategy is to isolate the boundary lines and the internal lines of the existing parts and trace their logical continuation into the blank space, ensuring the chosen piece snaps perfectly into the overall design's rule.

Example 8: Completion based on Diagonal Symmetry

- **Figure Description:** A large square divided into four smaller squares. The top-left and bottom-right quadrants are shaded black. The top-right quadrant is white. The bottom-left quadrant is missing.
- **Analysis:** The diagonal quadrants (top-left and bottom-right) are identical (black). The anti-diagonal quadrants (top-right and bottom-left) must therefore also follow the symmetry.
- **The Rule:** The figure follows diagonal symmetry, meaning the piece opposite the missing one determines the rule.

- **Conclusion:** Since the top-right quadrant is white, the missing bottom-left quadrant must also be **white** to maintain the pattern. The key here is recognizing the nature of the pattern whether it's across a side or across a diagonal.

4.3.7 Figure Matrix

Imagine a spreadsheet where instead of numbers, each cell contains a different visual figure, and these figures are arranged not randomly, but according to rules that apply across the rows and down the columns. The Figure Matrix test presents a 2 × 2 or 3 × 3 grid of figures where one cell is left empty. The task is to identify the figure that completes the matrix, which necessitates finding the rule governing the evolution of figures both horizontally and vertically. This is a complex test of simultaneous relational reasoning, as you must confirm that the chosen solution works for both the row rule and the column rule. It's an exercise in abstract pattern logic, highly relevant to data analysis and system design where multi-dimensional rules are common.

4.3.7.1 Discovering Dual Rules

The central challenge is that two rules are operating at once. You must first deduce the transformation rule for a row (e.g., Row 1: Figure A → Figure B → Figure C). This rule might be 'the shape rotates 450 and loses an internal dot.' Next, deduce the transformation rule for a column (e.g., Column 1: Figure A ↓ Figure D ↓ Figure G). This rule might be 'the size of the figure increases, and the shading alternates.' The correct answer must be the figure that results from applying the row rule to the last figure in its row AND applying the column rule to the last figure in its column.

Example 9: Figure Matrix (Addition/Subtraction Rule)

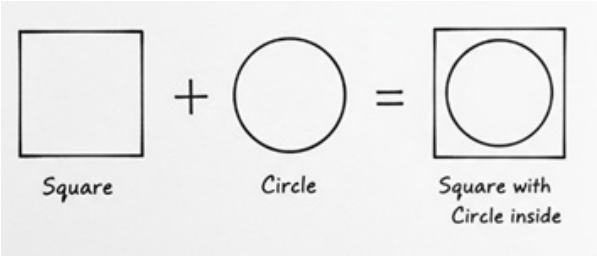
- **Matrix (3 × 3):**

  Rule:

  Addition (+) → Combine all visible elements.

  Subtraction (–) → Remove the common/overlapping element.

  - **Row 1:** (Square) + (Circle) = (Square and Circle combined)



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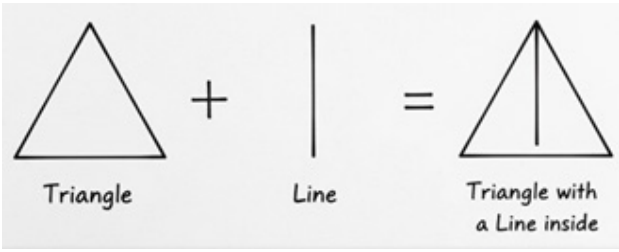
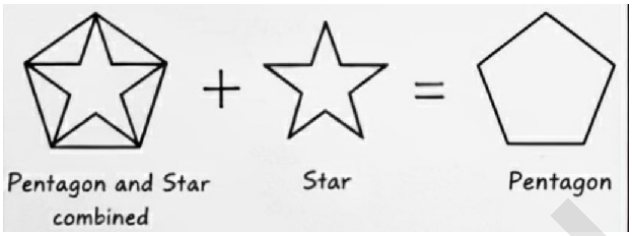
- **Row 2:** (Triangle) + (Line) = (Triangle with a Line inside)



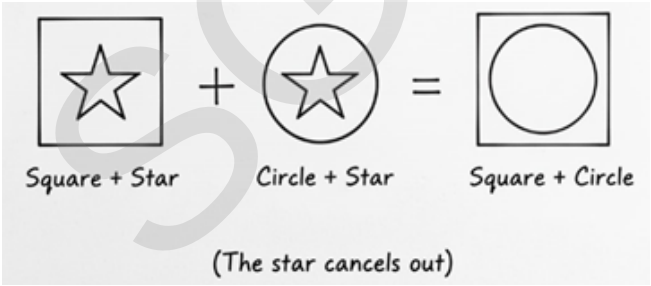
- **Row 3:** (Pentagon and Star combined) + (Star) = (Pentagon)



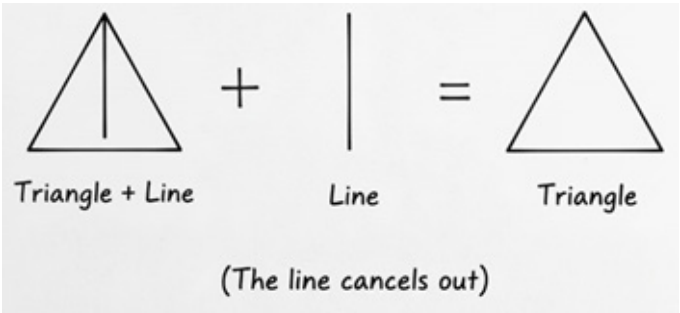
This implies subtraction/cancellation

♦ **Revised Rule (Subtraction/Cancellation):** The figure in the third column is the result of applying a rule to the figures in the first two columns. Let's assume the rule is 'The third figure is the combination of the first two, with common elements cancelled out.'

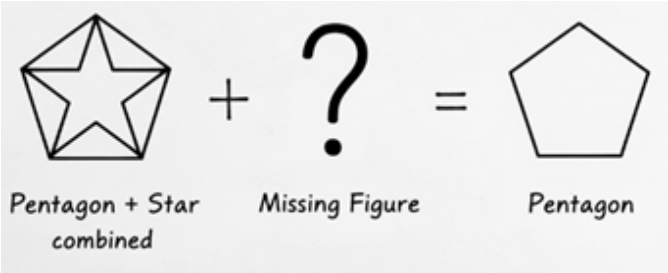
- **Row 1:** (Square + Star) + (Circle + Star) = (Square + Circle) (The star cancels out).



- **Row 2:** (Triangle + Line) + (Line) = (Triangle) (The line cancels out).



- **Row 3:** (Pentagon + Star) + (Missing Figure) = (Pentagon).



This implies subtraction/cancellation.

- **Deduction:** To get the Pentagon in Row 3, the shared element (the Star) must be subtracted/cancelled out from the first figure (Pentagon + Star).
- **Conclusion:** The missing figure must be a **Star**. This illustrates how matrix problems rely on seeing the relationship between three elements, not just two, often involving conceptual 'addition' or 'subtraction' of visual components.

4.3.8 Embedded Figures

Imagine trying to find a specific constellation in the night sky you're looking for a simple, predefined pattern hidden within a vast, complex visual field. The Embedded Figures test assesses your ability to quickly and accurately identify a simple given figure that is completely 'hidden' or embedded within a more complex design. This is a test of disembedding the capacity to isolate a specific visual component from its surrounding clutter without being distracted by the complexity of the host figure. It requires strong figure-ground segregation and is a direct measure of perceptual ability and focused visual attention, highly valuable in microscopy, camouflage detection, and circuit board inspection.

4.3.8.1 The Process of Disembedding

The primary technique for solving embedded figures problems is visual decomposition. You should avoid mentally tracing the complex figure and instead focus intently on the target figure's unique features its angles, line lengths, and junction points. Then, you scan the complex figure for the exact outline of the target, maintaining its size, shape, and orientation (unless rotation is explicitly allowed). The non-verbal reasoning here is the ability to ignore extraneous lines and focus only on the lines that form the required internal shape, demonstrating exceptional selective attention.

Example 10: Finding the Hidden 'L' Shape

- **Target Figure:** A capital 'L' shape.
- **Complex Figure:** A large star made of multiple intersecting triangles and lines.
- **Analysis:** You scan the star, looking for an intersection of lines that creates a perfect 90^0 angle with two unequal or equal sides, forming the 'L' shape. You might find the 'L' formed by the corner of one of the internal triangles and a segment of the star's main outline.

- **Strategic Hint:** It is often helpful to use a finger or a pencil to trace the lines of the target figure directly onto the complex figure, focusing only on finding the match, thereby physically isolating the embedded shape from its confusing background.

The skill of disembedding is essential for analytical thinking where data points or critical information must be pulled out of overwhelming noise.

Non-Verbal Reasoning is a comprehensive suite of analytical skills centered on the logic of patterns, space, and visualization. The unit's components from the sequential logic of Series Tests and the positional arithmetic of Ranking Tests, to the angular precision of the Clock Test and the geometric coherence of Incomplete Patterns together form a visual logic toolkit. The underlying cognitive skill across all these types is the ability to abstract a rule from a few examples (induction) and then apply that rule precisely to a new case (deduction). This unit offers vital training in critical thinking, moving beyond language to deal directly with the structure and transformation of abstract data, a skill increasingly vital in a data- and image-rich world.

Topic	Core Logic Principle	Practical Application
Coding Decoding	Pattern Recognition, Rule Induction	Cryptography, Data Security, IT Systems.
Ranking Test	Linear Positional Arithmetic	Resource Allocation, Queue Management.
Calendar/Clock Test	Modular Arithmetic, Angular Geometry	Time-based planning, Scheduling Optimization.
Figure Matrix	Simultaneous Dual-Rule Deduction	Analyzing Complex Data Grids, System Integration.
Embedded Figures	Figure-Ground Segregation	Inspection, Quality Control, Visual Search tasks.

Recap

- Non-Verbal Reasoning uses shapes, figures, and patterns.
- Coding-Decoding tests rule identification and abstraction.
- Ranking Tests use linear positional arithmetic.
- Clock and Calendar problems rely on modular logic.
- Series Tests require sequential rule induction.
- Figure Matrix problems demand dual-rule deduction.
- Embedded Figures assesses visual disembedding ability.
- The above logics are crucial in fields like design and engineering.

Objective Questions

1. If FAN is coded as HCP, what is the code for PEN?
2. If CAT = 24 (sum of positional values), find the code for HIP.
3. A dot moves one corner clockwise in each step around a square. After four steps, where will it be?
4. In a series, a triangle rotates 90° clockwise each step. After two steps, what is its net rotation?
5. In a queue of 40 students, Anita is 8th from the front. What is her position from the back?
6. In a line, Ajay is 10th and Rohit is 15th. How many students are between them?
7. How many odd days are there in February of a leap year?
8. At 3:00, what is the angle between the hour and minute hands?
9. In a 4-part symmetric pattern, the missing quadrant must be a mirror image of which part: adjacent or opposite?
10. The best strategy to find a hidden figure is to match its unique shape based on…?

Answers

1. RGP
2. 33
3. Same initial corner
4. 180°
5. 33rd
6. 4
7. 1
8. 90°
9. Adjacent
10. Outline

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Assignments

1. Create your own coding rule using alphabet shifts + letter reversal. Encode BRAIN using your rule, and explain the transformation steps clearly.
2. Draw a 4-step figure series where:
   - ♦ the outer shape rotates,
   - ♦ the inner element shifts position,
   - ♦ a line is added every alternate step.

   Explain the rule governing each change.
3. A class has an unknown number of students. Rani is 12th from the top, and 18th from the bottom.
   - ♦ Draw the lineup visually.
   - ♦ Calculate the total number of students using the positional formula.
   - ♦ Write a short explanation of the overlap principle.
4. Prepare a small table calculating the day of the week for the following dates using odd-day logic:
   - ♦ 15 August 1947
   - ♦ 1 January 2000
   - ♦ 26 January 2020

   Show all intermediate steps (years → months → days → odd days).
5. Design a 3×3 Figure Matrix using shapes of your choice (square, circle, triangle, line, etc.).

   Make sure:

   - ♦ The row rule is rotation,
   - ♦ The column rule is addition/subtraction of elements.

   Leave one cell blank and write the correct answer figure with justification.

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Reference

1. Aristotle. (n.d.). *Prior Analytics* (J. Barnes, Ed.).
2. Bentham, J., & Mill, J. S. (n.d.). *Foundations of Utilitarianism*.
3. Copi, I. M., Cohen, C., & McMahon, K. (2014). *Introduction to Logic* (14th ed.). Pearson.
4. Kant, I. (1785). *Groundwork of the Metaphysics of Morals*. (Various translations).
5. National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School Mathematics*. Reston, VA: Author.
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7. Wikipedia. (n.d.). *Articles on Geometric Principles, Calendar Algorithms, and Clock Calculation.*

Suggested Reading

1. Copi, I. M., Cohen, C., & McMahon, K. (2014). *Introduction to Logic* (14th ed.). Pearson.
2. Salmon, W. C. (1984). *Logic* (3rd ed.). Prentice-Hall.
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4. Rachels, J., & Rachels, S. (2021). *The Elements of Moral Philosophy* (10th ed.). McGraw-Hill Education.
5. Law, S. (2011). *Humanism: A Very Short Introduction*. Oxford University Press.

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MODEL QUESTION PAPER SETS

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Model Question Paper - SET 1

QP CODE: ……

Reg. No: …….....

Name: …….....

THIRD SEMESTER (FYUGP) EXAMINATION

SKILL ENHANCEMENT COURSE

SGB24UC201SE - HUMANISM AND LOGIC

(2024–25 Admission Onwards)

Time: 2 Hours Maximum Marks: 45

SECTION A

Answer any five questions in one word or a sentence each.

(5 × 1 = 5 Marks)

1. In situation-based reasoning, what is the first essential step in approaching any dilemma?
2. Who propounded the doctrine of the Middle Path?
3. Which type of reasoning involves interpreting visual patterns, shapes, and figures to identify logical relationships??
4. A person is 14th from the left and 11th from the right. What is the total number of people in the row?
5. What symbol represents negation in symbolic logic?
6. What is a term in logic?
7. When the English alphabet is written in reverse order (Z to A), what is the 5th letter from the left?
8. What is meant by an analogy?

SECTION B

Answer any five questions in two or three sentences each.

(5 × 2 = 10 Marks)

9. A person walks 8 m North, turns right and walks 6 m, turns right again and walks 8 m, then turns left and walks 4 m. Determine the final position relative to the starting point.
10. What is *Anukampa* according to Sree Narayana Guru?

11. If CAT is coded as 24 (using positional value summation), what will be the code for DOG??

12. What does a figure matrix test aim to evaluate?

13. What does Ubuntu teach about human interconnectedness?

14. Define a dilemma in the context of decision-making?

15. What is the Square of Opposition?

16. What is a fallacy? Give an example.

SECTION C

Answer any four questions in about 100 words each.

(4 × 5 = 20 Marks)

17. Discuss how time pressure in tests affects verbal reasoning performance and suggest two strategies to cope with it.

18. Explain Sree Narayana Guru's critique of caste in *Jatinirnayam*.

19. Describe the structure of a categorical syllogism with an example.

20. How does "skimming" differ from "scanning" in comprehension-based exercises?

21. What are logical connectives? Illustrate with examples.

22. What is analogical reasoning? How is it used in daily life?

SECTION D

Answer any one question in about 300 words.

(1 × 10 = 10 Marks)

23. Critically examine how different religious and philosophical traditions interpret compassion (Agape, Anukampa, Rahma, Karuna) as the foundation of humanism.

24. Explain the differences and similarities between traditional logic and symbolic logic.

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SREENARAYANAGURU OPEN UNIVERSITY

Model Question Paper - SET 2

QP CODE: ……

Reg. No: …….....

Name: …….....

THIRD SEMESTER (FYUGP) EXAMINATION

SKILL ENHANCEMENT COURSE

SGB24UC201SE - HUMANISM AND LOGIC

(2024–25 Admission Onwards)

Time: 2 Hours Maximum Marks: 45

SECTION A

Answer any five questions in one word or a sentence each.

(5 × 1 = 5 Marks)

1. What does Ahimsa mean?
2. Who taught the Eightfold Path?
3. What is a term in logic?
4. What verbal reasoning skill is being tested when a student is asked to identify the logical relationship between two-word pairs and map it onto another pair?
5. Which symbol represents conjunction?
6. Which type of reasoning focuses on understanding and analysing information expressed through words or language?
7. Who propounded the doctrine of the Middle Path?
8. What is meant by inference?

SECTION B

Answer any five questions in two or three sentences each.

(5 × 2 = 10 Marks)

9. If the alphabet is reversed (Z to A), what letter is the 8th to the right of the 12th letter from the left?
10. What is deep ecology?
11. Define a categorical proposition.

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12. What is the Law of Excluded Middle?

13. Explain the concept of validity in symbolic logic.

14. What is equivalence in propositional logic?

15. Distinguish between deduction and induction.

16. What is a scientific method?.

SECTION C

Answer any four questions in about 100 words each.

(4 × 5 = 20 Marks)

17. Write a short note on environmental humanism in Gandhi.

18. Explain the four types of categorical propositions with examples.

19. Discuss the role of quantifiers in symbolic logic.

20. Discuss the relationship between vocabulary, grammar, and logical structure in verbal reasoning.

21. Rearrange the following sentences into a coherent paragraph and explain your reasoning:

    a. These changes drastically improved early human survival.

    b. The mastery of fire was a turning point in human evolution.

    c. It provided protection, warmth, and a method for cooking food.

    d. Archaeological evidence suggests its controlled use began nearly a million years ago.

22. How does scientific reasoning differ from everyday reasoning?

SECTION D

Answer any one question in about 300 words.

(1 × 10 = 10 Marks)

23. Analyse the concept of equality with reference to Rawls, Amartya Sen, and Ambedkar.

24. Discuss the nature and structure of deductive and inductive reasoning with suitable illustrations.

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സർവ്വകലാശാലാഗീതം

വിദ്യയാൽ സ്വതന്ത്രരാകണം
വിശ്വപൗരരായി മാറണം
ഗ്രഹപ്രസാദമായ് വിളങ്ങണം
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DON'T LET IT
BE TOO LATE

SAY NO TO DRUGS

LOVE YOURSELF AND ALWAYS BE HEALTHY

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The State University for Education, Training and Research in Blended Format, Kerala

HUMANISM AND LOGIC

COURSE CODE: SGB24UC201SE

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