Class 9

Answer Key

Artificial Intelligence Ver. 3.0

Part A: Employability Skills

1. Communication Skills-1

Reboot (Page 37)

1. A sentence is a group of words arranged together and has a complete meaning.
2. The two most basic parts of a sentence are subject and a predicate.
3. Following are the rules for writing a sentence: • It begins with a capital letter. • It ends with a full stop, exclamation mark, or question mark depending on the type of a sentence. • It must contain one subject and one verb with an independent clause. • It should have a meaning.
4. Comma is used to mark a pause in a sentence.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. b 2. a 3. a 4. c 5. d

B. 1. True 2. True 3. False 4. True 5. False

C. 1. Interrogation 2. Assertive 3. Interrogation 4. Assertive
5. Assertive 6. Exclamatory 7. Imperative 8. Imperative
9. Imperative 10. Assertive

D. 1. **She** (pronoun) **went** (verb) **to** (preposition) the **market** (noun) to **buy** (verb) **fruits** (noun).
2. **I** (pronoun) **am** (verb) **scared** (adjective) **of** (preposition) **thunder** (noun) and **lightning** (noun).
3. **Ankit** (noun), what's **your** (pronoun) **opinion** (noun) **about** (preposition) **this** (pronoun)?
4. **Teacher** (noun) **Sunita** (noun) **teaches** (verb) **Physics** (noun) and **Mathematics** (noun).
5. **Priya** (noun) and **her** (pronoun) **friends** (noun) **are going** (verb) **on** (preposition) a **picnic** (noun).

E. 1. **IT as part of the education system**

Information Technology (IT) has revolutionized the education system by making learning more accessible and interactive. With the help of digital tools like online classes, e-books, and AI-powered learning platforms, students can study anytime and anywhere. IT enables personalized learning experiences and enhances engagement through multimedia content. It also plays a vital role in research, communication, and data analysis, preparing students for the digital age.

2. **Gratitude**

Gratitude is the act of appreciating the good things in life. It helps us focus on positivity and strengthens our relationships. Expressing gratitude towards parents, teachers, and friends makes us feel happier and more content. Small acts like saying "thank you" or writing a gratitude journal can make a big difference in our mindset. Practicing gratitude regularly leads to a more fulfilling and peaceful life.

F. 1. an 2. The 3. a 4. an, the
5. The 6. a

G. 1. Active: She sings a beautiful song.
Passive: A beautiful song is sung by her.
2. Active: The teacher explains the lesson.
Passive: The lesson is explained by the teacher.
3. Active: John reads a book every night.
Passive: A book is read by John every night.
4. Active: They built a new house.
Passive: A new house was built by them.
5. Active: The dog chased the cat.
Passive: The cat was chased by the dog.
6. Active: The chef cooks delicious meals.
Passive: Delicious meals are cooked by the chef.
7. Active: The dog barked at the stranger.
Passive: The stranger was barked at by the dog.
8. Active: I finished my homework.
Passive: My homework was finished by me.
9. Active: He repaired the broken chair.
Passive: The broken chair was repaired by him.
10. Active: We planted a tree in the garden.
Passive: A tree was planted in the garden by us.

SECTION B (Subjective Type Questions)

A. 1. Encoding in communication is the process of converting thoughts or ideas into symbols, words, or gestures for transmission.

2. If the surrounding area of the communication is imbalanced, then, the impact of the communication will not be much. Fear, anxiety, aggression, etc. strongly affect the communication skills.
3. The content of the message should stick to the topic and should flow in a sequence that makes sense.
4. Oral communication is communication using spoken words in an interactive way to share ideas or information. It can be a direct face-to-face conversation or a telephonic conversation.
5. Interrogative Sentences
6. A' and 'An' are indefinite articles which are used before a noun that are not specific or known before. "A" is used before a word beginning with a consonant (alphabets other than vowels) sound. For example: * A book (it can be any book) * A game (it can be any game). "An" is used before a word that begins with a vowel (a, e, i, o, u) sound. For example, an umbrella, an hour, an ice cream cone, etc.

B. 1. Interjection: An interjection is a word or a phrase that expresses a sudden or a strong feeling. Grammatically they are not related in a sentence but expresses a relationship between a word and a phrase in a sentence. Sometimes they are followed by an exclamation mark(!). For example:

- Alas! I am so lost without you.
- Great! You are coming with me.

Conjunction: Conjunction is a word that joins words, phrases, clauses, or sentences together. There are different types of conjunctions. Some conjunctions may be used to make a list while some may be used to connect thoughts, ideas or actions.

For example:

- I bought a pen, pencil, and ruler for my exams.
- Neither this bridge nor that road is good to travel by car.

2. Facial Expressions: Facial expressions are a very powerful way of conveying different forms of feelings and emotions. For effective non-verbal communication, you should smile when you meet someone, match your expressions with your words, and nod while listening. Being aware of your own facial expressions is very important in a professional environment. In one of the studies, it was found that the most trustworthy facial expression involved a slight rise of the eyebrows and a slight smile. Six basic facial expressions are—anger, fear, happy, disgust, sad, and surprise.

Appearance: Appearance includes our choice of colour, body cleanliness, properly dressed, hairstyle, etc. When you are speaking in public, you may be representing your organisation or just yourself. You should ensure that you are properly and neatly dressed. It also increases your self-confidence and you will definitely feel good about yourself.

3. The 3P's of public speaking are Prepare, Practice and Perform.

   Prepare: Prepare the content of your speech. Think about what your audience is expecting you to speak and then plan your content. Make it interesting in such a way that your audience feel engaged and are full of praises for you.

   Practice: Rehearse out loud your speech before your D-day. Work to control your voice modulation, make a list of few filler words and plan your body movements and hand gestures. Practice, pause, and breathe. Use a clock to check your timings and allow time for the unexpected.

4. An adjective is a word that defines a noun or a pronoun.

   For example:

   - I have a beautiful dress.
   - My smart dog runs on a smooth road.

5. Apostrophe can be used to indicate the omission of some letters in a word.

   For example:

   - I'm enjoying my friend's company.
   - It's very hot outside.

   It is used to show the possession of a thing.

   For example:

   - Adrissa's eyes are blue in colour.

C. Competency-based/Application-based questions.

1. Grading Criteria for a Paragraph:
   - **Clarity & Relevance:** The paragraph should clearly convey the main idea and stay on topic.
- **Structure:** It should have a proper introduction, body, and conclusion.
- **Grammar & Spelling:** Correct grammar, punctuation, and spelling should be used.
- **Coherence & Flow:** Ideas should be logically connected with appropriate transitions.
- **Content & Accuracy:** The information should be relevant, accurate, and well-supported with facts or examples.

2. Correct Sentence: I bought **a** smartphone.

   Rules for Using Articles:

   - **'A'** is used before words that begin with a consonant sound (e.g., a book, a university).
   - **'An'** is used before words that begin with a vowel sound (e.g., an apple, an hour).
   - **'The'** is used for specific nouns (e.g., the sun, the Eiffel Tower).
   - The choice of article depends on **pronunciation, not just spelling**. "Smartphone" starts with a consonant sound (/s/), so "a" is correct.

Lab Activity (Page 49)

Do it yourself.

Class Activity (Page 49)

Do it yourself.

2. Self-Management Skills-I

Reboot (Page 57)

1. successful
2. positive
3. preparation

Reboot (Page 58)

1. Various
2. Environmental
3. confidence

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. a 2. d 3. a 4. b 5. b

B. 1. Social 2. Problem-solving 3. self-esteem 4. attire

Section B (Subjective Type Questions)

A. 1. It is the ability to manage your impulse, emotions and behaviour. Know yourself so you can manage your emotions and impulses. It acts as a force to have a more successful and satisfying life. For example, the Indian system of fasting is an excellent example of self-control. Fasting restricts a person from eating specific food.

2. It is the ability to plan and organise a given task in an effective manner. Good organisational abilities will prevent difficulty in your work and disorder in your daily life. For example, A student needs to have necessary material for the assigned activity, stay in their seat, and finish required work before going to the next assignment.

3. Low self-confidence can lead to hesitation, missed opportunities, and vulnerability to external influences, often resulting in undesirable situations.

4. Apart from academics, the only source of knowledge is experience.

5. Positive Affirmations for Success
    - I am capable of achieving my goals with dedication and persistence.
    - Every challenge I face is an opportunity to grow stronger.
    - I trust my skills and creativity to make a meaningful impact.
    - Distractions and doubts do not define me—I stay focused and resilient.
    - I am building a future where innovation, leadership, and purpose align.
    - My efforts today shape the success I will achieve tomorrow.

B. 1.
- It helps in the overall development of a person.
- It polishes your skills and enhances your employability with better career prospects.
- It makes you realise your potential and maximises your productivity that helps you grow personally and professionally.
- It brings strong organisational skills that help you streamline your work.

2. Following are the steps to identify your strengths:
    - Identify your strengths by talking to a few people close to you. Listen to them honestly what they have to say good about you.

      Ask them:
        - What do you think I am good at?
        - What are my strengths?
        - How can I use my strengths to choose my career?
        - Which task can I do for hours without getting tired?
    - List down the good things conveyed to you by these people, sit alone, and introspect.
    - If you want to be doubly sure, then, you can also take a personality test by going to a professional.
    - Feel your strength with these good points and what others have appreciated in you.
    - Use your strength in choosing the correct path for your overall development.
3. Being aware of the purpose in life is very important to make your own existence feel. Knowing yourself helps you understand your own identity. It is important to know yourself in order to achieve success in life. It gives you purpose, direction and a true sense of well-being.

   In this process of knowing yourself, it is important to know our:
    - Body and physical challenges
    - Personality in private and public moments
    - Morale and principles
    - Strengths and weaknesses
    - Temptations and frustrations

- Likes and dislikes
- Beliefs and opinions
- Background and relationships
- Positive and negative emotions
- Tolerance and understanding of others
- Creativity and interests
- Limits and boundaries

4. Social factors include our society and people around us. It can be the people in our classroom, family at home, friends in our colony, colleagues in our workplace, strangers on the street. Each one of us needs a push to start working harder, all of us want to be motivated by loved ones around us. The pressure of society has a very strong impact on the self-confidence of a person and will affect the performance of a person to a certain level.

   For example:

   - Michael Jordan, the famous basketball player, was told in high school that he did not have the skill and felt dejected during his childhood.
   - Dr. Seuss, the famous author of children's literature, was rejected by nearly 27 publishers early in his career.

5. People with low self-confidence often doubt their abilities, fear failure, and seek constant validation. They may hesitate to take risks, avoid challenges, and struggle with self-expression.

   In contrast, individuals with high self-confidence trust their skills, embrace challenges, and learn from failures. They take initiative, maintain a positive outlook, and handle criticism constructively. Their self-assurance helps them stay resilient and focused on their goals, leading to greater success and personal growth.

6. CARE:
   - Keep your hair free of dandruff
   - Rub oil/cream to take care of your skin
   - Brush your teeth daily
   - Change your toothbrush after a period of time.
   - Cut your nails every week

   WASH:
   - Wash your hands frequently
   - Take bath every day
   - Wash your clothes regularly
   - Wash your hair at least every second day
   - Wash your feet often

AVOID:

- Blow your nose/cough into a handkerchief to avoid spreading germs
- Keep your feet dry and change your socks every day

C. 1. Organisational Skills 2. Self-Control 3. Self-Motivation
4. Self-Commitment 5. self-Confidence

D. **Competency-based/Application-based questions.**

1. Ankit, try using a daily planner or to-do list to organize your tasks. Setting clear goals, breaking them into smaller steps, and following a schedule will help you stay on track. Also, set deadlines for yourself—it builds self-discipline and ensures timely work.
2. I judge myself based on my own views, not others' expectations. Everyone has different strengths and goals, so comparing with others is not helpful. I focus on improving myself, setting my own standards, and growing at my own pace.

Lab Activity (Page 71)

Do it yourself.

Class Activity (Page 71)

Do it yourself.

3. ICT Skills-I

Reboot (Page 105)

1. SMTP (Simple Mail Transfer Protocol): SMTP is a protocol used for sending and receiving email. It handles the transmission of emails between servers and is responsible for the reliable and efficient delivery of emails over the Internet.

   FTP (File Transfer Protocol): FTP is a standard network protocol used for transferring files between a client and a server on a computer network. It provides a simple way to upload and download files from one computer to another over the Internet.
2. A web browser (commonly referred to as a browser) is a software application for using and sharing information on the World Wide Web.
3. A web client (like a browser) sends requests to a web server to access web pages, while a web server processes these requests and delivers the requested content. The client initiates communication, and the server responds with data.

4. Online learning: There are a number of courses available online-some are free while others are not. You can do a course on a topic you like or want to know more about.

   Social networking: You can share your interests, knowledge and stories with your family and friends around the world. For example, Facebook and Twitter

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. a 2. c 3. d 4. b 5. c 6. b

B. 1. ICT 2. E-Banking 3. Communication Channels 4. YouTube 5. Protocols
6. Homepage 7. URL 8. BCC

C. 1. False 2. False 3. True 4. False 5. False 6. False
7. True 8. True

D. Plotter – Output Device
Microphone – Input Device
Flash Drive – Storage Device
Speaker – Output Device
Scanner – Input Device
Printer – Output Device
Hard Disk – Storage Device
Bar Code Reader – Input Device
Light Pen – Input Device
Projector – Output Device

E. 1. System Software vs. Application Software:
   - **System Software:** Controls and manages hardware operations (e.g., Operating System).
   - **Application Software:** Designed for specific tasks (e.g., MS Word, Photoshop).

2. Cold Booting vs. Warm Booting:
   - **Cold Booting:** Starting the computer from a powered-off state.
   - **Warm Booting:** Restarting the computer without turning off the power.

3. Serial Port vs. Parallel Port:
   - **Serial Port:** Transfers data one bit at a time (e.g., COM port).
   - **Parallel Port:** Transfers multiple bits simultaneously (e.g., Printer port).

F. 1. SMTP (Simple Mail Transfer Protocol)
2. TCP/IP (Transmission Control Protocol / Internet Protocol)
3. FTP (File Transfer Protocol)
4. HTTPS (Hypertext Transfer Protocol Secure)

Section B (Subjective Type Questions)

A. 1. Blu-ray disc is of the same dimension as that of CD or DVD and uses the same optical rays technology for recording and playing back high-definition (HD) video and for storing large amounts of data. It has a capacity of up to 25 GB.

2. Mobile Operating Systems are designed to run the applications and other programs on smartphones, tablets, smart watches or other portable devices. It is a combination of an operating system and communication technology.

3. A light pen is a pointing device shaped like a pen and is connected to a VDU. The tip of the light pen contains a light-sensitive element which, when placed against the screen, detects the light from the screen enabling the computer to identify the location of the pen on the screen. We generally use it to make a selection or draw anything on a screen.

4. A laser printer works just like a photocopy machine that prints the output at high-speed and good quality. It creates images using a laser beam and powdered ink called toner. It is more expensive than inkjet printers and can be used for home or business purposes.

5. Motherboard or the main board consists of a board containing electric circuit that connects all the important components of the computer. If the CPU is the brain of the computer, then, the motherboard is the central nervous system making it the backbone or spine of a computer system. It consists of:
   - Ports to connect different input and output devices.
   - Memory slots that contain the system's main memory.
   - ROM-BIOS chip that acts as an interface between the operating system and the hardware of a computer.
   - System Clock that synchronises all the components of the motherboard.
   - Power Connector that gives power supply to all the essential components on the motherboard.

6. (a) ALU: Arithmetic Logic Unit
   (b) CU: Control Unit
   (c) CPU: Central Processing Unit

7. CU stands for Control Unit. It controls the flow of information in the system. The control unit is responsible for the flow of data from input devices to the processing unit and then to the output devices. It works like a traffic policeman who controls the traffic on the road.

8. • In postal mail, if you have to send the same letter to multiple recipients, then it is an expensive process. Through email we can send the same mail to multiple recipients by just writing the email address in cc or bcc with no added cost.
   • In postal mail, the recipient can receive mail only at the marked geographical location using street number, locality, city, pincode, etc. In email, it is a logical address that can be accessed from any computer and at any location all over the world.
9. Protocols are a set of rules and standards that define how data is exchanged and transmitted over a network.

   SMTP (Simple Mail Transfer Protocol); FTP (File Transfer Protocol)
10. File is defined as a program that stores the data organised in a specific format. A folder is a directory created for storing the related files or subfolders under a specific name.
11. Shopping: Our shopping habits have changed because of the online medium. Instead of going to the market, we can receive everything at our doorstep with online shopping. It not only saves our effort of going out but also provides us with options of reasonable prices.

    Communication: ICT helps us to communicate to our friends and relatives. There are more and more ways to talk to people without meeting them. For example through emails, video conferencing, video calls, etc.
12. Neetu should use a Multimedia Messaging Service (MMS) or an Instant Messaging app (like WhatsApp or Telegram) to share her recipes along with food photos with all her friends.
13. Raghav should use YouTube, as it is a popular video-sharing platform where he can explore various types of traveling videos for his travel portal.
14. a. Phone b. Calendar c. Calculator d. Camera

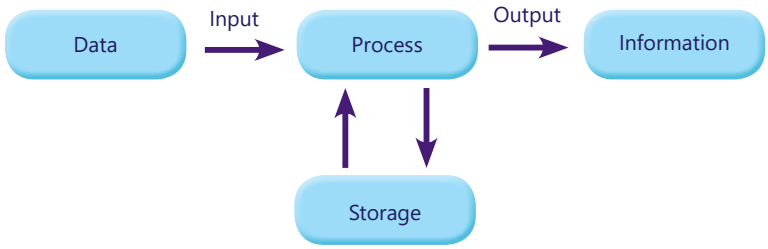
B. 1. UNIX: Unix is one of the oldest, reliable, and powerful Operating Systems developed at AT&T's Bell Laboratories in the early 1970's. It has a simple user interface called Shell, which interacts with the kernel to execute tasks. Some of its important features are:
   • It has a character user interface.
   • It supports multiuser and multitasking. Several users can run multiple programs or processes simultaneously on one system.
   • It has machine independent architecture written in high level language.
   • It has a hierarchical file system to represent information.

   Mobile Operating System: Mobile Operating Systems are designed to run the applications and other programs on smartphones, tablets, smart watches or other portable devices. It is a combination of an operating system and communication technology. Some of the important features are:
   • It has a graphical user interface with menus and buttons supporting different types of apps.

- It has a strong multitasking feature.
- It allows a device to easily interact in short distance or long distance communication.
- Some of the commonly used mobile OS are Android, iOS, etc.

2. There are six components of ICT:
   - **Data:** It is an individual unit that contains raw material given as input in ICT system. This data is interpreted to generate an information/processed data. For example, student marks of all subjects entered in a system.
   - **Procedures:** These are methods used to pass data and information to people involved in ICT system. For example, using code designed in any specific computer language to generate a report card.
   - **Information:** It is the processed data or output/result generated in ICT system. For example, generating report card of marks entered as data.
   - **People:** People involved in giving input and generating output using the procedures. They use the generated information for the specific purpose. For example, marks entered by the teacher, report generated by staff of computer department in a school.
   - **Software:** These are programs and applications used in ICT system. These are available both as front end and back end tools. For example, MS Word, MS Excel, and Visual Basic.
   - **Hardware:** All physical components of the ICT system which we can touch and feel are called hardware. For example, Input Devices (Mouse and Keyboard), Output Devices (Monitor and Printer), Processing Device (Central Processing Unit) and Storage Devices (Hard Disk).
3. Motherboard or the main board consists of a board containing electric circuits that connects all the important components of the computer. If the CPU is the brain of the computer, then, the motherboard is the central nervous system making it the backbone or spine of a computer system. It consist of:
   - Ports to connect different input and output devices.
   - Memory slots that contain the system's main memory.
   - ROM-BIOS chip that acts as an interface between the operating system and the hardware of a computer.
   - System clock that synchronises all the components of the motherboard.
   - Power connector that gives power supply to all the essential components on the motherboard.
4. All computing work revolves around three parts which are input, process and output.
   - An input is accepted by the user through the input devices.
   - It is then processed by CPU and sent to the user as an output using output devices.
   - There can be a need to store the output for later use in the storage devices.
   - Sometimes the result generated acts as an input for the next stage of data flow.

- This flow of information follows a cycle which is known as the Input-Process-Output Cycle.



5. Input devices and output devices are two types of computer hardware.

   Input devices are used to send data to a computer. They help users give commands or input information. Examples include a keyboard, mouse, microphone, and scanner.

   Output devices display or produce results from the computer. They show or share processed data with the user. Examples include a monitor, printer, speaker, and projector.

   In simple terms, input devices help **send data into** the computer, while output devices help **get data out** in a useful form. Many devices, like touchscreens, can work as both.

6. Linux is an open source operating system having UNIX like features. It was originally created by Linus Torvalds in 1991. It is also known as the Operating System of the future. Some of its important features are:
   - It has a graphical user interface.
   - Free and open source operating system. Anyone with GNU General Public License (GPL) can run, modify and even sell the software.
   - It supports multiuser and multitasking. Several users can run multiple programs or processes simultaneously on one system.
   - It has a hierarchical file system to represent information. Different variants of Linux are available in the market like Red Hat, Ubuntu, Arch Linux etc.

   The first version of Windows, launched by Microsoft in 1985 which was an extension of the Disk Operating System. The most important change is the support of Graphical User Interface where the mouse as an input device played a very important role. Following are some of its important features:
   - Initial versions supported single user at a time but now new versions support both single user and multi users at a time.
   - It has multitasking features.
   - It has a Graphical User Interface where the user can get its work done by a few simple mouse clicks.
   - It provides easy access to the Internet. Some of the famous versions are, Windows 3.0, Windows 95, Windows NT, Windows 2000, Windows7, Windows 8.1, Windows 10 and the latest in the market is Windows 11.

7. Unix is one of the oldest, reliable, and powerful Operating Systems developed at AT&T's Bell Laboratories in the early 1970's. It has a simple user interface called Shell, which interacts with the kernel to execute tasks. Some of its important features are:
   - It has a character user interface.
   - It supports multiuser and multitasking. Several users can run multiple programs or processes simultaneously on one system.
   - It has machine independent architecture written in high level language.
   - It has a hierarchical file system to represent information.
8. The steps to shut down a computer are:

   Step 1: Click on Start button. The Start menu appears.

   Step 2: Select the Power button in the bottom-right corner.

   Step 3: Select Shut down option.

   OR

   Step 1: On the desktop, press Alt + F4 keys. It will display the Shut Down Windows screen.

   Step 2: Select the Shut down option.
9. An Operating System is a system software which acts as an interface between the user and the computer. It is an important component of a computer system which controls all other components of the computer system. It helps us to communicate with the computer without knowing its language. Without an Operating System the computer is of no use. Some of the commonly used Operating Systems are Windows, DOS, UNIX, Ubuntu, MacOS etc. Mobile devices also have operating system that help them perform their functions. For example, Apple iOS and Google Android.
10. To create an email account, follow the given steps:

    Step 1: Connect your computer to the Internet and type www.gmail.com in the address bar browser window.

    Step 2: Click on Create account option.

    Step 3: A window will open which will ask for the new username and password. It is always advisable to choose a strong password so that it is difficult for others to have access to your account. At the time of assigning a username, you may get a message "this user already exists" as there are so many users. This is to take care that only unique email ids are created. So, keep trying different combinations to create a unique username. After this is done, click on "Next" button.

    Step 4: A window will be displayed which will ask for some additional data like date of birth, alternate email address, email recovery questions etc. After you specify these details, click on "Next" button.

    Step 5: When you click on the Next button, Google will send a verification code on your mobile number that you have entered in the previous steps. The next screens ask to enter the verification code. After entering the code, when you click on the Verify button, a window will be displayed with details of the "Privacy Policy". Select "I agree" option and then click on "Next" button.

Step 6: After this, an account is created and a homepage of the newly created Gmail account will be displayed.

11. It is a campaign launched by the Government of India to make our country digitally equipped. Prime Minister Narendra Modi launched the campaign on 1st July 2015. Under this scheme all the government services are now available electronically for better and faster execution of services to Indian citizens. Digital India has immensely improved the online infrastructure of our country. The country now has better Internet connectivity and progressed in the field of Information Technology.
12. An email address is a unique logical address of an email account in any email service provider. A user can send and receive messages using an email address. It is made up of:
    - Username: It is a unique name which is not case sensitive and spaces are not allowed.
    - @sign: It works as a separator of the username and domain name in an email address.
    - Domain name: It is the name of the email service provider. For example— gmail, yahoo, hotmail, etc.

    For example: orangebooks@gmail.com authors_orange@hotmail.com anjana.shalini@outlook.com myaccount@orangeeducation.in

C. Competency-based/Application-based questions.

a

Lab Activity (Page 120)

Do it yourself.

Class Activity (Page 121)

Do it yourself.

4. Entrepreneurial Skills-I

Reboot (Page 124)

1. Product business is a business that is involved in the production and sale of any product. This type of business involves activities related to the manufacturing, distribution, and marketing of a product. For example, a sports shop, furniture shop

   Hybrid business is a mix of two or more different types of businesses. It can be in service or manufacturing or merchandising or all of these. It does business in the form of goods and services. For example, a restaurant is in manufacturing by preparing ready to eat food in the form of fine dining. At the same time, it works as a merchandiser by selling beverages with fine meals. It also provides services by serving home deliveries through online or offline orders.

2. Hybrid business is a mix of two or more different types of businesses. It can be in service or manufacturing or merchandising or all of these. It does business in the form of goods and services.
3. This kind of business provides services in the form of consulting, accounting, hospitality and many more of such types which can be delivered either physically or in a digital form through the Internet or mobile apps. These services are not in the physical form which can be touched or stored or bought from the retailers. They are provided by professionals or experts in such areas.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. a 2. c 3. a 4. b

B. 1. systematic 2. merchandise 3. Green
4. quality, availability 5. Marketing

C. 1. Manufacturing 2. Hybrid 3. Entrepreneur 4. Founder

D. 1. True 2. False 3. False 4. True 5. True 6. True
7. True 8. False 9. True 10. False

Section B (Subjective Type Questions)

A. 1. A businessman is a person who starts a business based on an idea already existing in a society. For example, opening a grocery shop, mobile shop, etc.
2. Feedback in the long run: It is important to take feedback from the customers in the long run. You can use the feedback to improve your product and reach out to a larger group for future expansion of the business.
3. Entrepreneurship often involves facing challenges and uncertainties. Patience is essential to handle difficult times and waiting for the efforts to be paid, especially at the time of dealing with setbacks. It allows entrepreneurs to maintain a long-term perspective and make strategic decisions.
4. Entrepreneurship is setting your own business in an innovative manner which may have great risks and desires to earn more profits.
   The output of the innovative process of setting up a business is called an enterprise.
5. Wage Employment: It exists as a partnership between two entities : the employer and the employee. In this type of employment, an employee receives compensation for their work in the form of wages or salary. It does not involve risks and the amount paid is fixed with certain incentives irrespective whether an employer is having loss or profit in his business.

6. Feeling a large responsibility for the business may sometimes be scary and brings a lot of mental instability. Funds management, unpredictable market, employees' reactions and sometimes less time for family may lead to emotional setback for an entrepreneur.
7. Market Leader who creates his own market.
8. Susan can consider starting the following service businesses with minimal investment:
   - Social Media Management
   - Event Planning
   - Personalized Coaching (Sales, Marketing, or Life Coaching)
   - Freelance Content Writing or Copywriting
   - Virtual Assistant Services
   - Online Tutoring
   - Cleaning or Home Organization Services
   - Digital Marketing Agency (low-cost ads, SEO)

   These require skills, time, and minimal capital.
9. Product Business: A business that is involved in the production and sale of any product. This type of business involves activities related to the manufacturing, distribution, and marketing of a product. For example, a sports shop, furniture shop.

   Service-based business: This kind of business provides services in the form of consulting, accounting, hospitality and many more of such types which can be delivered either physically or in a digital form through the Internet or mobile apps. These services are not in the physical form which can be touched or stored or bought from the retailers. They are provided by professionals or experts in such areas. Salon is an example of Service business.
10. Organisation: This plays an important role if a startup is launched at a large scale with a big investment. Though an entrepreneur is a person leading the whole business with his ideas but the other employees working in an organisation are equally important for the success of the startup.

B. The various benefits of entrepreneurship include the following:

- Do what you are interested in: Entrepreneurship helps the entrepreneurs to pursue their passions and interests, allowing for greater creativity and innovation in their work.
- Work for yourself, and not for others: Entrepreneurship provides the freedom to design work hours, select projects, and work from any place. Entrepreneurs can decide the kind of work they would like to do and how they want to do it.
- Make profits for yourself: As an entrepreneur, one can decide how much money they want to earn and how much they want to invest in the business. They decide on the salary, wages and incentives of the employees.
- More risk, more profit: Entrepreneurship involves the risk of failure, but successful entrepreneurs are often courageous and ready to take risks. Taking risks can lead to greater financial success, as it allows entrepreneurs access to more resources.

2. **Manufacturing:** This kind of business uses raw materials, labour, technology, capital and other resources for the production of finished goods. It follows a step-by-step approach of putting together raw materials, parts and components, moving from one workstation to the other with the help of technology, machinery, robots, computers, and labour.

   Trading: This deals with buying and selling a product. In this, the finished products are purchased at wholesale price and sold to consumers at retail price. The form of the products is not changed but the products are sold at a little higher price than the purchase price that helps them to earn profits. They also transport the product from the factory to warehouses. Examples of these businesses include wholesalers, distributors and retail shops.

3. Step 1: Plan and finalise a business idea.
   Step 2: Plan and finalise your finances.
   Step 3: Choose your legal business structure.
   Step 4: Finalise the business location.
   Step 5: Build your team.
   Step 6: Target the prospective customers.
   Step 7: Promote the business.
   Step 8: Feedback in the long run.

4. Entrepreneurship development is the process of enhancing knowledge and improving skills of an entrepreneur through structured training and classroom programs. Through this process, a person is equipped with the required skills and knowledge needed for starting and running the enterprise. Hence, this will be a big effort in preparing new entrepreneurs which will pave the way for a better economy and make the path for the creation of a developed society.

5. Entrepreneurship is setting your own business in an innovative manner which may have great risks and desires to earn more profits. Entrepreneurship, thus involves taking risks with innovation, planning and decisions so as to increase productivity in any field business, agriculture, social work, education, etc. It thus plays an important role in the process of economic development. Entrepreneurship can be at small scale, medium scale or large scale in terms of products and services.

6. • Patience: Entrepreneurship often involves facing challenges and uncertainties. Patience is essential to handle difficult times and waiting for the efforts to be paid, especially at the time of dealing with setbacks. It allows entrepreneurs to maintain a long-term perspective and make strategic decisions.
   • Positivity: A positive mindset is essential in overcoming obstacles and setbacks. It helps entrepreneurs to stay focused on solutions rather than problems even when he/she takes a big risk.
   • Hardworking, Never Giving Up and Perseverance: Hard work is the foundation for building and sustaining a successful business. Entrepreneurs should never give up in attaining their goals, even at the time of failures. It is important to learn from setbacks and keep on moving towards their goals.

- Confidence: Confidence plays a crucial role in making decisions, taking risks, and leading a team. Entrepreneurs need to believe in their abilities and vision to inspire trust in others, including employees, investors, and customers. Confidence brings vision and helps them navigate through uncertainty.

7.

Factors	Businessman	Entrepreneur
Meaning	A businessman is a person who starts a business based on an idea already existing in a society. For example, opening a grocery shop, mobile shop, etc.	An entrepreneur is a person who starts an enterprise with a new idea or concept. For example, selling products through online services.
Market Status	Market Player who creates his own place in the existing market.	Market Leader who creates his own market.
Risk Factor	Risk factor is less.	Risk factor is high.
Procedures	Businessman follows traditional procedures.	Entrepreneur follows unconventional procedures.
Competition	High.	Low.
Focus	Profits.	Customers, employees, profits and society.

8. Social Development—Creation of Jobs: An entrepreneur starts their business initially on a small scale. If the business shows some profits and grows over time, then an entrepreneur needs to expand operations, creating more jobs. Good quality jobs enable more people to earn money and have a good life.

C. Competency-based/Application-based questions.

1. a. Entrepreneur b. Employee c. Entrepreneur
2. a. Product b. service c. service

Lab Activity (Page 137)

Do it yourself.

Class Activity (Page 137)

Do it yourself.

5. Green Skills-I

Reboot (Page 158)

1. The government of India launched the Green Skills Development Programme (GSDP) in India in the year 2017.
2. Renewable Energy, Green Buildings, Green Transport.
3. People possessing Green Skills are getting jobs in the fields of agriculture, manufacturing, Research and Development (R&D), administrative, and service activities that are aimed at sustaining and protecting the environment. These jobs are called Green Jobs.
4. Soil pollution is the contamination of soil with harmful chemicals or waste, negatively impacting its quality and ecosystem.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Quiz

A. 1. a 2. a 3. a 4. b 5. b 6. c

B. 1. ecosystem 2. 8 3. recycled 4. Chemical fertilizers 5. aquatic

C. 1. False 2. False 3. True 4. True 5. False 6. False 7. True 8. True 9. False 10. True

Section B (Subjective Type Questions)

A.
1. During the rainy season or floods, the vegetative cover of the stream bank is often washed away into the stream, leading to soil erosion. This can be prevented by forming vegetation, constructing rock ripraps, planting trees, and growing native grasses and shrubs along a stream bank.
2. Carbon dioxide, Methane
3. In this method, the soil is ploughed along the contour to decrease the soil runoff. By growing the crops in a contour pattern, plants can absorb more rain water and thus minimise the soil erosion.
4. Global warming refers to the increase in the average temperature of the Earth's atmosphere mainly due to greenhouse gases (carbon dioxide, CFC's) produced by a lot of human activities.
5. **Renewable:** Resources which occur in abundance and are renewed on their own by our mother nature through the natural process of recycling, replacement, and reproduction are called renewable resources. For example, forest, wind, water, sunlight, geothermal (energy from the heat inside the earth).

6. It aims to develop green skilled workers having technical knowledge and commitment to sustainable development. It will help in attainment of Nationally Determined Contributions (NDCs), Sustainable Development Goals (SDGs), National Biodiversity Targets (NBTs) and Waste Management Rules 2016.
7. • Using renewable energy (example, using solar power and wind energy)
   • Water and waste management
   • Rain water harvesting
8. Green Transport: It supports a well-planned transportation system with minimum damage to the forest and environment. It also promotes efficient use of fuel that produces minimum greenhouse gases and also uses alternate sources of fuel like CNG, battery, etc.
9. An ecosystem is defined as a community where living and non-living things interact with each other and their surrounding environment to form a balanced system.
10. Planting trees and grass:
    • Building check dams
    • Using mulching techniques
    • Promoting terrace farming
    • Avoiding overgrazing
11. Solar energy, Wind energy, Hydropower, Geothermal energy, Biomass energy, Tidal energy, Wave energy, Hydrogen fuel
12. Water is an essential natural resource for the existence of life. Our body is made up of 70% of water. We need water for agricultural, industrial, household and recreational activities. We can conserve water by using the given measures:
    • By doing rainwater harvesting.
    • Setting up water treatment plants to reuse the water for irrigation or other purposes.
    • Judiciously using water at homes, restaurants, social gatherings and workplaces.

B. 1. Environmental imbalance happens when natural ecosystems are disturbed. Some major factors include deforestation, which destroys habitats and reduces oxygen levels, and pollution, which contaminates air, water, and soil. Overpopulation increases demand for resources, leading to excessive waste and depletion. Industrialization releases harmful chemicals into the environment, harming wildlife and humans. Climate change, caused by greenhouse gases, leads to extreme weather, affecting ecosystems. Protecting nature can help restore balance.
2. The given methods for conserving food are used at different stages of food transfer from producer to consumer level:
   • Cooling: Certain varieties of food can be refrigerated, while others can be frozen to stop the growth of harmful microorganisms like bacteria, mould, fungi, etc. on the food, thus preventing it from being unfit for consumption.
   • Heating: Microorganisms are destroyed by heat at specific temperature. This process includes pasteurisation, cooking, and sterilisation.

- Removing moisture from food: This will hinder the growth of microorganisms on food by drying, salting, pickling, sugaring, and smoking food.
- Use of preservatives: Food preservatives like Sodium Benzoate, Parabens, Formaldehyde, etc. are used to increase the shelf life of food items by keeping it fresh for a long time.

3. Repurpose:

It refers to finding a new use or function for something that was originally intended for a different purpose. It's about creatively finding ways to extend the lifecycle of an item rather than disposing of it.

- Transforming old clothing into cleaning rags.
- Using glass bottles as decorative vases.
- Repurposing wooden pallets into furniture.
- Turning old furniture into garden planters or using glass jars as storage containers.

Reduce:

By reducing waste, we reduce the use of resources, so that there are less efforts for waste management.

- Avoid printing non-essential documents. If needed, print on both sides of the page.
- If something has to be bought in large quantities, then buy in bulk altogether to reduce packaging and transportation.
- Buy products that can do more than one thing.
- Buy reusable items rather than disposable ones.
- Carry your own reusable shopping bags to avoid using plastic bags.
- Reduce the use of single-use plastics, plastic packaging, and styrofoam cups.

Reuse:

Reuse of the products will save the cost of making disposable products. This will help in saving more money which will work in favour of the country's economy and ultimately less waste to manage.

- Second-hand stores should be opened in various locations, so that people can send their things like clothes, toys, utensils and other products which are of no use for them and others in need can reuse them.
- Give unwanted toys and books to NGOs and people in need.
- Use reusable packaging material for food and other items. Recycle Recycle is the most eco-friendly method of waste disposal. In this process, the waste material is reproduced to create another product which can be used for some other purposes.
- People should be encouraged to buy products that are made from recycled materials.
- Automobiles' parts, cans, construction material, etc. are all made of metals that can be recycled.

- Any plastic bottle or container for food storage must be recycled.

Refuse:

In an environmental context, "refuse" means to actively choose not to use or accept something, especially items that are wasteful or harmful to the environment.

- Refusing single-use plastic bags by using reusable cloth bags instead, or refusing to buy products with excessive packaging.
- Refusing single-use plastics like straws and bags.
- Avoiding products with excessive packaging.
- Saying no to disposable utensils and opting for reusable ones.

4. Here are four main causes of soil pollution:
   - **Industrial Waste** – Factories release harmful chemicals and heavy metals into the soil, making it toxic.
   - **Agricultural Chemicals** – Excessive use of pesticides and fertilizers contaminates the soil and reduces its fertility.
   - **Plastic and Waste Dumping** – Non-biodegradable waste like plastic and electronic waste pollutes the soil.
   - **Deforestation** – Cutting down trees removes natural protection, making the soil prone to erosion and pollution.
5. Biotic: It refers to living organisms of the ecosystem which can be plants and animals. Plants are considered to be autotrophs which make their own food by trapping energy of the sun. This energy flows through all the other living components when plants are consumed by plant eating animals which inturn are eaten up by other bigger animals.

   Abiotic: Abiotic components are the non-living components of an ecosystem. It includes air, water, soil, minerals, sunlight, temperature, nutrients, etc.
6. People with green jobs ensure that resources in an economy are allocated in a fair and an equitable manner. These jobs help in:
   - Ensuring judicious consumption of energy and raw materials.
   - Reducing the greenhouse gas emissions especially that of carbon dioxide.
   - Minimising pollution at all levels.
   - Putting in place proper waste management systems that minimise waste generation and contamination of the environment.
   - Protecting and restoring our ecosystems.
   - Positively impacting our country's green economy.
   - Producing eco-friendly goods or services.

7. Fourth Partner Energy: This green project makes solar energy accessible. It was founded in 2010 by Vivek Subramanian, Saif Dhorajiwala and Vikas Saluguti. Fourth Partner Energy (4PEL) focuses on financing and building rooftop solar projects for commercial, industrial, and residential clients. It recently raised $125 million in equity funding from Norwegian investment fund Norfund and existing shareholder, The Rise Fund.
8. Social benefits of green economy are:
   - It improves the health and well-being of the society which increase the productivity of the country and reduce the costs of health care.
   - It improves livelihood status and poverty rate.
   - It reduces environment related health problems.
9. a. Salinity Management: The water, after evaporating from the soil, leaves behind salt. It is generally seen in the areas near sea, lakes, oceans and in weathering of rocks. It affects soil fertility and reduces absorption of water by plant. Using humic acids can prevent this or growing crops like saltbush can rejuvenate soil and replenish lost nutrients.

   b. No-Till Farming: It is a method of growing crops without tilling the soil. This practice will not disturb the top layer of soil and the last crop present in the top layer will be decomposed fast which helps in maintaining the soil nutrients and preventing soil erosion.

   c. Crop Rotation: It is the system of cultivating different varieties of crops on the same piece of land across different seasons. This helps to conserve soil fertility as different crops have different requirements of soil nutrients.
10. The concept of green growth aims at achieving economic growth that is socially inclusive and environmentally sustainable. The Ministry of Environment, Forest, and Climate Change, Government of India recognized green growth in its vision, wherein 'poverty eradication' along with green growth is to be seen as the focal point for green economy. The Finance Commission of India articulated green growth as involving "rethinking growth strategies with regard to their impacts on environmental sustainability and the environmental resources available to poor and vulnerable groups." The extent to which its economy will "grow green" will depend on its ability to reduce the quantity of resources required over time to support economic growth that leads to enhancement of social equity and job creation. Green growth could play an important role in balancing these priorities. To ensure sustainable development, any activity that is expected to bring about economic growth must also consider its environmental impacts so that it is more consistent with long term growth and development. This means vehicles on the road which leads to traffic congestion, waste of time for all the commuters, and a great load of particulate matter and carbon monoxide from the exhaust of vehicles should be slowly replaced with an efficient public transport system.

C. Competency-based/Application-based questions.

1. Environment-friendly fuels – I would suggest using biogas, LPG, solar cookers, or smokeless chulhas as they cause less pollution and are safer for health. These fuels produce less smoke, reducing air pollution and health problems. Using cleaner fuels also helps in conserving natural resources.
2. Disposing of books responsibly – I would donate usable books to needy students or libraries and send damaged ones for recycling to reduce waste and protect the environment. Reusing books saves paper and trees. Organizing a book donation drive in school can also help share knowledge with others.

Lab Activity (Page 165)

Do it yourself.

Class Activity (Page 166)

Do it yourself.

Class 9

Answer Key

Part-B: Subject Specific Skills

Artificial Intelligence Ver. 3.0

1. AI Reflection, Project Cycle and Ethics

Ai Task (Page 172)

1. "The Mitchells vs. the Machines" (2021), "Finch" (2021), "M3GAN" (2023)
2. Predicting the exact trajectory of artificial intelligence by 2030 is challenging, but we can make some educated guesses based on current trends and expert opinions. Here are some potential developments:
   - **Advanced General AI (AGI):** While true AGI—an AI with human-like general intelligence—remains a longer-term goal, we may see significant strides toward more versatile and adaptable AI systems. These systems might be capable of performing a wide range of tasks across different domains with less need for human intervention.
   - **Natural Language Processing:** AI's ability to understand and generate human language will likely continue to improve. We can expect more sophisticated and context-aware conversational agents, capable of holding more natural and nuanced interactions with humans.
   - **Autonomous Systems:** Self-driving cars, drones, and other autonomous systems will become more reliable and widespread. Advances in AI and sensor technology will enable these systems to navigate complex environments more safely and efficiently.
   - **Healthcare:** AI will play an increasingly critical role in healthcare, from diagnostics and personalized treatment plans to drug discovery and robotic surgery. AI-driven tools will help doctors and researchers achieve better outcomes for patients.
   - **AI in Creativity:** AI will enhance creative processes in fields like art, music, and writing. Tools powered by AI will assist artists and creators in generating new content, exploring novel ideas, and pushing the boundaries of human creativity.
3. Computers currently surpass humans in a wide range of activities, especially those involving specific types of tasks and data processing. Here are some key areas where computers excel, Data Processing and Analysis Mathematical Calculations, Pattern Recognition, Repetitive Tasks, Memory and Recall, Speed, Multitasking, Complex Simulations, Chess and Other Games, Natural Language Processing.

Ai Task (Page 172)

Do it yourself.

Ai Reboot (Page 174)

a. Yes b. No c. No d. Yes e. Yes

Ai Task (Page 176)

Do it yourself.

Ai GAME 01 (Page 178)

1. Not always.
2. I was trying to study the most probable moves of the system.
3. Not really.
4. It analyzed the move of the player and predicted the next move based on its previous experience.

Ai GAME 02 (Page 180)

1. Not always.
2. Try to make an outline of the object asked to draw so it may identify it.
3. Most of them.

Ai GAME 03 (Page 181)

Do it yourself.

Ai Reboot (Page 182)

Application	Domain
Google Image Search	Computer Vision
Akinator	Data Science
Face-Recognition System in Mobile	Computer Vision
Cortana	NLP

Ai Task (Page 186)

Telemarketing Roles, Administrative legal positions, Routine customer support roles

Ai Task (Page 187)

One advantage of AI: AI is branching out into every aspect of our lives and helping us live a better life. We use AI systems to interact with our phones and speakers through voice assistants like Siri, Alexa, and Google. Cars made by Tesla using AI for self-driving cars. Even Google gives us recommendations based on our activities.

One disadvantage of AI: AI machine lacks human emotions and creativity. AIs can become skilled machines but they can never acquire the abilities of humans. The creativity of AI is only limited to the ability of humans that created them.

Ai Reboot (Page 189)

1. Problem Scoping, Data Acquisition, Data Exploration, Modeling, Evaluation, Deployment.
2. Before deployment, the AI model must be tested to see if it is meeting the goals established in the first phase. The testing is also done to ensure that the AI model works not just with the data on which it is trained but new data that is added to it.

Ai Task (Page 190)

Do it yourself.

Ai Task (Page 196)

Do it yourself.

Ai Reboot (Page 200)

Surveys, Web Scraping, Sensors, Cameras, Observations, APIs

Ai Task (Page 201)

- 1. **Satellite imagery:** to detect plastic waste patches.
  2. **Drone footage:** for high-resolution localized detection.
  3. **Oceanographic data:** currents, temperature, salinity for understanding plastic movement.
  4. **Environmental parameters:** marine habitats, biodiversity hotspots.
- These features not only enable AI models to pinpoint the location and concentration of plastic waste but also facilitate real-time adjustments to cleanup strategies based on dynamic ocean conditions. By integrating diverse data sources, AI can offer comprehensive insights into the spread of plastic pollution, enhancing the efficiency and effectiveness of cleanup operations worldwide.
- Environmental organizations, government agencies, research institutions, satellite imagery providers, and local communities contribute crucial data on plastic waste distribution and environmental conditions, fostering collaborative efforts towards sustainable ocean conservation.
- Regularly, considering the dynamic nature of ocean currents and seasonal changes.
- Model accuracy decreases, leading to ineffective detection and cleanup operations, ultimately hindering progress in mitigating the environmental impact of ocean plastic pollution and jeopardizing marine biodiversity conservation efforts.
- 1. Spatial analysis: distribution and concentration of plastic waste.
  2. Temporal analysis: changes over time and seasonality.
  3. Feature extraction: identifying plastic debris among other marine features.
- 1. Cross-validation techniques using ground truth data ensure that AI models generalize well beyond training datasets, providing robust performance across various environmental conditions.

2. Real-world testing in different oceanic regions validates the scalability and adaptability of AI-driven solutions, confirming their practical effectiveness in diverse marine ecosystems.

- Analysis guides the deployment of AI models and cleanup strategies in targeted oceanic areas, optimizing resource allocation and prioritizing areas most in need of intervention to maximize the impact on ocean plastic pollution reduction.

Also,

- 1. **AI-driven Detection:** Develop CNN models for automated plastic detection in satellite and drone imagery.
  2. **Autonomous Cleanup:** Integrate AI with drones and underwater robots for efficient cleanup operations.
  3. **Scalable Deployment:** Implement cloud-based solutions for global coverage and scalability.
  4. **Real-time Monitoring:** Utilize AI for continuous monitoring and adaptive cleanup strategies.
- Plastic concentrations, Ocean currents and dynamics, Marine habitat and biodiversity data, Satellite and drone imagery quality, Environmental parameters (temperature, salinity)
- **Data Acquisition:** Gather satellite imagery, drone footage, and oceanographic data from various sources.

  Data Exploration: Clean, preprocess, and visualize data to understand plastic waste distribution and dynamics.

  Modelling: Develop and train AI models (CNNs, reinforcement learning) for plastic waste detection and cleanup optimization.

  Evaluation: Validate models using metrics and real-world testing.

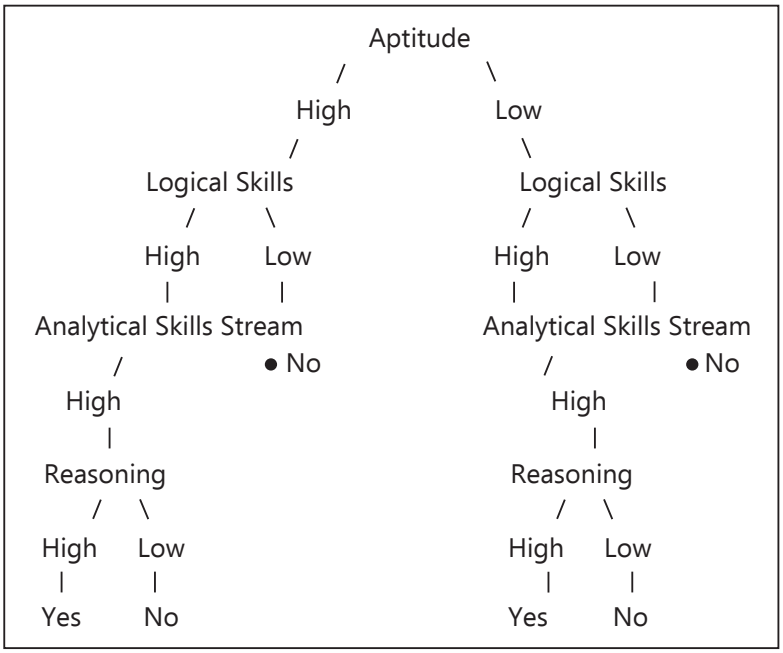
  Deployment: Integrate AI models into autonomous systems for operational deployment.

Ai Task (Page 201)
Do it yourself.

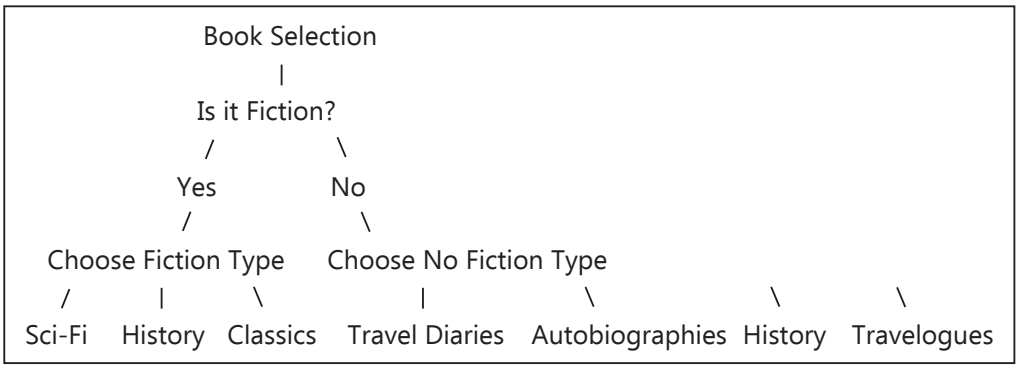
Ai Reboot (Page 205)
Do it yourself.

Ai Task (Page 209)

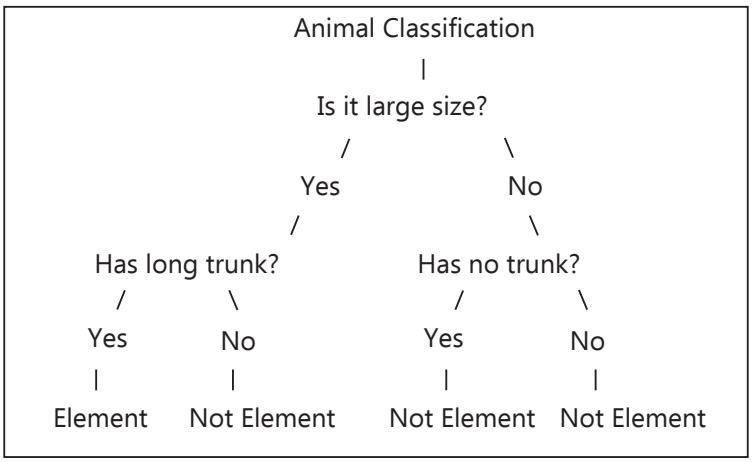
1.



2.



3.



Ai Task (Page 210)

Do it yourself.

Ai Task (Page 212)

Calculate the total number of pixels:

Total pixels=width×height

For an image with a resolution of 3264x2448 pixels:

Total pixels=3264×2448=7,990,272 pixels

Convert pixels to megapixels:

Megapixels=Total pixels/ 1,000,000

Megapixels=990,272/1,000,0007≈7.99 MP

So, an image with a resolution of 3264x2448 pixels is approximately 7.99 megapixels.

Ai Reboot (Page 212)

1. Problem scoping is the first and one of the most critical stages in the AI project cycle. It involves defining the problem that the AI system is intended to solve. Proper problem scoping ensures that the project goals are clear, achievable, and aligned with the desired outcomes.
2. Data acquisition is the process of gathering and filtering the data from various sources, while data exploration is analysing and visualizing the patterns and hidden insights from the data.

Ai Reboot (Page 215)

1. The prediction is the output which is given by the machine and the reality is the real scenario in which the prediction has been made.
2. The confusion matrix, also known as the error matrix, is mainly use for statistical classification. It is a specific table layout that allows visualization of the performance of an algorithm. Each row of the matrix represents an instance in a predicted value while the column represents the actual value, or vice versa.

Video Session (Page 219)

Do it yourself.

Ai Task (Page 221)

AI Project Cycle Mapping Template

Problem Solving	Data Acquisition	Data Exploration	Modelling	Evaluation	Deployment
Identify the specific problem in personalized education to address.	Collect relevant data for training the AI model and personalizing content.	Analyze and preprocess the data to understand its structure and relevance.	Develop and train AI models to personalize educational content based on the data.	Assess the effectiveness of the AI models and the solution.	Implement the AI solution in a real setting and ensure its effectiveness.

Example: Students receive generic content without consideration of individual learning styles and needs.	Student Profiles: Learning styles, academic performance Educational Content: Textbooks, videos Interaction Data: Engagement metrics, quiz results	Data Cleaning: Handle missing or inconsistent data Descriptive Statistics: Summarize data EDA: Identify patterns and correlations	Recommendation Systems: Personalized learning material suggestions Adaptive Learning Models: Real-time content adjustments NLP: Tailored feedback	Accuracy: Alignment with student needs Student Engagement: Interaction levels Performance Improvement: Academic progress measures	Integration: Incorporate into existing platforms Monitoring: Track performance Feedback Loop: Refine based on user feedback

Ai Reboot (Page 222)

1. Problem Scoping
2. Data Acquisition
3. Data Exploration
4. Modelling
5. Evaluation
6. Deployment

Ai Task (Page 225)

Sr. No.	App Name	Ethical or Privacy Concern
1.	WhatsApp	NO
2.	Facebook	YES
3.	Paytm	NO
4.	Linkedin	YES
5.	SBI YONO	NO

Ai Task (Page 227)

Do it yourself.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

AI Quiz

A.

1. a	2. d	3. d	4. c	5. a	6. b
7. d	8. b	9. a	10. c	11. b	12. a
13. a					

B.

1. machine learning algorithms
2. skilled workforce and favourable government policies
3. Hanson Robotics
4. analysis and prediction
5. image recognition and interpretation
6. computer vision system
7. Word Association
8. iterative design
9. APIs (Application Programming Interfaces)
10. data

C.

1. False	2. False	3. False	4. True	5. True
6. False	7. True	8. True	9. False	10. True

SECTION B (Subjective Type Questions)

A.

1. Self-driving cars use computer vision to recognize and interpret road signs, obstacles, and pedestrians.
2. Healthcare (diagnostic tools), finance (fraud detection), and transportation (autonomous vehicles).
3. AI can transform industries, improve efficiency, solve complex problems, and enhance everyday life through automation, personalized services, and advanced decision-making.
4. Data statistics involves analyzing data to uncover patterns and trends, which helps AI systems make informed decisions and predictions.
5. To assess the performance of a classification model by displaying the number of true positive, true negative, false positive, and false negative predictions.
6. A leaf node represents the final classification or decision outcome in a decision tree, indicating the end of a decision path.
7. Data acquisition is the process of collecting and gathering data from various sources for analysis, training, and model development.

8. Weak AI and narrow AI are often used interchangeably. Both refer to AI designed for specific tasks, but weak AI generally implies limited capabilities, while narrow AI emphasizes its specialization in a particular function.
9. AI research in natural language understanding focuses on enabling machines to interpret, process, and respond to human language in a meaningful way, improving communication between humans and computers.
10. AI can assist in analyzing data from space missions, controlling spacecraft autonomously, optimizing mission planning, and detecting anomalies or patterns in space environments.
11. AI can lead to unemployment by automating tasks and jobs previously performed by humans, potentially reducing job opportunities in certain industries.
12. AI can automate repetitive tasks with high accuracy and efficiency, reducing human workload and freeing up time for more complex and creative activities.

B. 1. **Artificial General Intelligence (AGI)** refers to AI systems that possess the ability to understand, learn, and apply intelligence across a broad range of tasks at a level comparable to human capabilities. AGI can perform any intellectual task that a human can, but it is still hypothetical and has not yet been achieved.

Artificial Super Intelligence (ASI), on the other hand, refers to AI systems that surpass human intelligence in all aspects, including creativity, problem-solving, and emotional understanding. ASI would be vastly superior to the most intelligent human minds and could potentially outperform human capabilities in every field. While AGI is a step towards achieving ASI, ASI remains a theoretical concept and presents significant ethical and safety concerns.

2. **Machine Learning Engineer:** Develops and implements machine learning models and algorithms to solve specific problems and improve data-driven applications.

Data Scientist: Analyzes and interprets complex data to help organizations make informed decisions, often using machine learning and statistical techniques.

AI Research Scientist: Conducts research to advance the field of AI, focusing on developing new algorithms, models, and theories to improve AI systems and address challenges in the field.

3. - **Expensive Technology:** As AI is advancing day by day, the hardware and software need to get updated with time to meet the latest requirements. Setting up AI-based systems requires high costs because of the complexity of the engineering that goes behind its making. AI Reflection, Project Cycle and Ethics 187
   - **Leads to Unemployment:** With the rapid development of AI, the fear of unemployment is constant. Jobs in manufacturing, agriculture, food service, retail, transportation, logistics, and hospitality are some of the industries likely to be affected. The majority of the repetitive tasks would be taken over by AI.
   - **Lacks Emotions and Creativity:** AI machine lacks human emotions and creativity. AIs can become skilled machines but they can never acquire the abilities of humans. The creativity of AI is only limited to the ability of humans that created them.

- **Does Not Improve with Experience:** Humans learn from experiences, whereas it's not possible with machines. AIs cannot alter their responses based on the changing environment. They are programmed to behave in a specific manner, so they cannot make decisions in case they encounter an unprogrammed situation. If a change is required, they need to be re-programmed.
- **Discouraging Human Creativity:** Apps like ChatGpt and others can be used with ease to do anything and everything

4. Computer vision is crucial because it enables machines to interpret and understand visual information from the world, mimicking human vision. This technology is essential for applications such as autonomous vehicles, facial recognition, medical imaging, and surveillance systems. By allowing computers to process and analyze images and videos, computer vision facilitates a wide range of automated and intelligent tasks, enhancing efficiency and creating new possibilities in various fields.
5. **Healthcare:** AI assists in diagnosing diseases, personalizing treatment plans, and analyzing medical images for early detection of conditions like cancer.

   Finance: AI is used for fraud detection, algorithmic trading, and personalized financial advice, improving the accuracy and efficiency of financial operations.

   Customer Service: AI-powered chatbots and virtual assistants provide 24/7 support, handle customer inquiries, and automate routine tasks, enhancing customer experience and reducing operational costs.
6. AI improves email communication through features such as smart email categorization, spam filtering, and predictive text. AI algorithms can automatically sort emails into different folders, prioritize important messages, and filter out unwanted spam. Additionally, AI-driven tools can suggest responses, correct grammatical errors, and provide writing assistance, making email management more efficient and user-friendly.
7. **Manufacturing Workers:** Automation and robotics can replace repetitive and manual tasks in manufacturing, leading to job displacement.

   Customer Service Representatives: AI chatbots and virtual assistants can handle routine customer inquiries and support tasks, reducing the need for human representatives.

   Data Entry Clerks: AI and automation tools can process and input data more quickly and accurately than humans, potentially eliminating the need for manual data entry jobs.
8. **Data:** AI systems are the result of the data that is fed into them. The data used to train the AI system is the first step to check for biasness. The dataset for AI systems should be realistic and need to be of a sufficient size. However, the largest data collected from the real world may also reflect human subjectivity and underlying social biases. The Amazon AI recruitment system is a good example. It was found that their recruitment system was not selecting candidates in a gender-neutral way. The machine learning algorithm was based on the number of resumes submitted over a period of 10 years and most of them were men, so it favoured men over women.

Algorithms: The algorithms themselves do not add bias to an AI model, but they can amplify existing biases. Let's look at an example of an image classifier model trained on images in the public domain—pictures of people's kitchens. It so happens that most of the images are of women rather than men. AI algorithms are designed to maximise accuracy. Therefore, an AI algorithm may decide that the people in the kitchen are women, despite some of the images being of men

9. **Human rights:** This principle emphasises that AI solutions should respect, protect, and uphold fundamental human rights. This includes rights such as privacy, freedom of expression, freedom from discrimination, and the right to a fair trial. AI systems should be designed and implemented in a way that they do not infringe upon these rights and should be held accountable if they do.

   Bias: Bias in AI refers to the unfair or unjust treatment of individuals or groups based on characteristics such as race, gender, age, or socioeconomic status. Bias can be unintentionally introduced into AI systems through biased training data, flawed algorithms, or skewed decision-making processes. Addressing bias in AI involves identifying, mitigating, and preventing bias at every stage of the AI development lifecycle, from data collection and preprocessing to model training and deployment.

   Privacy: Privacy concerns the protection of individuals' personal data and their right to control how that data is collected, used, and shared. AI systems often rely on vast amounts of data, which may include sensitive information about individuals. It is essential to implement robust privacy measures, such as data anonymisation, encryption, and user consent mechanisms, to ensure that AI solutions respect individuals' privacy rights and comply with relevant data protection regulations.

   Inclusion: Inclusion in AI refers to ensuring that AI solutions are accessible, equitable, and beneficial for all members of society, regardless of factors, such as race, gender, disability, or socioeconomic status. This involves considering the diverse needs, perspectives, and experiences of different user groups throughout the design, development, and deployment of AI systems. Inclusive AI design aims to prevent the exacerbation of existing inequalities and to promote equal opportunities and outcomes for all individuals

10. Difference between ethics and morals:

Aspects	Ethics	Morals
Definition	Rules provided by an external source	Principles regarding right and wrong held by an individual
Source	Institutions, organisations, societal norms	Personal beliefs, cultural norms, religious teachings
Application	Specific situations and professional practices	Personal behaviour and conduct

Objective	Maintain order and fairness in society	Foster personal integrity and align with personal values
Examples	Medical ethics, business ethics, legal ethics	Personal beliefs about honesty, integrity, kindness
Origin	External and often codified	Internal and subjective
Scope	Consistent within a profession or society	Varies between individuals
Enforcement	Enforced by external bodies (e.g., professional organisations, legal systems)	Self-governed and enforced by individual conscience
Flexibility	Can change over time to reflect new norms or societal changes	More stable over time, but can evolve with personal growth

C. Competency-based/Application-based questions:

1. Recommendations based on user behavior and location data.
2. b. i.
3. a. a. i), ii) and iv)

Assertion and Reasoning Questions

4. a. Both A and R are true and R is the correct explanation of A.
5. d. A is false but R is true.

AI In Life (Page 240)

Do it yourself.

AI Deep Thinking (Page 240)

1. The concern that AI might turn evil and harm humans is a topic of significant debate among experts. While AI itself does not have intentions or desires, the way it is designed, deployed, and used can lead to unintended harmful consequences. Here are some factors that could potentially contribute to an AI system causing harm:
   - **Poor Design and Misalignment:** If an AI system is not properly aligned with human values and ethical considerations, it might make decisions that are harmful. For example, an AI designed for maximizing profit might make choices that are detrimental to human welfare.
   - **Bias and Unintended Consequences:** AI systems trained on biased or incomplete data might make unfair or harmful decisions. These biases could be amplified if the AI is used in critical areas like law enforcement or healthcare.
   - **Lack of Oversight:** Without proper monitoring and regulation, AI systems might be used in ways that are unethical or harmful. For instance, AI could be weaponized or used in surveillance to infringe on privacy.

- **Autonomous Decision-Making:** Highly autonomous AI systems might act in ways that are not anticipated by their creators, especially if they are given the power to make significant decisions without human intervention.

2. Place: [Your City, Country]

   Date: [Today's Date]

   Dear Future Self,

   I hope this letter finds you well in the year 2030. It's fascinating to think about how much has changed since now. Back in 2024, technology was rapidly evolving, and we were on the cusp of breakthroughs in artificial intelligence, quantum computing, and renewable energy.

   By now, I imagine technology has progressed even further. AI likely plays an even more significant role in daily life, seamlessly integrated into everything from personalized education and healthcare to advanced robotics and smart cities. The way we work and interact with technology has probably transformed, with AI taking on more complex tasks and augmenting our capabilities in unprecedented ways.

   I hope you're leveraging these advancements to make a positive impact, continuing to learn and adapt in this fast-paced world. Remember the values and principles we held dear—ethics, creativity, and empathy—as you navigate this future.

   Hope this letter brings back old memories.

   Sincerely,

   xyz

3. **Title:** Navigating Career Changes in the Age of AI

   As we stand on the brink of a new technological era, artificial intelligence (AI) is reshaping our job landscape in profound ways. While AI brings remarkable advancements, it also displaces certain roles, prompting a significant shift in how we approach our careers.

   The rise of AI has led to automation in various sectors, from manufacturing to data analysis. This shift might initially seem daunting, but it opens doors to new opportunities. Workers are increasingly pivoting to roles that emphasize creativity, problem-solving, and human interaction—areas where AI still lacks proficiency.

   For example, roles in AI development, ethical oversight, and human-centric fields like psychology and education are burgeoning. Upskilling and reskilling have become crucial as individuals transition from routine tasks to more strategic and innovative positions.

   While the displacement of jobs due to AI can be challenging, it is also a call to embrace continuous learning and adaptability. By focusing on sectors where human ingenuity is indispensable, we can turn this technological upheaval into an opportunity for growth and fulfillment.

   To navigate this transition successfully, we must invest in education and training programs that prepare individuals for the future workforce, ensuring that everyone has the skills to thrive in an AI-enhanced world.

   Thank you.

Ai Lab (Page 241)

1. Do it yourself.
2. Do it yourself.
3. Do it yourself.
4. Do it yourself.
5. a. If you don't select any of the given options in Inklewriter, the story will not progress to the next part. The user will be stuck at the current point in the narrative until they make a choice. This design ensures that readers make decisions that shape the story's direction, creating an interactive experience.

   b. Yes, users can alter or add new options in the story. Inklewriter allows users to edit the existing options and add new choices, which lets them shape the narrative according to their creative vision. This flexibility helps in creating a more dynamic and personalized interactive story.

   c. Yes, you can connect two different plots of the story together in Inklewriter. The platform supports branching narratives where different storylines can converge or diverge based on user choices. This feature allows for complex storytelling where different paths can eventually lead to the same or different outcomes.

   d. Inklewriter itself doesn't use AI in the traditional sense of machine learning or data processing. However, the use of AI in similar interactive storytelling tools can be attributed to:

   - **Personalization:** AI can help in analyzing user choices and tailoring the story dynamically to suit individual preferences.
   - **Content Generation:** AI can assist in generating or suggesting narrative elements based on user input, creating more engaging and diverse storylines.
   - **Complexity Management:** AI algorithms can manage and track numerous branching storylines and outcomes efficiently, ensuring a coherent and interactive narrative experience.

   Inklewriter's focus is more on providing a user-friendly interface for creating interactive stories rather than using AI directly, but similar applications in interactive storytelling can benefit from AI in these ways.

Class Activity (Page 246)

1. a. Homework Help
   b. Study Schedule
   c. Exam Preparation
   d. Personalized Learning

e. Virtual Tutoring

f. Task Reminders

2. a. **LUIS Interpretation:** LUIS identifies the user intent as booking a flight and extracts key information such as the destination ("Cairo"). It would recognize that the user wants to arrange travel plans and might need to integrate with a flight booking system to process the request further.

b. **LUIS Interpretation:** LUIS detects the intent as placing a food order and extracts details like the quantity ("2") and the item ("pizzas"). It understands that the user wants to order food and would need to integrate with a food delivery service to finalize the order.

c. **LUIS Interpretation:** LUIS identifies the user intent as setting a reminder and extracts the information about the action ("call my dad") and the time ("tomorrow"). It helps in scheduling the reminder and ensuring the user is notified at the appropriate time.

d. **LUIS Interpretation:** LUIS understands the intent as finding a location and extracts the relevant entity "nearest club." It processes the query to provide information on the closest club or similar venue, often needing to integrate with location-based services or maps.

Ai Ready 1

1. Yes, the development of artificial intelligence does raise ethical issues. These concerns include privacy, as AI systems handle extensive personal data, and the potential for bias, which can lead to discriminatory outcomes if algorithms are trained on skewed data. Additionally, AI's impact on autonomy and decision-making can undermine human control, while job displacement due to automation poses significant economic challenges. Security is also a concern, as AI systems can be vulnerable to attacks or misuse. Finally, the complexity of AI algorithms can obscure how decisions are made, impacting transparency and accountability. Addressing these issues is crucial for the responsible advancement of AI technology.
2. While the goal of AI systems is often to replicate certain human-like functions, making them unpredictable and emotional may not be desirable or practical. Human unpredictability and emotions can lead to inconsistency and inefficiency, which are not ideal for many applications of AI. Instead, AI systems are typically designed to be reliable, consistent, and transparent. They can simulate emotional responses to improve user interaction and empathy, but this simulation is usually controlled and predictable to maintain functionality and effectiveness. The focus should be on enhancing AI systems to complement human capabilities while ensuring they operate within clear, ethical guidelines.
3. Yes, data features significantly influence the accuracy of an AI model. Features are the individual measurable properties or characteristics used by the model to make predictions. The quality, relevance, and comprehensiveness of these features determine how well the model can learn from the data and make accurate predictions. Well-chosen features can improve model performance, while irrelevant or poorly selected features can lead to lower

accuracy and less effective models. Therefore, careful feature selection and engineering are crucial for building accurate and robust AI models.

4. Yes, limiting the use of smartphones is advisable because various apps can collect and potentially misuse personal data. Many apps gather extensive data on users, including location, contacts, and browsing habits. If this data is not securely managed, it can be exploited for purposes such as targeted advertising, identity theft, or unauthorized sharing with third parties. By being cautious about app permissions, regularly reviewing privacy settings, and limiting unnecessary app usage, individuals can better protect their personal information and reduce the risk of data misuse.

2. Data Literacy

Video Session (Page 249)

Do it yourself.

AI Task (Page 251)

Wisdom	Technology in our day to day life, and our inability to avoid it even if we want to.
Knowledge	Impact of Technology on our social interactions, life style, and convenience.
Information	Different Technologies available, which are catering to different aspects of life, defense, space etc.
Data	What references to Technological Innovations can be presented to the audience

Ratings Given:

- First presentation: 'outstanding'
- Second presentation: 'poor'
- Third presentation: 'satisfactory'

Filtered Data:

- Ratings: 'outstanding,' 'poor,' 'satisfactory'
- Type: The ratings are qualitative and subjective measures of presentation quality.

Analysis:

- The ratings are not of the same type in a quantitative sense but are comparable in terms of their descriptive nature. They provide qualitative feedback on the presentations but do not offer numeric data.

AI Task (Page 252)

Do it yourself.

Ai Reboot (Page 254)

1. Data literacy refers to the ability to read, understand, create, and communicate data effectively. It involves understanding data sources, recognizing patterns, interpreting data trends, and using data to make informed decisions.
2. Data literacy is indispensable because it enables informed decision-making, enhances problem-solving, and ensures effective communication and critical evaluation of data.

Ai Task (Page 254)

1. **Filter** the category by price, setting the filter from low to high to find the least expensive option.
2. **Evaluate** reviews and ratings by checking user feedback and overall ratings to determine the most popular product.
3. **Check** the product details and specifications to ensure it meets your specific needs and requirements.
4. **Review** the estimated delivery dates provided by the seller to plan accordingly.

Ai Reboot (Page 257)

Data Awareness, Data Understanding, Data Analysis, Data Interpretation, Data Communication, Data Decision-Making.

Video Session (Page 261)

Do it yourself.

Ai Task (Page 261)

1. **Use Strong Passwords:** Create complex passwords and change them regularly.

   Enable Two-Factor Authentication: Use additional verification methods to secure accounts.

   Be Cautious with Personal Information: Avoid sharing sensitive details online and be aware of phishing attempts.

   Update Software Regularly: Ensure that all software, including antivirus, is up-to-date to protect against vulnerabilities.

   Secure Your Devices: Use security features like firewalls and encryption to protect your devices from unauthorized access.
2. **Respect Others' Privacy:** Avoid sharing or discussing others' personal information without consent.

   Be Mindful of Communication Tone: Use appropriate language and avoid using offensive or inappropriate remarks.

   Verify Information: Ensure that information shared is accurate and sourced from reliable places.

   Respect Copyrights: Do not use or distribute content without proper authorization or giving credit to the original creators.

Practice Proper Online Behavior: Follow guidelines for respectful and constructive interaction in online communities and discussions.

Reboot (Page 262)

1. Data security protects data from unauthorized access and breaches, while data privacy ensures that personal information is used and shared according to user consent and privacy laws.
2.
   - Use strong, unique passwords.
   - Enable two-factor authentication.
   - Limit data sharing.
   - Review privacy settings.
   - Secure devices with encryption.
   - Avoid public Wi-Fi for sensitive tasks.
   - Read privacy policies.
   - Update software regularly.

Task (Page 265)

Data	Categorise
Temperature	Numeric Data
Gender	Textual Data
Show Size	Numeric Data
Comment on social media	Textual Data
Favourite colour	Textual Data
Newspaper article	Textual Data
Population number in a state	Numeric Data
Email	Textual Data
Heart Rate	Numeric Data
Weight of a person	Numeric Data

Task (Page 267)

Observations	Categories
1. You notice peculiar markings on trees that seem to form a pattern.	Data Discovery
2. You find additional clues hidden under rocks and in hollowed-out tree trunks.	Data Augmentation
3. You create a map based on the patterns and clues you have discovered.	Data Generation
4. You observe changes in the forest's appearance as you get closer to the treasure, like altered vegetation.	Data Discovery

Ai Task (Page 271)
Do it yourself.

Ai Task (Page 276)

List of trending sports (top 5)	List of trending movies (top 5)
1. Soccer	1. "Avatar 3"
2. Basketball	2. "Guardians of the Galaxy Vol. 4"
3. Tennis	3. "The Batman 2"
4. Cricket	4. "Fast & Furious 10"
5. Rugby	5. "Black Panther: Wakanda Forever Part II"

Ai Task (Page 277)
Do it yourself.

Ai Reboot (Page 280)

1. c 2. d 3. a 4. c 5. c

Video Session (Page 286)
Do it yourself.

Ai Task (Page 287)
Do it yourself.

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Ai Quiz

A. 1. a 2. c 3. d 4. a 5. b 6. d
7. a 8. c 9. a 10. b

B. 1. Information literacy 2. Critical thinking 3. The DIKW pyramid
4. Secondary data sources 5. Data acquisition
6. Natural Language Processing (NLP) 7. Attributes
8. Skills 9. A strong password 10. Data backup

C. 1. False 2. True 3. True 4. False 5. False
6. True 7. False 8. False

D.

1.	Computer Vision	b. Image Data
2.	NLP	e. Qualitative Data
3.	Textual Data	d. Data history
4.	Sources of data	a. Data scraping
5.	Data Discovery	c. Dataset search

SECTION B (Subjective Type Questions)

A. 1. i. A data pyramid, also known as the DIKW pyramid, represents the hierarchical relationship between data, information, knowledge, and wisdom. It illustrates how raw data can be processed to extract useful information, which in turn can lead to the formation of knowledge and ultimately wisdom.

ii.
- A: Data
- B: Information
- C: Knowledge
- D: Wisdom

iii.
- Data: Raw facts and figures without context.
- Information: Data processed and organized to be meaningful.
- Knowledge: Information analyzed and applied to make decisions.
- Wisdom: The ability to make sound judgments and decisions based on knowledge.

2. It enables individuals to make informed decisions by understanding and interpreting data accurately.

   It enhances critical thinking skills, allowing individuals to question assumptions and analyze data effectively.

3. Pie charts visually represent the proportions of different categories within a dataset, making it easier to compare and understand the relative sizes of each category.
4. Data interpretation provides insights and context to raw data, enabling decision-makers to understand trends, patterns, and correlations, which leads to more accurate and effective decisions.

   Training Data: It is data on which we train our AI project model. It is basically to fit the parameters of the project for the model. In training data, the output is available to the model.

   Testing Data: It is used to check the performance of an AI model. In testing data, the data is not seen for which the predictions have to be made.

5.

Quantitative Data	Qualitative Data
Data is depicted in numerical terms.	Data is not depicted in numerical terms.
Can be shown in numbers and variables like ratio, percentage, and more.	Could be about the behavioural attributes of a person, or things.

Quantitative Data	Qualitative Data
Examples: 100%, 1:3, 123	Examples: loud behaviour, fair skin, soft quality, and more.

6. Data processing involves tasks to refine raw data for analysis or application, including cleaning, organising, transforming, and summarising information. It ensures data accuracy, relevance, and accessibility for effective decision-making and analysis. It is crucial across various sectors like business, science, and technology, facilitating better utilisation of data assets. Data processing helps computers understand raw data. Use of computers to perform different operations on data is included under data processing.
7. Kaggle is an online platform for data science and machine learning competitions. It provides datasets, code, and community discussions, allowing data enthusiasts to practice and improve their skills, collaborate with others, and gain exposure to real-world problems.
8. Data backup refers to the process of creating copies of data to ensure that it can be restored in the event of data loss due to natural disasters, accidents, cyber-attacks, or other unexpected events. Sometimes physical backup media is used to secure in access-controlled environments. Another method to secure data can be the cloud backup which is considered more reliable.
9. This means the development and enhancement of data literacy skills are not static or one-time event. Instead, they evolve through continuous cycles of learning, application, and refinement.
10. - Understanding what data you have collected, how it is handled, processed, used, and where it is stored.
    - Only necessary data required for a project should be collected.

B. 1. - Take steps to understand and avoid any preferences or partiality in data
    - Take necessary permissions before collecting or using an individual's data
    - Explain how you intend to use the collected data and do not hide intentions
    - Protect the identity of the person who is the source of data
    - Take responsibility for your actions in case of misuse of data

2. Cyber attacks are becoming more frequent as a result of the growing volume of data stored in the cloud. The best course of action given the volume of traffic being produced is to regulate and secure the transmission of private or sensitive data everywhere, that it is known to exist. Avoid entering sensitive information, such as your address, PAN, or Aadhar number on unrecognised and unsafe websites.

   The most possible reasons why data security is more important now are:

   - A constant fear cyberattacks affect all people.

- The fast-technological changes will boom cyberattacks.
- A persistent fear everyone is impacted by cyberattacks.
- Rapid technical advancements will increase the frequency of cyberattacks.

3. AI systems often rely on vast amounts of data for training and operation. Unauthorised access and tampering could lead to inaccurate AI models and compromised outcomes. Many AI applications process sensitive data, such as personal, financial, or health-related information. Strong data security measures can stop data breaches and unauthorised access.
4. - Use strong, unique passwords with a mix of characters for each account.
   - Activate Two-Factor Authentication (2FA) for added security.
   - Download software from trusted sources only and scan files before opening.
5. Numeric data can be further classified as:

Continuous Data	Discrete Data
Continuous data can take any numeric value within a specified range.	Discrete data refers to distinct single values. It consists of whole numbers without decimal parts that represent distinct categories or values.
Continuous data is measurable.	Discrete data is countable.
This type of data can be infinitely subdivided and often includes decimal points.	Discrete data cannot be subdivided meaningfully.
Often used to analyse using statistical techniques such as mean, median, standard deviation, and correlation.	It is used to analyse using frequency distributions, bar charts, and probability distributions.
Examples: dimensions of classroom, height, weight, temperature, time, etc.	Examples: number of girls and boys in class, number of subjects in class 9th, count of anything.

6. **Natural Language Processing (NLP)**

   NLP is a subfield of AI that enables computers to understand and process human language.

   Types of Data:

   - Textual data: Articles, emails, social media posts.
   - Audio data: Spoken language recordings transcribed into text.

   Computer Vision

   Computer Vision uses AI to help computers interpret images and videos.

   Types of Data:

   - Image data: Photos, satellite images, medical scans.
   - Video data: Recorded videos.

Statistical Data

Statistical data analysis involves interpreting data to find patterns and insights for decision-making.

Types of Data:

- Numeric data: Data from tables and spreadsheets.
- Time series data: Data recorded at specific time intervals, like stock prices and weather data.

C. Competency-based/Application-based questions:

1. a. Quantitative data interpretation involves numerical data that can be measured and quantified, while qualitative data interpretation involves descriptive data that can be observed but not measured. Quantitative data interpretation methods include statistical analysis and graphical representation, which provide objective, precise, and comparable results. However, they may not capture the full context or nuances of the data and require a good understanding of statistical methods. On the other hand, qualitative data interpretation methods such as content analysis and thematic analysis provide in-depth insights and a deeper understanding of context. They capture the complexity of human experiences and perceptions but can be subjective, harder to generalize, and time-consuming.

   b. Quantitative data interpretation involves using descriptive statistics like mean, median, mode, and standard deviation, as well as inferential statistics like hypothesis testing and regression analysis. Visualization techniques such as bar charts, histograms, and scatter plots are also commonly used. These methods offer objectivity, generalizability, and precision but may overlook context and complexity.

   Qualitative data interpretation involves methods like content analysis, which includes coding textual data into manageable categories and identifying patterns, themes, and relationships. Thematic analysis develops themes from the data and analyzes them to interpret meanings and insights, while narrative analysis focuses on the stories and personal accounts in the data. These methods provide depth of understanding and context-rich insights but are subjective, limited in generalizability, and time-consuming.

   By employing these methods and techniques, one can effectively interpret both quantitative and qualitative data, leveraging their respective strengths while being mindful of their limitations.

2. To present the company's sales performance across different regions during a quarterly review meeting, I would use bar graphs, line charts, and pie charts to convey trends and patterns effectively.

   A bar graph will be used to compare total sales across different regions, highlighting which regions are performing well and which are lagging. This visualization will help stakeholders quickly assess regional performance and facilitate discussions on strategic adjustments.

A line chart will show sales trends over time for each region. This will help stakeholders observe how sales have fluctuated throughout the year, identify any seasonal patterns, and understand long-term trends. By seeing the sales trajectory, stakeholders can better predict future performance and make data-driven decisions.

A pie chart will illustrate the percentage share of total sales by region, providing a quick visual overview of the sales distribution. This will help stakeholders understand the relative importance of each region to the company's overall sales.

Using these visualizations, stakeholders will gain a comprehensive understanding of the sales performance across different regions, enabling them to make informed decisions based on clear, visual data insights.

Δi In Life (Page 296)

Do it yourself.

Δi Deep Thinking (Page 296)

1. In today's digital age, data is crucial for AI systems, much like gold was for the gold rush. Data fuels AI by:
   - Training Models: Data helps AI algorithms learn patterns and improve accuracy.
   - Enhancing Accuracy: More data leads to better model performance and predictions.
   - Enabling Personalization: AI uses data to customize user experiences and recommendations.
   - Driving Innovation: Data supports the creation of new AI applications and technologies.
   - Improving Decision-Making: AI analyzes data to provide insights and support strategic decisions.

   In essence, data powers AI advancements and transformations, similar to how gold drove economic growth in the past.
2. Clive Humby first described data as "the new gold" to highlight its immense value in today's economy. Unlike gold, which is a finite resource, data is continuously generated and offers limitless potential for economic growth and innovation. Its ability to drive advancements across industries and provide valuable insights makes it exceptionally valuable. While gold has intrinsic worth, data's versatility and scalability often make it even more precious in the modern digital landscape.

Δi Lab (Page 296)

Do it yourself.

Δi Ready 2

1. - Data literacy enhances decision-making ability in individuals based on evidence. Based on sources of data, emerging trends and interpretations, individuals can make decisions that are data-driven.

- Data literacy is able to cultivate critical thinking skills to understand and explore data's implications by questioning assumptions, reaching logical conclusions, identifying patterns, and evaluating evidence and data accuracy.
- Data literacy helps in analytically producing solutions to problems that help people develop critical thinking skills. It enables user to tackle complex problems and derive meaningful relevance.
- Data literacy fuels innovation by providing tools and techniques to explore data from different perspectives. It helps in innovating to meet the requirements of emerging trends and market demands.

2. Data privacy is important because:
   - a data breach at a government agency can put top secret information in the hands of an enemy country.
   - a data breach at a hospital can put personal health information in the hands of those who might misuse it.
   - a data breach at a corporation can cause put proprietary data in the hands of a competitor.
   - a data breach at a school can inconvenience to the parents, by getting continuous calls from tuition and coaching centers cause annoyance and stress.
3. The 3 C's of data literacy are:
   - Context: Understanding the background and relevance of the data, including its sources, limitations, and the situation it represents.
   - Critical Thinking: Analyzing and questioning the data, including evaluating its accuracy, reliability, and potential biases.
   - Communication: Effectively conveying insights and findings from the data to others, using appropriate visualizations and explanations.

   We can create decision trees with the help of these points:
4. A cyber attack is an intentional attempt to damage, disrupt, or gain unauthorized access to computer systems or data. An example is the 2017 WannaCry ransomware attack, which encrypted files and demanded ransom payments, affecting organizations worldwide.

3. Maths For AI (Statistics & Probability)

Ai Task (Page 299)

1. The given pattern appears to involve a series of multiplications of 2 with consecutive odd numbers.
2. 0, 1, 4, 9, 25, 16, 36
3. The skill used to identify the pattern is **pattern recognition** or **analytical reasoning**. This involves observing the sequence, identifying the mathematical relationship or rule governing

the pattern, and applying this rule to find the missing elements.

Ai Task (Page 300)

1. 8
2. 3, 6, 12, 24, 48, 96,192
3. Highest temperature is 50, at 6 am.
4. 6
5. 2
6. Sphere

Ai Reboot (Page 303)

- Analysing how students and teachers use educational technology for future implementations.
- Statistics helps in determining the average skills of students in a particular school or grade. This information shows which areas need more focus to help improve education strategies

Ai Task (Page 304)

Case 1: a cat

Case 2: a toffee

Case 3: ½

Ai Task (Page 305)

1/4

1/2

Ai Task (Page 307)

1. likely
2. unlikely
3. impossible
4. equal probability
5. certainly

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Ai Quiz

A. 1. b 2. c 3. b 4. b 5. d
6. d 7. c 8. b

B. 1. AI 2. Meteorologists 3. Equally likely
4. Zero 5. Probabilistic 6. Equal 7. Probability 8. Epidemiologists

C. 1. True 2. False 3. True 4. False 5. True
6. False 7. True 8. True

SECTION B (Subjective Type Questions)

A. 1. Mathematics and AI are interconnected fields, with Mathematics supplying the theoretical foundations for many AI algorithms. Patterns are repeating designs or sequences that can be observed in numbers, shapes, images, languages, or objects in our surroundings. They follow a specific order or arrangement, making them easily recognisable. Mathematics aids in the study of these patterns. These patterns allow you to solve puzzles. They help identify an order or arrangement in lists of images or numbers. They are present everywhere around us.

2. Patterns are regular and repeated ways in which data or events occur. For example, the sequence of even numbers (2, 4, 6, 8) or the seasonal patterns in weather data.

3. Equal probability events are events that have the same chance of occurring. For example, when flipping a fair coin, the probability of getting heads or tails is equal.

4. Collecting data is the first step in statistics and involves gathering relevant information from various sources to analyze and draw conclusions.

5. Two applications of statistics in real life are:
   - Analyzing consumer behavior in marketing to improve product sales.
   - Assessing the effectiveness of medical treatments in healthcare.

6. The probability of wearing a white dress is 313\frac{3}{13}133.

7. One use of statistics in disaster management is to analyze past disaster data to predict and prepare for future events.

8. One use of probability in finance is to assess the risk of investment portfolios and predict future market trends.

B. 1. **"Statistics is used for collecting, exploring, and analyzing the data."** Statistics involves several key steps: First, data collection involves gathering relevant information from various sources such as surveys, experiments, or observational studies. For instance, if a company wants to understand customer satisfaction, it would collect data through customer feedback surveys. Next, exploring the data involves summarizing and visualizing it to uncover patterns and trends. This could mean creating charts or tables to see the distribution of satisfaction levels. Finally, analyzing the data involves applying statistical methods to draw conclusions and make predictions. For example, statistical tests might reveal that customers who receive timely support are more satisfied. Thus, statistics helps in making informed decisions based on data.

2. **Three uses of statistics in education:**
   - Analysing test scores and grades to evaluate student learning, identify areas for improvement, and allocate resources effectively.
   - Using data to identify gaps in the curriculum and areas where students need more support.
   - Analysing how students and teachers use educational technology for future implementations.
3. Concept of probability with a deck of 52 cards: Probability measures the likelihood of an event occurring. In a standard deck of 52 cards, there are 4 suits (hearts, diamonds, clubs, spades) with 13 cards each. If you want to calculate the probability of drawing a card from a particular suit, say hearts, you would use the formula for probability:

   Probability=Total number of outcomes/Number of favorable outcomes = 13/52=1/4

   So, the probability of drawing a heart from the deck is 1/4, or 25%.
4. **Likelihood of an event with examples:** The term "likely" describes events that have a high chance of occurring but are not guaranteed. For example, consider the likelihood of drawing a card from a standard deck of 52 cards and it being a face card (Jack, Queen, or King). There are 12 face cards in a deck:

   Probability=Number of face cards/Total number of cards= 12/52

   This probability suggests that while it's not certain, it's relatively likely to draw a face card compared to other outcomes.
5. **Role of probability in estimating road traffic:**
   - **Predicting Peak Traffic Hours:** Probability models help forecast times of day when traffic congestion is most likely based on historical data. For instance, if data shows heavy traffic between 8-9 AM, probability helps in planning routes to avoid congestion.
   - **Traffic Light Timing:** Probability helps in optimizing traffic light timings to minimize delays. If traffic data indicates high vehicle volume at certain times, light cycles can be adjusted to improve flow.
   - **Assessing Traffic Jam Risks:** Probability estimates the likelihood of traffic jams during special events or adverse weather conditions. For example, if an event is expected to draw large crowds, probability models can predict increased traffic and help in managing road usage.
6. Likely, unlikely, impossible, and equal probability events:
   - **Tossing a Coin:** Equal probability (both heads and tails have a 50% chance of occurring).
   - **Rolling an 8 on a Standard Die:** Impossible (a standard die only has faces numbered 1 to 6).
   - **Throwing Ten 5's in a Row:** Unlikely (the probability is very low, as the chance of getting a 5 on a single throw is 1/6, and this event occurring consecutively ten times is rare).

- **Drawing a Card of Any Suit:** Likely (every card drawn from the deck will be of one of the four suits, so it's guaranteed that a suit will be drawn).

7. Examples of impossible and equal probability events:
   - **Impossible Events:**
     - **Rolling a 7 on a Standard Die:** A standard die has only six faces, so rolling a 7 is impossible.
     - **Drawing a Card from an Empty Deck:** If a deck has no cards, drawing one is impossible.
   - **Equal Probability Events:**
     - **Tossing a Fair Coin:** Each side (heads or tails) has an equal chance of landing face up.
     - **Rolling a Fair Six-Sided Die:** Each number (1 through 6) has an equal chance of appearing.
8. Certain Events and Likely Events with Examples:
   - **Certain Events:** These are events that are guaranteed to happen. For example, the sun rising in the east each morning is a certain event.
   - **Likely Events:** These are events that have a high chance of occurring but are not guaranteed. For example, during the winter season in a cold climate, it is likely to snow, but it is not certain every day.

C. Competency-based/Application-based questions:

1. How will the student use the estimated probabilities to prepare for the exam?

   The student can prioritize studying the topics with the highest probabilities of appearing on the exam. For instance, Topic A with a probability of 0.8 and Topic D with a probability of 0.7 are more likely to be on the exam, so the student should focus more on these topics. This targeted preparation can increase the chances of performing well in the exam by ensuring the student is well-prepared for the most likely topics.

2. Role of statistics in launching a new smartphone:

   Statistics help the company analyze market research data to understand consumer preferences, potential demand, and market trends. By using statistical techniques such as surveys, regression analysis, and forecasting models, the company can make data-driven decisions about product features, pricing, and marketing strategies. This reduces the risk of product failure and helps in aligning the product with market needs.

3. Applications of probability in predicting earthquakes:
   - **Seismic Risk Assessment:** Probability models estimate the likelihood of earthquakes occurring in different regions based on historical data and fault lines. This helps in identifying areas at higher risk and planning for mitigation.
   - **Aftershock Forecasting:** After a significant earthquake, probability models predict the likelihood and intensity of aftershocks, helping in emergency response and preparedness.

4. Examples of probability theory in artificial intelligence:
    - **Spam Filtering:** AI uses probability to classify emails as spam or not based on the likelihood of certain words or patterns appearing in spam emails. This helps in effectively filtering out unwanted messages.
    - **Recommendation Systems:** Probability models predict which products or content a user is likely to be interested in based on their past behavior and preferences, enhancing the accuracy of recommendations.

Δi In Life (Page 316)

Do it yourself

Δi Deep Thinking (Page 316)

Do it yourself.

Class Activity (Page 317)

Do it yourself.

Δi Lab (Page 319)

Data Analysis

Total Number of Cars Spotted:

Add the tallies for each color and convert them to numbers. For example:

- Red: 6 (IIII II)
- Black: 12 (IIII IIII IIII)
- White: 11 (IIII IIII IIII III)

Total cars = 6 (Red) + 12 (Black) + 11 (White) = 29 cars

Color Spotted the Maximum Amount of Time:

Black cars are spotted the most, with 12 sightings.

Data Interpretation

The most common color choice for the residents in this area is black, as it was spotted the most frequently.

Δi Ready 3

1. Mathematics and AI are interconnected fields, with Mathematics supplying the theoretical foundations for many AI algorithms. Patterns are repeating designs or sequences that can be observed in numbers, shapes, images, languages, or objects in our surroundings. They follow a specific order or arrangement, making them easily recognisable. Mathematics aids in the study of these patterns. These patterns allow you to solve puzzles. They help identify

an order or arrangement in lists of images or numbers. They are present everywhere around us.

2. The probability that your feedback is not altered by the chatbot is high because the chatbot is designed to collect your responses as you provide them. As long as there are no technical issues, your feedback is generally recorded as entered.
3. Probability affects the weather forecast system by providing estimates of the likelihood of various weather conditions occurring. Meteorologists use probability to predict the chance of events like rain, snow, or storms, helping to inform the public and guide decision-making. For example, a forecast of "80% chance of rain" means there is an 80% likelihood that rain will occur, helping people plan their activities accordingly.

4. Introduction to Generative AI

Ai Task (Page 322)

Image 1	Image 2
1. Real	a. AI- generated
2. Real	b. AI- generated
3. Real	c. AI- generated
4. AI- generated	d. Real
5. Real	e. AI- generated

Real images are captured by cameras, they are visual representations depicting scenes, objects, or people in the same way as they exist in the real world. They are created on the same side of the lens or mirror as the viewer. These images are either created by or clicked by humans. AI-generated images are created using AI algorithms. These algorithms use large amount of data and learn patterns to create new images that look like real ones. Sometimes AI incorporates small details that don't exist in the original picture to enhance the look of the scene. AI can create images that can be modified and enhanced. It can also create entirely new, imaginative images.

Ai Reboot (Page 326)

1. Supervised learning is a machine learning where a model is trained on a labelled dataset, implying that each input data point is associated with a corresponding output label. The goal of supervised learning is to learn the mapping between input data and output labels, enabling the model to make predictions on new, unseen data

   Unsupervised learning is a type of machine learning where models are trained using data that does not have labels. This means the model has to find patterns and relationships in

the data on its own. The goal of unsupervised learning is to find patterns, structures, or representations in the data without human intervention.

2.
   - AI-generated images may include elements that seem unrealistic or improbable, such as impossible perspectives, mismatched colours, or objects that defy physics, making the image appear unnatural or inconsistent with the scene.
   - Odd outlines to sharpen or smoothen the edges, stray pixels to cover inconsistency, and abnormal shapes can be easily seen, if an image is zoomed to the maximum, on each of its parts.

Ai Task (Page 328)

The right hand side image is AI generated because:

i. Inconsistent Details: The image features only one strap of the student's bag visible, which is unusual and may suggest that the image has been artificially generated or altered.

ii. Unnatural Features: The student's lens being broken is an odd detail that might not align with real-world scenarios and could be a result of the AI's attempt to generate realistic but imperfect features.

iii. Imaginative Elements: The combination of the male student wearing a bindi—an element that might not typically be associated with the context or appearance—could indicate the image is AI-generated, as AI often blends or includes unconventional details to create a visually interesting composition.

Ai Reboot (Page 329)

A "random noise dataset" typically refers to a collection of data points or samples where each data point is generated randomly.

Example: In daily life, the static on a TV screen when it's not tuned to a channel is an example of random noise, as it consists of random visual artifacts with no meaningful pattern.

Video Session (Page 329)

1. Generative AI refers to artificial intelligence systems designed to create new content, such as images, text, or music, by learning from existing data. These systems use algorithms to generate original outputs that resemble or are inspired by the data they were trained on.
2. **DeepArt:** An AI tool that creates artistic images based on user-provided photos and styles, transforming them into artwork inspired by famous artists' styles.

   GPT-3: An advanced language model developed by OpenAI that generates human-like text, useful for tasks such as writing, translation, and conversation.

Video Session (Page 336)

1. Respect for Style: Ensure the AI preserves the original art's style and techniques.
2. Cultural Sensitivity: Be mindful of historical and cultural contexts.
3. Ethical Implications: Address issues of authorship and originality.

4. Quality Data: Use diverse, high-quality datasets for training.
5. Transparency: Clearly indicate when art is AI-generated.

Video Session (Page 336)

AIVA

Video Session (Page 337)

Concerns arising from the use of ChatGPT include privacy issues, potential misuse for generating misleading or harmful content, and ethical considerations around the impact on jobs and human interaction.

Ai Task (Page 339)

Do it yourself.

Ai Task (Page 340)

Do it yourself.

Video Session (Page 342)

Do it yourself.

Ai Task (Page 342)

Do it yourself.

Ai Task (Page 343)

Do it yourself.

Ai Task (Page 344)

Do it yourself.

Ai Reboot (Page 346)

1. **Biases in Generative AI:**

   Gender Bias: Generative AI models trained on biased datasets may produce stereotypes, such as associating certain professions with specific genders, as seen in some job-related content.

   Racial Bias: AI-generated images or content might depict certain races in stereotypical or limited ways, often reflecting biases present in the training data.

   Cultural Bias: Language models might generate content that is culturally insensitive or irrelevant to specific groups, influenced by the predominance of certain cultural perspectives in the data.

2. **Deepfake:**

   Deepfake refers to AI-generated media, such as videos or audio recordings, that manipulate or fabricate content to make it appear as if someone said or did something they didn't. This technology uses deep learning techniques to create realistic but false representations.

Unsolved Questions

SECTION A (Objective Type Questions)

Ai Quiz

A.

1. c	2. b	3. c	4. c	5. b	
6. c	7. b	8. a	9. b		

B.

1. Unsupervised	2. Ethical	3. Generative AI	4. Bias
5. Generative AI	6. Deepfakes	7. Sequential	
8. Real	9. Images	10. Runway ML	

C.

1. True	2. True	3. False	4. True	5. True
6. False	7. False	8. True	9. False	10. False

D.

1. e	2. c	3. a	4. b	5. d

SECTION B (Subjective Type Questions)

A.

1. Autoencoders compress data into a latent space and then reconstruct the input data, focusing on dimensionality reduction. VAEs, on the other hand, generate new data points by learning the distribution of the input data and sampling from this distribution.
2. **Example 1:** VAE for generating handwritten digits (MNIST dataset).

   Example 2: VAE for generating faces using the CelebA dataset.
3. AlphaGo was introduced in October 2015.
4. Example 1: GPT-3 (by OpenAI)

   Example 2: DALL-E (by OpenAI)

   Example 3: StyleGAN (by NVIDIA)

   Example 4: Artbreeder
5. **Generative AI:** Used for creating new content such as text, images, music, and videos. Examples include generating realistic human faces, writing essays, and composing music.

   Conventional AI: Typically used for tasks such as classification, regression, prediction, and optimization. Examples include fraud detection, recommendation systems, and speech recognition.
6. Generative AI models require large datasets to capture the variability and complexity of the data distribution they aim to model. The quality and diversity of the generated outputs depend on the richness of the training data. Insufficient data can lead to overfitting and poor generalization, resulting in less realistic or diverse generated content.
7. Generative AI models can perpetuate and amplify biases present in the training data. If the training data contains biased representations or stereotypes, the generated outputs can reflect and reinforce these biases. This can lead to unfair or harmful outcomes, especially in sensitive applications like hiring, law enforcement, or healthcare.

8. **Feature 1:** Allows users to blend and evolve images to create unique artworks.

   Feature 2: Provides sliders for users to adjust different attributes of images, such as age, gender, and art style.

9. **Consideration 1:** The potential for misuse in creating deepfakes, which can be used for malicious purposes such as misinformation, fraud, and invasion of privacy.

   Consideration 2: The need for transparency and accountability in the use of generative AI, ensuring that users are aware when they are interacting with AI-generated content.

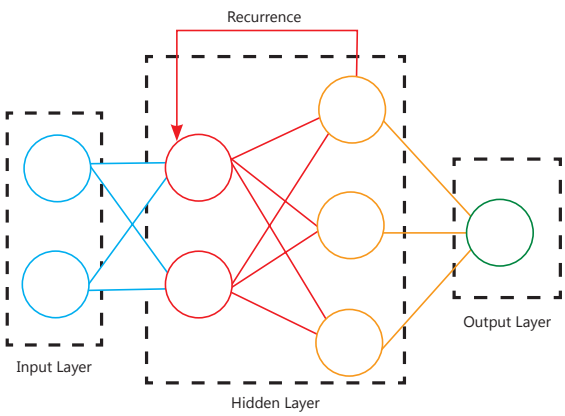
10. Generative AI can pose privacy risks by generating realistic synthetic data that can be used to impersonate individuals or reconstruct private information. Additionally, if generative models are trained on sensitive data without proper anonymization, they can inadvertently leak confidential information, leading to data breaches and misuse.

B. 1. Generative AI has transformed music creation and production. Tools like OpenAI's MuseNet can compose music in various genres, while Amper Music generates custom tracks by setting parameters such as mood and tempo, making music production more accessible. Platforms like Endel create personalized soundscapes based on user activities, enhancing listening experiences. In addition, AI can suggest different arrangements and instrumentations, aiding composers in exploring new sounds. AI also improves old recordings by removing noise and filling gaps. AIVA (Artificial Intelligence Virtual Artist) is an example, composing symphonic music for films, ads, and games.

2. Autoencoders (AEs) are neural networks that learn to compress data into a latent space and then reconstruct it. They are used for tasks like dimensionality reduction and feature learning. Key features include:

   - **Dimensionality Reduction:** Compresses data to lower dimensions for easier visualization and reduced computational cost.
   - **Data Denoising:** Removes noise from data, improving quality.
   - **Anomaly Detection:** Identifies outliers by reconstructing normal data poorly.
   - **Feature Learning:** Learns useful features for tasks like classification.

   Examples include image compression, denoising photographs, and fraud detection.

3. 

4. **Architecture:** Generates multiple design variations and optimizes plans, enhancing creativity and efficiency.

   Coding: Generates boilerplate code and suggests completions, increasing productivity and reducing development time.

   Music: Composes original music and generates background scores, providing new tools for creativity.

   Content Creation: Produces high-quality written content, realistic images, and videos, enabling quick production of diverse media.

C. Competency-based/Application-based questions:

1. **Verify Sources:** Ensure the AI-generated content is cross-referenced with credible sources.

   Avoid Plagiarism: Use AI tools to generate ideas and outlines but write the essay in your own words.

   Understand the Topic: Use AI for research and learning, but make sure you understand the material thoroughly.

   Cite Properly: If using AI-generated content, ensure it is properly cited to avoid plagiarism.

   Ethical Use: Avoid using AI to generate the entire essay; instead, use it to enhance your understanding and provide additional perspectives.

2. Generative AI can revolutionize the creative industry by enabling the generation of unique and innovative designs. In art, AI can create new styles and compositions, offering artists novel ideas and expanding their creative horizons. In fashion, AI can design clothing and accessories, predict trends, and customize designs for individual preferences. This technology fosters creativity by providing diverse and original concepts that may not have been conceived by human designers alone.

3. To ensure responsible use of generative AI, it is crucial to establish guidelines and regulations that balance benefits and risks. These guidelines could include:

   Transparency: Ensuring AI-generated content is clearly labeled.

   Accountability: Implementing accountability measures for creators and users of AI.

   Bias Mitigation: Developing methods to detect and mitigate biases in AI-generated content.

   Privacy Protection: Safeguarding personal data used in AI training and generation.

   Ethical Standards: Encouraging adherence to ethical standards in AI development and usage.

   Balancing the potential benefits and risks involves fostering innovation while protecting individuals and society from potential harm.

4. Parameter 1: Human-Like Response

   ChatGPT: Highly conversational and natural language generation.

   Gemini: Focuses on natural language understanding with precise and coherent responses.

Copilot: Provides code suggestions with a conversational aspect for coding assistance.

Parameter 2: Training Dataset and Underlying Technology

ChatGPT: Trained on a diverse dataset using GPT architecture.

Gemini: Uses proprietary datasets and technology optimized for dialogue.

Copilot: Based on OpenAI Codex, trained on a large dataset of code from GitHub.

Parameter 3: Authenticity of Response

ChatGPT: High-quality responses but may occasionally generate plausible-sounding incorrect information.

Gemini: Emphasizes accurate and reliable information.

Copilot: Focused on accurate code generation and documentation.

Parameter 4: Access to the Internet

ChatGPT: No real-time internet access.

Gemini: Typically does not access the internet in real-time.

Copilot: No real-time internet access, trained on static data.

Parameter 5: User Friendliness and Interface

ChatGPT: User-friendly with intuitive interfaces across platforms.

Gemini: Designed for ease of use in conversational contexts.

Copilot: Integrated into code editors for seamless coding assistance.

Parameter 6: Text Processing: Summarisation, Paragraph Writing, Etc.

ChatGPT: Excellent at summarization and generating coherent paragraphs.

Gemini: Strong in generating concise and relevant text.

Copilot: Primarily focuses on code-related text generation.

Parameter 7: Charges and Price

ChatGPT: Various pricing tiers, including free access with limitations.

Gemini: Pricing depends on usage and integration specifics.

Copilot: Subscription-based model, typically around $10/month.

5. Idea Generation: Use AI to generate initial concepts and inspiration for the bridge design.

   Sketch Variations: Generate multiple design variations to explore different possibilities quickly.

   Refinement: Use AI-generated sketches as a base to refine and develop unique designs.

   Collaborative Tool: Collaborate with classmates or mentors to review and improve AI-generated concepts.

   Ethical Use: Ensure originality by not solely relying on AI-generated designs; use them as a tool for inspiration and enhancement.

6. (a) Both A and R are true and R is the correct explanation of A.

AI In Life (Page 355)

Do it yourself.

Ai Deep Thinking (Page 355)

1. The adoption of generative AI will notably impact creative job markets.

   Positive Impacts:

   Generative AI enhances creativity by providing inspiration and generating ideas, allowing professionals in art, writing, and music to focus on refining their work. It also creates new job roles, such as AI ethicists and content curators, and makes creative tools more accessible to a wider audience.

   Negative Impacts:

   AI may reduce demand for traditional roles in these fields as it takes over more content generation tasks. It could also lead to oversaturation of AI-generated content and widen economic disparities between established and emerging creators.

   Balancing the Impact:

   To address these changes, professionals should upskill to integrate AI into their work, and guidelines should be established to ensure ethical use. Emphasizing collaboration between human creativity and AI can foster innovative outcomes.

Ai Lab (Page 355)

1.
   - Inconsistencies: Look for unusual or inconsistent details, such as distorted objects or irregular patterns.
   - Unnatural Features: AI images may have unnatural or overly smooth features, like oddly shaped faces or hands.
   - Background Anomalies: Check for oddities in the background, such as warped textures or unrealistic elements.
   - Lighting and Shadows: AI images might have inconsistent lighting and shadows that don't match the scene.
   - Over-Detailing: Some AI images may have excessive or unrealistic detail in textures or elements that seem overly polished.
2. Do it yourself.
3. Do it yourself.

Ai Ready 4

1. Data from ChatGPT can be useful but may not always be entirely authentic. While it provides information based on a broad range of sources, it might occasionally generate responses that are incorrect or outdated. Always verify with reliable sources.
2. Gemini often emphasizes natural language understanding and precision in responses, whereas ChatGPT focuses on conversational quality and generating human-like dialogue. Gemini may also have different underlying technologies and training data compared to ChatGPT.

3. Graphic Design: AI can automate design tasks, reducing the need for human graphic designers.

   Illustration: AI tools can generate detailed illustrations and artwork, potentially replacing some illustrator roles.

4. RNN stands for Recurrent Neural Network.

   Applications of RNN:

   Language Modeling: Used for predicting the next word in a sentence.

   Speech Recognition: Helps in converting spoken language into text.

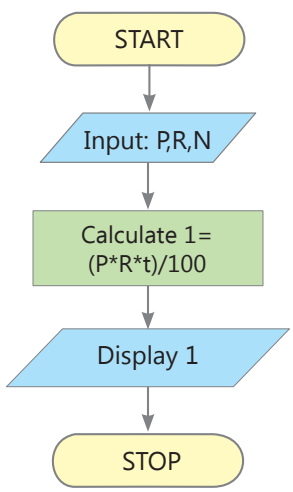
5. Introduction To Python

Ai Task (Page 361)

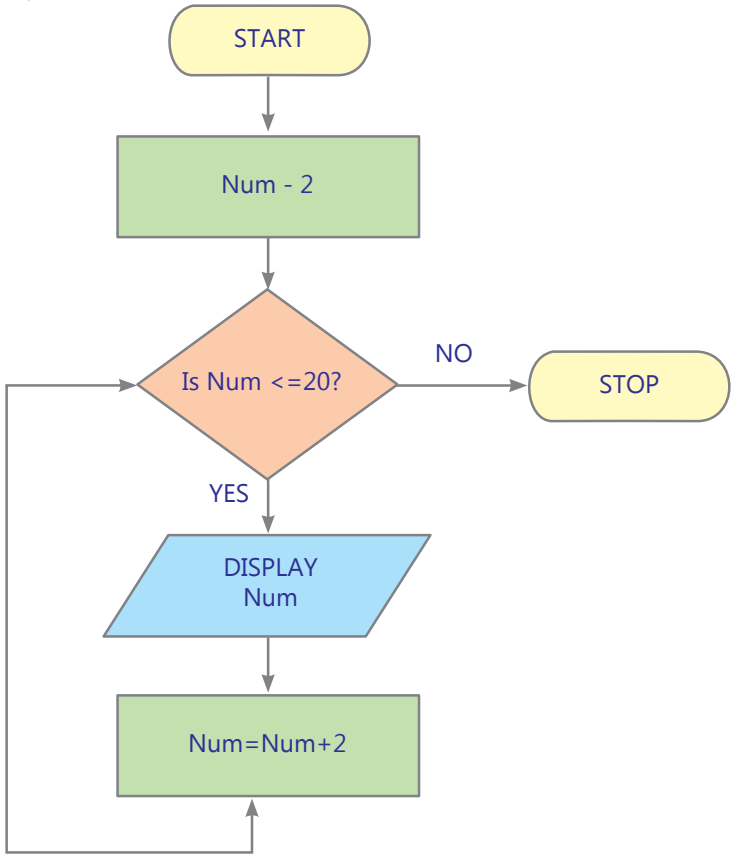
Yes, there can be other ways of making a different kind of sandwich.

1. Start
2. Take 2 slices of whole wheat or multigrain bread.
3. Spread peanut butter or almond butter evenly on one slice.
4. Slice fruits like bananas, strawberries, or apples into thin pieces.
5. Place the fruit slices evenly on top of the nut butter.
6. (Optional) Sprinkle some chopped nuts or a few chia seeds for crunch.
7. Place the second slice of bread on top.
8. Press gently and cut the sandwich into halves or quarters.
9. Serve fresh and enjoy your healthy fruit & nut butter sandwich!
10. Stop

Ai Task (Page 363)



Ai Task (Page 365)



Ai Task (Page 377)

Do it yourself.

Ai Reboot (Page 383)

1. What is the use of the ** operator?

   The ** operator is used for exponentiation in Python.

   It raises a number to the power of another number.

   Example: 2 ** 3 means 2 raised to the power 3, which is 8.

2. Define the relational operators.

   Relational operators are used to compare two values.

   They return True or False depending on the condition.

   The relational operators in Python are:

   - == (equal to)

- != (not equal to)
- > (greater than)
- < (less than)
- >= (greater than or equal to)
- <= (less than or equal to)

3. Give an example to use **= operator.

   The **= operator is used for power assignment.

   It raises the value to a power and assigns it back.

   Example:

   ```
   x = 2
   x **= 3
   print(x)  # Output: 8
   ```

4. Run the given statements in interactive mode and write the output generated:

   ```
   True + 1
   # Output: 2
   45 + bool(-11)
   # Output: 46  (bool(-11) is True, which is 1)
   2 + False + bool(0)
   # Output: 2  (False is 0 and bool(0) is also False → 0)
   12 - 10 + bool(10)
   # Output: 3  (bool(10) is True → 1)
   True + "hello"
   # Output: TypeError: unsupported operand type(s) for +: 'bool' and 'str'
   ```

Ai Task (Page 384)

- = 10 + (20 / 5) – (3 * 2)
  = 10 + 4 – 6
  = 14 – 6
  = 8
- = 5 * 15 + 10 – 5
  = 75 + 10 – 5
  = 85 – 5
  = 80

Ai Task (Page 393)

1. The Zen of Python, by Tim Peters

   Beautiful is better than ugly.

   Explicit is better than implicit.

   Simple is better than complex.

   Complex is better than complicated.

2. radius = float(input("Enter the radius of the circle: "))

   area = 3.14159 * radius * radius

   perimeter = 2 * 3.14159 * radius

   print("Area of the circle:", area)

   print("Perimeter (Circumference) of the circle:", perimeter)

Ai Task (Page 407)

1. abcabc
2. abcabc
3. abcabcabcabcabcabc

Ai Task (Page 409)

- Output: ['N', 'I', 'A', 'U']
- This starts from index -1 (which is 'N') to the end of the list.

  Output: ['N']
- This prints from the start (0) up to index -1 (exclusive), so it excludes the last element 'N'.

  Output: ['E', 'D', 'U', 'C', 'A', 'T', 'I', 'O']

Exercise

Unsolved Questions

SECTION A (Objective Type Questions)

Ai Quiz

A. 1. d 2. c 3. a 4. d 5. a

B. 1. algorithm 2. 10 3. Flowchart 4. Documentation
5. Guido van Rossum, www.python.org 6. =, += 7. ASCII
8. None 9. sequential 10. condition 11. else 12. Traversal
13. Negative 14. Syntax 15. clear()

C. 1. True 2. False 3. True 4. True 5. True
6. False 7. True 8. True 9. True 10. False

D. 1.
```
x = 10
a = input("enter number: ")
print("number entered is", a)
b = 10
a = int(a) + 5
a = a + 10
print(a)
```
2.
```
y = int(input("Enter Y: "))
if y < 10:
    print("smaller")
else:
    print(y)
```
3.
```
M = int(input("Enter M: "))
while M < 10:
    if M == 5:
        print("Middle Value")
    else:
        print(M)
    M += 1
```
4.
```
str = "book"
i = 0
while i <= 1:
    print(str, sep="%")
    i += 1
```

E. 1.
```
C = 1
while C < 5:
    print(C)
    C += 2
print("Python")
```
2.
```
sum = 0
for i in range(20, 10, -2):
    sum += i
print(sum)
```

F. 1. Output:

1022*1024*1026*1028*

2. Output:

   50

3. Output:

   0*2*4*

SECTION B (Subjective Type Questions)

A. 1. The two coding programs available in CodeCombat are Python and JavaScript.

2. Flowcharts are more preferred because they are visual, easier to understand, and clearly show the flow of the program using symbols.

3. Yes, we can write multiple algorithms for the same problem as there can be different ways to solve a problem based on logic and approach.

4. Selection flow allows the program to choose between different paths based on a condition using statements like if, if-else, or if...elif...else.

5. Multi-line strings in Python can be created using triple quotes, either ''' or """.

6. The print() function is used to display output on the screen.

   Example:

```
print("Hello")
print(5 + 3)
print("Age is", 12)
```

7. Variables are names used to store data. They are important because they allow programs to store, change, and reuse values during execution.

8. Normal division (/) gives the result with decimals, while floor division (//) gives the largest whole number less than or equal to the result.

9. Sequential programming means the instructions in a program are executed one after another in the order they are written.

   Consideration 2: The need for transparency and accountability in the use of generative AI, ensuring that users are aware when they are interacting with AI-generated content.

10. A nested if statement is an if statement placed inside another if statement to check multiple conditions.

11. Step value helps control the number of loop repetitions and prevents the loop from running infinitely.

12. A while loop is called an entry-controlled loop because the condition is checked before the loop body is executed.

13. The sort() function is used to arrange the elements of a list in ascending or descending order.

14. Key features of Python include simple syntax, readability, large library support, and cross-platform compatibility.

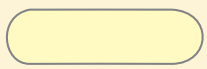
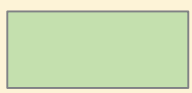
    Applications include web development, AI, machine learning, automation, data science, and game development.

15. The pop() function removes an element by index and returns it, while remove() deletes the first matching value from the list.
16. False – Because the comparison goes element by element, and 6 is not less than 5.

B. 1.

Algorithm	Flowchart
It is a step-by-step textual approach to solve a problem.	It is a graphical representation of a algorithm.
It can be written in natural language, pseudocode, or code.	It uses standardised symbols and shapes.
Difficult to represent branching and looping.	Easily represents branching and looping through symbols.

2.

SYMBOL NAMES	SYMBOLS	PURPOSE
Oval		Used to start and stop a flowchart.
Parallelogram		Used to take input and display output.
Rectangle		Used to perform assignment, mathematical and processing operations.

3. To solve this problem of writing a program, we follow some steps as given below:
   i. Understanding the problem: This is a crucial step where we need to understand the main objective of the problem. In this step, we should clearly define the problem, gather all necessary requirements, understand constraints, and clarify goals. These actions are essential to moving in the right direction and finding an effective solution.
   ii. Analysing the problem: Break down the problem into smaller parts, identify inputs and outputs, and explore existing solutions. Consider edge cases and unusual scenarios. This comprehensive analysis sets a detailed plan for tackling the problem.
   iii. Developing the solution: Design a detailed algorithm and choose appropriate tools and technologies. It is always recommended to first write an algorithm and draw a flowchart for solving a problem and then only write the program. This translates analysis into a practical, actionable plan.

iv. Coding and implementation: This is the last step where every instruction of an algorithm is converted into a computer understandable instruction by using the syntax and semantic of a specific computer language.

4. Control structures are a set of instructions that control the flow of instructions in a program. It is a programming tool that determines the order of execution of the statements in any programming language. There are three different types of control structures: sequential flow, selection flow, and repetition flow. Let us learn about these in detail.

Sequential Flow

In sequential flow, the statements are placed one after the other and the flow of execution occurs starting from line 1, line 2 and so on with a top-down approach. It is the default flow followed in any programming language. For example, the steps for calculating the percentage of any student by taking as an input marks of English, Science, Maths are as follows:

Step 1 Start

Step 2 Input Eng, Science, Math

Step 3 Total = Eng+Science+Math

Step 4 Percentage = (Total / Maximum_Marks) * 100

Step 5 Display Percentage Step 6 Stop

Selection Flow Selection flow is also known as branching control as the flow of control branches based on a condition. A condition evaluates to either TRUE or FALSE. In the case of TRUE, the flow of control follows the set of instructions written for True. In case it is FALSE, then it follows the other route. For example, consider the scenario where an award is given only if the percentage is more than 90:

Step 1 Start

Step 2 Input Eng, Science, Math

Step 3 Total = Eng+Science+Math

Step 4 Percentage = (Total / Maximum_Marks) * 100

Step 5 Display Percentage

Step 6 If Percentage> 90 then

Display "Award given"

Step 7 else

Display "No award"

Step 8 Stop

Repetition Flow Repetition flow, also known as a loop, repeats a set of instructions a number of times based on a condition. For example, if we wish to repeat the above steps of calculating percentage for 10 students then we use the concept of repetition.

Step 1 Start

Step 2 count=1
Step 3 if count <=10 goto Step 4 else goto step 10
Step 4 Input Eng,Science, Math
Step 5 Total= Eng+Science+Math
Step 6 Percentage = (Total / Maximum_Marks) * 100
Step 7 Display Percentage
Step 8 count=count+1
Step 9 Goto Step 3
Step 10 Stop

5. Arithmetic operators are used to perform mathematical operations on variables and values. Following arithmetic operators are provided by Python:

Name	Symbol	Purpose	Example	Output
Addition	+	Adds two values.	2 + 4 2.0 + 4 "hi" + "all"	6 6.0 "hiall"
Subtraction	–	Subtracts second value form the first value.	6 – 2 6.0 – 2	4 4.0
Multiplication	*	Multiplies two values.	2 * 3 1.5 * 2 "Hi" * 3	6 3.0 'HiHiHi'
Division	/	Divides the first number with the second number.	4 / 2 6.0 / 2 6 / 2.0 11 / 2	2.0 3.0 3.0 5.5
Remainder or Modulus	%	Returns the remainder of a division.	5 % 2 16 % 11	1 5
Exponential	**	Second number raised to the power of the first number.	5 ** 2 1.5 ** 2	25 2.25

Floor division	//	Divides the first number with the second number and returns the whole number adjusted left to the number line.	11 // 2 -11 // 2 13 // 4 -13 // 4	5 –6 3 –4

6. Comments are used to increase the readability of the code. We use them to give a proper understanding of the code in simple English statements. They are completely ignored by the Python interpreter. It is always a good practice to add comments in your code so that if anybody in the future wishes to understand or modify your code, then through comments it will be easy to interpret the instructions. There are two different ways of writing comments in Python. Let us learn about them in detail.

   Single Line Comment

   Single line comment starts with hash symbol # followed by the text to be written as a comment that lasts until the end of the line.

   For example,

```
# assigning a value to a variable
    num1 = 10
    num2 = 20
# calculating the average
    (num1 + num2) / 2
```

   Multiple Line Comments When we add up comments which occupy two or more lines then we begin the comment with either 3 times single quotes ''' or double quotes """, followed by text on multiple lines and end with single quotes ''' or double quotes """ to mark the end of the comment.

   For example,

```
"""This program calculates the average
  of two numbers stored
  in two different variables"""
  a = 10
  b = 20
  c = (a + b) / 2
```

7. Numbers: Data with a numeric value falls into this category. It can be integer, float and complex. Python will automatically convert a number from one type to another if needed. Following are some number types:

   - **Integer:** Integers are whole numbers (+ve, -ve or 0) with no fractions or decimal value. Range of an integer in Python can be from -2147483648 to 2147483647, and long integer has unlimited range subject to available memory. For example, 10, 124, 4567, 7812568751.

- **Float:** It is a real number with floating point representation. For example, 15.5 and 12.0. It can also be represented using the exponent notation E. For example, 1E5 is 100000.
- **Complex:** It is made up of a real number and an imaginary number. For example, 3+2j where 3 is a real number, 2 is an imaginary number, and j is the imaginary unit.

8. There are three kinds of errors which a programmer encounters in Python: syntax error, logical error and runtime error. Let us learn about them in detail.

Syntax Error

Syntax refers to the rules for writing code in the Python language. A syntax error occurs when these rules are violated. This is the most common type of error made by a programmer.

Syntax errors can result from typing errors, incorrect indentation, or providing incorrect arguments to a function. When Python encounters a syntax error, it cannot interpret the instruction and will raise an error. In IDLE, syntax errors are highlighted by an arrow, indicating the line where the error occurred. You can then go to that line to rectify the error. Some examples of syntax errors include:

```
a + b = c
SyntaxError: cannot assign to operator

myname = Arshia
SyntaxError: EOL while scanning string literal

a = 5
b = 10
  c = a + b
SyntaxError: unexpected indent

print("Python"))
SyntaxError: unmatched ')'
```

Logical Error

This kind of error is difficult to find since the program will run correctly but the desired output is not achieved. This happens if we give a wrong formula for the calculation to be done, write wrong logic for the problem to be solved through the code.

For example, To calculate the average:

p = marks1 + marks2 / 2 #instead of (marks1+marks2) / 2

Preceding code produces a wrong output due to the logical error in formula. Let us take another example.

To find the perimeter of rectangle,

p = 2 * l + b #instead of p = 2 * (l + b)

Runtime Error Runtime errors occur during the execution of a program and can result from various issues such as incorrect input or output, undefined object errors, or division by zero errors. These errors can halt the program's execution unexpectedly, making them challenging to debug.

Example of runtime error is:

```
a = int(input("enter first number"))
b = int(input("enter second number"))
c = a / b If a = 5 and b = 0,
```

then it will display:

ZeroDivisionError: division by zero

9. Type conversion is the process of converting the value of one data type into another data type. It is commonly used in programming when data needs to be manipulated or matched with a different data type for a particular operation.

   There are two types of type conversion in Python:

   1. Implicit Type Conversion (Automatic Conversion)

      In this type, Python automatically converts one data type to another without user involvement. This usually happens when a smaller data type is combined with a larger data type.

   Example:

```
x = 10      # Integer
y = 2.5     # Float
z = x + y   # Integer + Float → Float
print(z)    # Output: 12.5
print(type(z))  # Output: <class 'float'>
```

   2. Explicit Type Conversion (Type Casting)

      In this type, the programmer manually converts the data type using built-in functions like int(), float(), str(), bool(), etc.

   Example:

```
a = "100"
b = int(a)   # Converting string to integer
print(b + 50)  # Output: 150
```

   In this example, a is a string. It is explicitly converted to an integer using int() before performing arithmetic.

10. The for Loop The for loop is used to repeat a set of instructions for a fixed number of times. This means the number of iterations are known/definite before we start the execution of the loop. Therefore, the for loop is also known as definite loop. Indentation of statements is must to specify the block of statements to be repeated using the for loop.

There are commonly two different ways of using the for loop:

• Using Sequence: In this type of for loop, a sequence of values is used over which the loop iterate. The syntax to use the for loop with a sequence is:

```
for <counter variable> in <sequence> :
          Statements
```

Different examples of for loop are:

Commands	Output
`for i in [1,2,3,4]:` `  print(i)`	1 2 3 4
`for words in ["hello", "friends", "how are you?"]:` `  print(words)`	hello friends how are you?
`for alphabets in "hello!":` `  print(alphabets)`	h e l l o !

Using the range() Function: The range( ) function is an inbuilt function that is used to generate a sequence of values between the specified range. The syntax to use the for loop with a range () function is:

```
for <Var> in range(<Start>, <End>, <Step>):
      Statements
```

Different examples of for loop with the range( ) function are:

Commands	Output

`for count in range(1,6,1):`
`  print("hello")`
`print("Program ends")`
	hello
	hello
	hello
	hello
	hello
	Program ends

`for var in range(1,10,2):` `  print(var,end=",")`	1,3,5,7,9

`for count in range(1,10):` `    print(count,end=",")`	1,2,3,4,5,6,7,8,9

The while loop is used to repeat a set of instructions as long as the condition is true. It means when the number of iterations are not fixed/indefinite before we start with the execution of a loop. Therefore, it is known as an indefinite loop. Indentation of statements is required to specify the block of statements to be repeated using a while loop. This loop is also called an entry-controlled loop as it checks for the condition in the beginning. If the condition is 'True' then the body of the loop will be executed. If the condition is 'False' then it will not be allowed to enter within the loop and it stops. The syntax of the while loop is:

```
while <condition>
    Statements
```

The different examples of while loop are:

Commands	Output

`count=1`
`while count<=5:`
`    print("hello")`
`    count+=1`
`print("Program ends")`
	hello
	hello
	hello
	hello
	hello
	Program ends

`i = 1`
`while i < 6:`
`  print(i)`
`  i += 1`
	1
	2
	3
	4
	5

```
"""Input a number and check for even or odd.
The whole process should continue till the user
wants"""
ans = "y"
while ans=="y":
    num=int(input("enter a number:"))
    if num%2==0:
       print(num," is Even")
    else:
       print(num," is Odd")
    ans=input("Press 'y' to continue:")
print("Program ends here")
```

```
enter a number: 3
3 is Odd
Press 'y' to continue: y
enter a number: 6
6 is Even
Press 'y' to continue: y
enter a number: 12
12 is Even
Press 'y' to continue: n
Program ends here
```

11. Rules:
    - for, in, and range are keywords.
    - Start, End, and Step are parameters of range() function and will always be integers.
    - Start is a starting value of loop, End is an ending value (not inclusive) of loop, and Step is the number of steps taken to reach the end value.
    - If only two parameters are used then Step value becomes 1 by default.
    - If only one parameter is used the Start becomes 0 and Step becomes 1 by default.
    - If Start > End then Step should be a negative integer.
    - If Start < End then Step should be a positive integer.
    - If Start >= End and Step value is not specified, the loop will not execute as this is an invalid condition.
12. There are two different functions used to remove elements in an existing list remove() and pop(). Let us learn about these functions in detail.

    The remove( ) Function The remove() function removes the first occurrence of the element with the specified value. It means only one value can be removed at a time even if there are duplicate values in the list. If you wish to remove multiple values then this function can be used within a loop where it repeats itself a specific number of times.

    The syntax of the remove() function is:

    ```
    list.remove(<single value>)
    ```

    For example,

Commands	Output

`marks = [23, 34, 23, 45, 56, 78, 56]`
`marks.remove(23)`
`print(marks)`
	[34, 23, 45, 56, 78, 56]

`marks = [23, 34, 23, 45, 56, 78, 56]`
`marks.remove(56)`
`print(marks)`
	[23, 34, 23, 45, 78, 56]

`marks = [23, 34, 23, 45, 56, 78, 56]`
`marks.remove(72)`
`print(marks)`
	ValueError: list.remove(x): x not in list

The pop( ) Function The pop() function removes an element from the list based on the index number specified in the function and returns the deleted value. In case no index number is given then by default it removes the last element from the list. If we try to remove an index number which does not exist then it gives an IndexError. For example,

Commands	Output

`vowels=['a', 'e', 'i', 'o', 'u']`
`val=vowels.pop(2)`
`print(val)`
	i

`vowels=['a', 'e', 'i', 'o', 'u']`
`val=vowels.pop()`
`print(val)`
	u

`vowels=['a', 'e', 'i', 'o', 'u']`
`val=vowels.pop(6)`
`print(val)`
	IndexError: pop index out of range

`lst=[]` `lst.pop()`	IndexError: pop from empty list

13. The * operator is used to replicate a list by a specific number of times. With * operator, one operand has to be a list and the other should only be an integer, otherwise it will give an error. For example,

Commands	Output

`A = [1, 2, 3]`
`B = A * 3`
`print(B)`
	[1, 2, 3, 1, 2, 3, 1, 2, 3]

`X = 5`
`A = [X] * 3`
`print(A)`
	[5, 5, 5]

`name = "Amit"`
`L1= [name] * 4`
`print(L1)`
	['Amit', 'Amit', 'Amit', 'Amit']

`name = "Amit"`
`L1 = [name] *`
`"a"`
	TypeError: can't multiply sequence by non-int of type 'str'

14. There are two main ways of indexing in a list in Python:

Positive Indexing: In positive indexing, the index starts from 0 for the first element and increases by 1 for each subsequent element.

Example:

```
fruits = ['apple', 'banana', 'cherry', 'date']
print(fruits[0])  # Output: apple
print(fruits[2])  # Output: cherry
```

Negative Indexing: In negative indexing, the index starts from -1 for the last element and goes backward.

Example:

```
fruits = ['apple', 'banana', 'cherry', 'date']
print(fruits[-1])  # Output: date
print(fruits[-3])  # Output: banana
```

C. 1.

```
a = int(input("Enter first angle: "))
b = int(input("Enter second angle: "))
c = int(input("Enter third angle: "))
  if a + b + c == 180:
      print("The angles form a triangle.")
  else:
      print("The angles do not form a triangle.")
```

2.
```
seconds = int(input("Enter time in seconds: "))
minutes = seconds / 60
print("Time in minutes:", minutes)
```
3.
```
area = (22 / 7) * 5 * 5
print("Area of the circle:", area)
```
4.
```
length = int(input("Enter length: "))
breadth = int(input("Enter breadth: "))
if length == breadth:
    print("It is a square.")
else:
    print("It is not a square.")
```
5.
```
day = int(input("Enter a number (1-7): "))
weekdays = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday",
"Saturday", "Sunday"]
if 1 <= day <= 7:
    print("Weekday is:", weekdays[day - 1])
else:
    print("Invalid number.")
```
6.
```
val1 = False
val2 = 15.6
print(val1 and val2)
```
7.
```
salary = float(input("Enter salary: "))
years = int(input("Enter years of service: "))
if years > 5:
    bonus = salary * 0.15
    salary += bonus
print("Net salary:", salary)
```
8.
```
val1 = "Zero"
val2 = True
print(bool(val1) + val2)
```
9.
```
amount = float(input("Enter billing amount: "))
if amount > 5000:
    discount = amount * 0.10
    amount -= discount
```

```
print("Net billing amount:", amount)
```

10.
```
val1 = True
val2 = "Hello"
print(str(val1) + val2)
```

11.
```
val1 = "Morning "
val2 = 90.4
try:
    print(float(val1) + val2)
except ValueError:
    print("Cannot convert string to float.")
```

Ai Lab (Page 428)

1. Write an algorithm for calculating the Net salary of a person (Net Salary = Basic + Allowances – Deductions). Take the Basic, Allowances and Deductions as input.

   Step 1 Start
   Step 2 Input Basic, Allowances, and Deductions
   Step 3 Calculate Net Salary = Basic + Allowances – Deductions
   Step 4 Print Net Salary
   Step 5 End

2. Step 1 Start
   Step 2 Input mark1 and mark2
   Step 3 If mark1 > mark2, print mark1
   Else, print mark2
   Step 4 End

3. a.
```
c = float(input("Enter temperature in Celsius: "))
f = (c * 1.8) + 32
print("Temperature in Fahrenheit:", f)
```

   b.
```
names = [input("Enter name: ") for _ in range(5)]
print(" ".join(names))
```

   c.
```
a = input("Enter first value: ")
b = input("Enter second value: ")
temp = a
a = b
b = temp
```

```
print("After swapping:", a, b)
```

d.
```
km = float(input("Enter distance in kilometre: "))
m = km * 1000
print("Distance in metre:", m)
```

e.
```
side = float(input("Enter side of square: "))
area = side * side
print("Area of square:", area)
```

f.
```
lst = [1, 2, 3, 4, 5, 6]
for i in range(0, len(lst)-1, 2):
    lst[i], lst[i+1] = lst[i+1], lst[i]
print("Updated list:", lst)
```

g.
```
cities = [input("Enter city: ") for _ in range(5)]
name = input("Enter city to search: ")
if name in cities:
    print("City found in the list.")
else:
    print("City not found.")
```

h.
```
marks = [float(input("Enter marks: ")) for _ in range(5)]
total = sum(marks)
percentage = total / 5
print("Percentage:", percentage)
```

i.
```
lst = [10, "hello", 3.14, True, 25]
for item in lst:
    if type(item) == int:
        print(item)
```

j.
```
marks = [int(input("Enter marks: ")) for _ in range(5)]
for mark in marks:
    if mark > 50:
        print(mark)
```

4. a. 345 - 430 = 135 - 120 = 15

Output: 15

b.
```
word=['P','R','O','G','R','A','M']
print(word[-4:])       # ['G', 'R', 'A', 'M']
print(word[::-2])      # ['M', 'R', 'O', 'P']
```

c.
```
word=['P','R','O','G','R','A','M']
print(word.count('R'))     # 2
print(word.index('R'))     # 1
```

d.
```
L=[1,2,3]
L*=3
print(L)              # [1, 2, 3, 1, 2, 3, 1, 2, 3]
```

e.
```
list1=[10,20]
list2=[30,40]
list1.append(25)
print(list1)          # [10, 20, 25]
list1.extend(list2)
print(list1)          # [10, 20, 25, 30, 40]
```

Ai Ready 5

1.
```
my_list = [1, 2, 3]
my_list[1] = 'Python'
my_list.append(5)
print(my_list)
```

2.
```
sentence = input("Enter a sentence: ")
reversed_sentence = sentence[::-1]
print(reversed_sentence)
```