Computer& Information Communication Technology



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Preparatory Three

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Information and Communication Technology (ICT)

Student's Book

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Unit 1:

Artificial Intelligence and Programming Languages



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Lesson 1: Computational Thinking and Problem Solving



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Lesson 1: Computational Thinking and Problem Solving

Lesson Objectives:

By the end of the lesson, students will be able to:

- Explain the meaning of **computational thinking**.
- Identify the steps of **problem solving.**
- Write a simple **algorithm.**

Dear student.. you face many problems in your daily life, such as solving a mathematic problem or organizing your time. **Have you ever thought that there is a systematic way to solve such problems?**

In this lesson, we will explore together a systematic method of thinking known as "computational thinking." It is a way of thinking that computers use to solve problems, and you can use it too.

In this lesson, we will learn about **computational thinking** — a systematic way of thinking that imitates how a computer processes and solves problems. You can also use it in your daily life.

First: What Is Computational Thinking?

Dear Student, before we start writing any program, we first need to learn how to think correctly and systematically.

Definition of Computational Thinking

Computational thinking is a systematic way of thinking that helps us solve problems like a computer.

Steps of Computational Thinking

Computational thinking is based on four main steps:

1. **Problem Decomposition** — breaking a large problem into smaller parts.
2. **Pattern Recognition** — identifying similarities between problems.
3. **Abstraction** — focusing on the important information and ignoring unnecessary details.
4. **Algorithm Design** — developing clear, specific, and ordered steps to solve the problem.

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Second: Steps for solving a Problem

Dear student, after learning about computational thinking, we now need to apply it practically through clear steps for solving a problem.

We follow these steps when trying to solve a problem:

Steps:

1.Understanding the Problem

2.Identifying the Inputs and Outputs

3.Developing the Solution Steps (Algorithm)

4.Converting the Solution into Code

5.Testing the Solution

Dear student, remember that the steps for solving a problem are not separate from computational thinking; rather, they are a practical application of it.

For example:

- When **understanding the problem** → we use **Problem Decomposition.**
- When **identifying the inputs and outputs** → we use **Abstraction.**
- When **writing the algorithm** → we use **Algorithm Design.**
- When **solving similar problems** → we use **Pattern Recognition.**

Therefore, we can say that computational thinking is the foundation on which we rely at every step.

Dear Student, now that we have understood the basic concepts, let us move on to practical applications, where we will use computational thinking to solve a set of simple problems.

Introductory Example: Adding Two Numbers

The Problem

- Calculate the sum of two numbers entered by the user.

The Four Steps of Computational Thinking

1. Problem Decomposition

- We need two numbers from the user.
- We need an addition operation.
- We need to display the result.

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2. Pattern Recognition

The process is repeated: Input ⟶ Processing ⟶ Output

3. Abstraction

- We focus only on the two numbers and the result.
- We do not need to consider the window color or font type.

4. Algorithm

1.Start.

2.Read the first number **(num1).**

3.Read the second number **(num2).**

4.Calculate **sum = num1 + num2.**

5.Print sum.

Common warning;

If the user enters text (such as **"five"**) instead of a number, a **ValueError** will occur

Reason: The int() function cannot convert Arabic or English text into an integer

Example 1: Determining Whether a Number Is Even or Odd

Dear student, let us begin with a simple example to illustrate the idea.

Computational Thinking Steps:

1. Problem Decomposition

- We need a number from the user.
- We need to determine whether the number is divisible by 2.

2. Pattern Recognition

- Any even number → its remainder when divided by 2 is 0.
- Any odd number → its remainder ≠ 0.

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3. Abstraction

We focus only on:

- The number.
- The remainder of the division.

4. Algorithm

1.Enter the number.

2.Calculate the remainder when the number is divided by 2.

3.If the remainder = 0 ⟶ **even**.

4.Otherwise ⟶ **odd.**

Code

```
num = int(input("Enter a number: ")
if num % 2 == 0:
    print("Even number")
else:
    print("Odd number")
```

Explanation

Dear student, notice that we started by thinking about the problem and then wrote the code. This is the purpose of computational thinking.

- **input()** ⟶ input from the user
- **int()** ⟶ converts the input into an integer
- **num % 2** ⟶ the remainder of the division
- **== 0** ⟶ Does it equal zero?
- **if** ⟶ executes a condition
- **else** ⟶ in the other case

Example 2: Calculating the Average of Three Numbers

Now that we understand the first example, let us move on to another example based on the same idea.

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Here, we use **Pattern Recognition** because the solution method is similar to that in other mathematical problems.

Computational Thinking

1. Problem Decomposition

- Enter three numbers.
- Add them.
- Divide the sum by 3.

2. Pattern Recognition

- **Arithmetic Mean = Sum of the values ÷ Number of values**

3. Abstraction

We focus only on:

- The three numbers.
- The final result.

4. Algorithm

1.Enter three numbers.

2.Add them.

3.Divide the sum by 3.

4.Display the result.

Code

```
a = int(input("Enter first number: "))
b = int(input(" Enter second number: "))
c = int(input("Enter third number: "))
avg = (a + b + c) / 3
print("Average =", avg)
```


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Explanation

- a + b + c → adding the numbers.
- / 3 → Calculating the Arithmetic Mean
- avg → a variable for storing the result.
- print() → displaying the result.

Note: Why Did We Use float Instead of int Here?

Because the Arithmetic Mean may be a decimal number (such as 85.5). If we use int(), we lose precision.

Example 3: Calculating the Area of a Rectangle

Dear Student, notice the connection between programming and mathematics. We use a familiar formula and convert it into code.

Computational Thinking

1. Problem Decomposition

- Enter the length and width.
- Calculate the area.

2. Pattern Recognition

- **Area = Length × Width**

3. Abstraction

We focus only on:

- The length.
- The width.

4. Algorithm

1.Enter the length.
2.Enter the width.
3.Multiply them.
4.Display the result.

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Code

```
length = int(input("Enter length: "))
width = int(input("Enter width: "))
area = length * width
print("Area =", area)
```

Explanation

- **length * width → calculates the area.**
- **area → stores the result.**
- **print() → displays the area.**

Example 4: Finding the Larger of Two Numbers

Now let us move on to using comparison, which is an extension of what we have learned about conditions.

Computational Thinking

1. Problem Decomposition

- **Enter two numbers.**
- **Compare them.**

2. Pattern Recognition

- The larger number is the number with the greater value.

3. Abstraction

- We focus only on comparing the two numbers.

4. Algorithm

1.Enter two numbers.
2.If the first number is greater ⟶ print it.
3.Otherwise ⟶ print the second number.

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Code

```
a = int(input("Enter first number: "))

b = int(input("Enter second number: "))

if a > b:
    print("The larger number is:", a)
else:
    print("The larger number is:", b)
```

Explanation

- a > b → **Comparison**
- If the condition is true → the if statement is executed.
- If the condition is false → the else statement is executed.

5-Example 5: Calculating the Sum of the Numbers from 1 to 5

Dear Student…after learning about arithmetic operations and conditions, we can use **loops here** to make the solution easier.

👉 **This shows how programming concepts are connected (variables + conditions + loops).**

Computational Thinking

1. Problem Decomposition

- We want to add the numbers from 1 to 5.
- We need repetition.

2. Pattern Recognition

- The numbers increase gradually.
- We add each number to the total.

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3. Abstraction

We focus only on:

- The current number.
- The total.

4. Algorithm

1.Set the sum = 0

2.Repeat from 1 to 5

3.Add each number to the sum

4.Display the result.

Code

```
sum = 0
for i in range(1, 6):
    sum += i
print("Sum =", sum)
```

Explanation

sum = 0 → the initial value.

for → a repetition loop

range(1, 6) → from 1 to 5

sum += i → gradual addition.

i → the current number.

Activity:

Dear Student, after these examples, try to apply what you have learned on your own.

The Problem

A student scored **3 marks.** Determine whether the student **passed or failed.**

Required:

- Write the steps of **computational thinking.**
- Then write **the code.**

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Questions and Exercises

First: Put (✓) in front of the correct statement and (✗) in front of the incorrect statement.

1.Computational thinking is a systematic way of thinking that helps us solve problems in a way that simulates how a computer works. ( )

2.Problem Decomposition means focusing on important information and ignoring unnecessary details. ( )

3.Pattern Recognition helps us identify similarities between different problems to make solving them easier. ( )

4.Algorithm Design involves developing specific and ordered steps to solve the problem. ( )

5.The steps of solving the problem are completely separate and have no relation to the steps of computational thinking. ( )

6.When identifying the inputs and outputs of a problem, we use the skill of Abstraction. ( )

7.In Python, the int() function is used to convert text into integers. ( )

8.The int() function can automatically convert Arabic text, such as the word "five," into the number 5 without errors. ( )

9.In Python, the symbol % is used to calculate the remainder of a division. ( )

10.If the remainder when a number is divided by 2 is zero, this means that the number is odd. ( )

11.The input() function is used to display results and outputs on the screen. ( )

12.It is preferable to use the int data type instead of float when calculating an average to avoid losing accuracy when the result is a decimal number. ( )

13.To calculate the area of a rectangle programmatically, we use addition of the length and width. ( )

14.In Python, the symbol == is used to test equality between two values in conditional statements. ( )

15.The statement written after else is always executed, regardless of whether the condition in if is true or false. ( )

16.The range(1, 6) function in Python generates the numbers 1, 2, 3, 4, 5, and 6. ( )

17.The for loop is used to repeat a block of code a specified number of times to make solving a problem easier. ( )

18.Testing the solution is the final step in the problem-solving process mentioned in the lesson. ( )

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19.When understanding a problem at the beginning, we directly apply the skill of Algorithm Design. ( )

20.In the example of adding two numbers, Abstraction means paying attention to the window color and the font type used in the program. ( )

Second: Choose the correct answer from the following options:

1. Which of the following represents the first and basic step in computational thinking skills when facing a new problem?

A. Pattern Recognition
B. Problem Decomposition
C. Abstraction
D. Algorithm Design

2. What is the scientific term in computational thinking that refers to focusing on important information and excluding unnecessary details?

A. Algorithm
B. Problem Decomposition
C. Pattern Recognition
D. Abstraction

3. When developing specific and logically ordered steps to reach a solution to a problem, we are carrying out:

A. Algorithm Design
B. Abstraction
C. Identifying the Inputs
D. Translating the Solution into Code

4. What will happen if the user enters a text word such as "ten" instead of the number 10 when using the int() function in Python?

A. It will be successfully converted to the number 10.
B. The variable will be assigned the value 0.
C. A ValueError will occur.
D. The input will be ignored and the program will continue

5. Which of the following functions is used in Python to receive data directly from the user while the program is running?

A. print()
B. int()
C. range()
D. input()

6. In the statement if num % 2 == 0, what does the symbol % represent mathematically?

A. Percentage
B. Long division
C. Remainder of division
D. Repeated multiplication

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7. In programming, if we want to calculate the average of three numbers (a, b, c), which of the following expressions is logically and mathematically correct?

A. a + b + c / 3
B. a + (b + c) / 3
C. (a + b + c) / 3
D. a * b * c / 3

8. Why is it recommended to use the float data instead of int when calculating an arithmetic average?

A. Because it makes the program run faster.
B. Because int uses more storage space.
C. To preserve accuracy and avoid losing the decimal part of the result.
D. Because the int() function does not support the print() data type.

9. When calculating the area of a rectangle, which computational thinking skill enables us to infer that Area = Length × Width based on previously known rules?

A. Problem Decomposition
B. Abstraction
C. Pattern Recognition
D. Algorithm Design

10. In conditional statements, which reserved word is used to execute a block of statements only when the initial if condition is not true?

A. for
B. elif
C. else
D. print

11. What is the most appropriate programming tool for efficiently calculating the sum of the numbers from 1 to 100 using the fewest lines of code?

A. if and else conditions
B. Repetition loops such as for
C. Multiple print statements
D. Mathematical comparison

12. What values will the variable i take in sequence in the following loop: for i in range(1, 4)?

A. 1, 2, 3, 4
B. 1, 2, 3
C. 3, 2, 1
D. 2, 3, 4

13. Which step in the problem-solving process directly corresponds to the computational thinking skill of Algorithm Design?

A. Understanding the Problem
B. Identifying the Inputs and Outputs
C. Developing the Solution Steps
D. Testing the Solution

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14.Which step comes after Translating the Solution into Code in the problem-solving process?

A. Developing the Solution Steps
B. Testing the Solution
C. Identifying the Outputs
D. Problem Decomposition

15. In the code sum += i, what does this operation mean in programming?

A. sum = sum - i
B. sum = sum + i
C. sum = i + 1
D. sum = i

16. In the example of determining the larger of two numbers, we use the skill of Abstraction by:

A. Paying attention to the type of numbers and their formatting
B. Focusing only on comparing the two input numbers
C. Repeating the input process several times
D. Calculating the average of the two numbers

17. Computational thinking is a skill limited only to computer programmers and cannot be used in daily life.

A. Completely true
B. True, when writing code only
C. False; it is a systematic method that we can use to solve problems in our daily lives
D. False; because it is used only in mathematics

18. Which of the following statements correctly describes the relationship between computational thinking and the steps of problem solving?

A. Computational thinking is the theoretical foundation, while the steps of problem solving are its practical application.
B. They are exactly synonymous terms, with no difference between them.
C. The steps of problem solving use only Abstraction and not the other skills.
D. Computational thinking is always applied after completing the steps of problem solving.

19. If the condition written in the if statement evaluates to False, which path will the program take?

A. The program stops working completely.
B. The statement following else is executed, if present.
C. The condition is executed again.
D. The statements following if are executed anyway.

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20. When solving the problem of determining whether a student has passed based on 3 marks, what is the logical first step in developing the algorithm?

A. Calculate the total immediately.
B. Compare the score with the passing mark.
C. Enter the three marks.
D. Print the result.

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Lesson 2: Artificial Intelligence Algorithms

Lesson Objectives

By the end of the lesson, students will be able to:

- **Explain different types of algorithms.**
- **Distinguish between traditional algorithms and artificial intelligence algorithms.**
- **Write simple algorithms in Python.**

In the world of technology around us, the programs and applications we interact with every day work according to **organized and precise steps** to solve problems and perform tasks. These steps are known as algorithms. They are the foundation on which all programs are built, from the simplest arithmetic operations to the most complex systems.

Dear student: Imagine that you want to make a cup of tea. You would follow a set of steps in order: boil the water – add the tea – add the sugar. These sequential steps are a simple example of the concept of an algorithm in programming.

First: What Is an Algorithm?

Algorithm: A set of ordered and logical steps for solving a specific problem.

Example

Problem:

Determine whether a number is even or odd.

Algorithm:

1.Enter the number.

2.If it is divisible by 2 → Even.

3.Otherwise → Odd.

Dear student… notice that an algorithm is like instructions you give someone to solve a problem step by step. The clearer the instructions are, the easier the solution is.

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Dear student: When drawing a flowchart, you should notice that each shape is used correctly. The arrows should also be arranged clearly to show the sequence of execution from beginning to end.

Oval: Used for the beginning and end.	
Rectangle: For arithmetic operations or fixed steps.	
Parallelogram: Used for input and output.	
Diamond: Used for decision making (condition).	

Second: Types of Algorithms

Dear student: Now that you understand what an algorithm is, let's learn about the main types used in programming.

1. Sequential Algorithms

It is executed step by step in a fixed order, where each step depends on the one before it.

Example: Enter a name, then print the name preceded by the word "Hello".

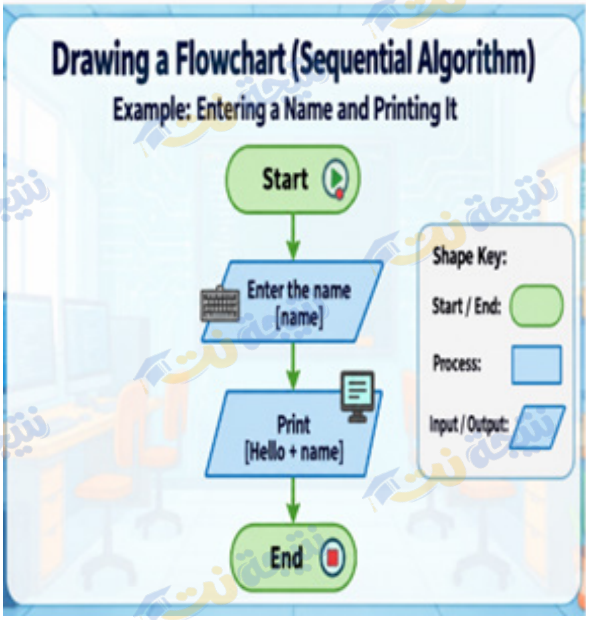
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Flowchart

Step 1: Print a message to enter the name.

Step 2: Enter the name.

Step 3: Print the name.



Flowchart

Step 1: Print a message to enter the name.
Step 2: Enter the name.
Step 3: Print the name.

Code:

```
print("Enter your name:")
name = input()
print("Hello", name)
```

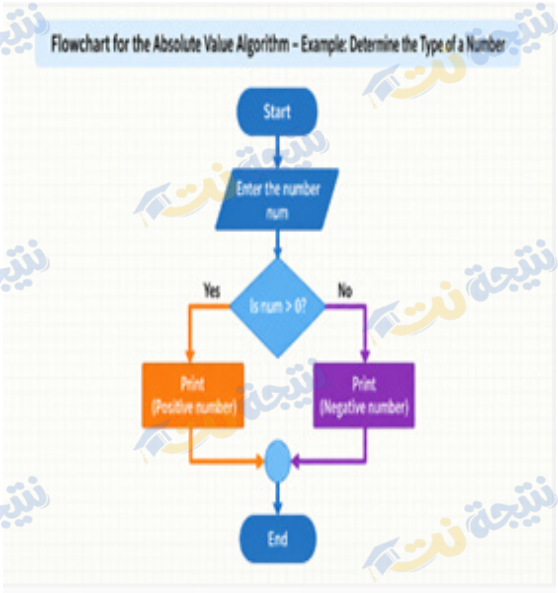
Explanation: The commands are executed in order from top to bottom.

Dear student: This type is very simple, like reading a book from the first page to the last one.

2. Conditional Algorithms

They depend on an **If statement condition.**

Example: Enter a number, then determine whether it is even or odd.



- **Start:** The starting point of the program.
- **Enter the number (num):** Receives the value from the user.
- **Make a decision** (Is num > 0?):
  - If the answer is Yes, the program moves to print **"Positive number."**
  - If the answer is No, the program moves to print **"Negative number."**

Code

```
num = int(input("Enter a number:"))
if num > 0:
 print("Positive number")
else:
print("Negative number")
```

Explanation: If the condition is met → execute; **if not** → execute the alternative.

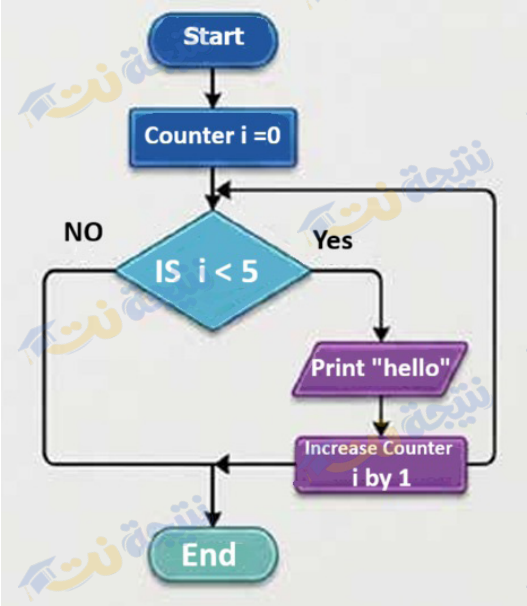
Dear student: This is like making a decision in everyday life: **If you study, you pass; otherwise, you need to study more.**

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3. - Iterative Algorithms (Loops)

Repeat the same operation several times.

Example: Print the word "Hello" 5 times.



Code

```
for i in range(5):
    print("Hello")
```

- **Start:** The starting point of the algorithm.
- **Counter i** = 0: Set the initial value of the variable used for counting.
- Is i < 5?: This condition determines whether the repetition continues.

If Yes: The program prints "Hello", increases the counter by 1, and checks the condition again.

If No: The program stops and moves to the end.

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Explanation: The code is repeated 5 times.

Dear Student: Repetition saves time and effort instead of writing the same code several times.

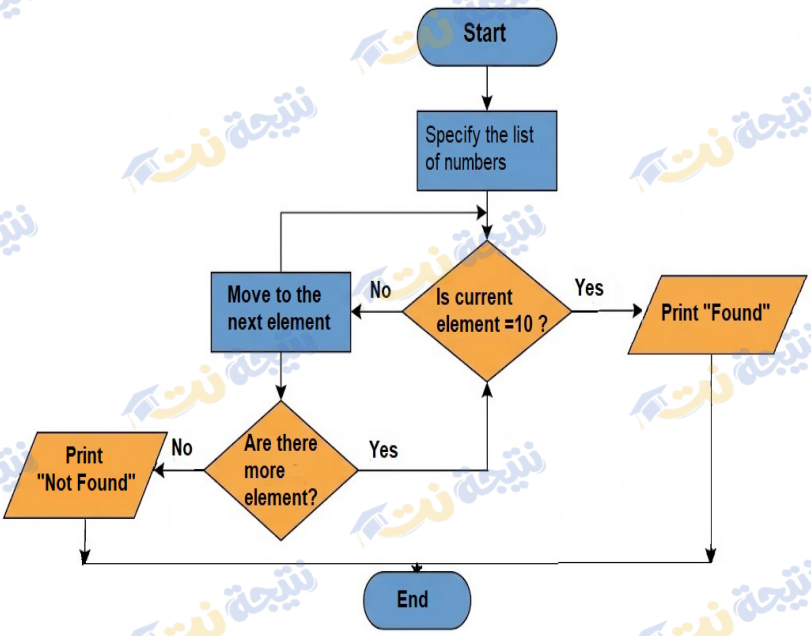
4. Search Algorithms

They are used to find an element.

Example: Enter a list of elements, then search for the number 10. If it is found, print "Found"; if it is not found, print "Not Found".

Flowchart

Algorithm : search for number 10



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Start: The starting point of the algorithm.

Specify the list: Enter the data to be searched.

Check the element: Check whether the current element is the number 10.

Yes: Print "Found", then move to the end.

No: Move to check whether there are more elements.

Repetition: If there are more elements, the program moves to the next element and repeats the check. If there are no more elements, the process ends.

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```
numbers = [3, 7, 10, 5]
target = 10
for num in numbers:
if num == target:
    print("Found")
```

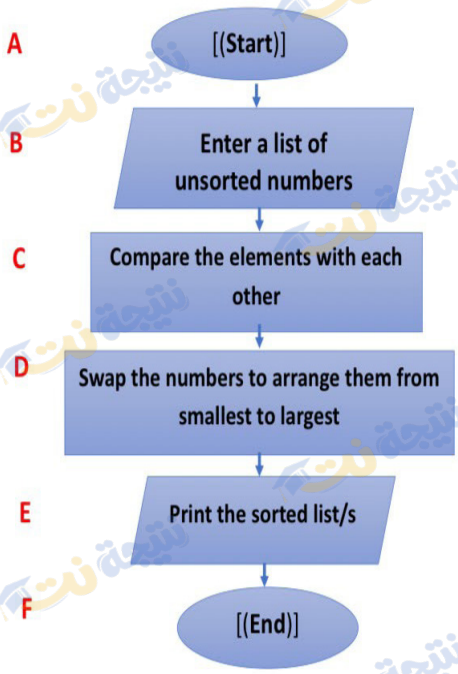
Dear student: Imagine that you are searching for your name in a list of students. This is the idea of searching.

5. Sorting Algorithms

They are used to arrange data.

Example: Enter a list of numbers, then sort them.

Flowchart



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```
numbers = [5, 2, 9, 1]
```

```
numbers.sort()
print(numbers)
```

Dear student: Sorting helps you organize data, such as arranging numbers from smallest to largest.

Third: What Are Artificial Intelligence Algorithms?

Dear student: After reviewing traditional algorithms, let us move on to a newer, smarter, and more advanced generation: algorithms that **learn from data** rather than simply executing fixed, predefined steps.

In simpler terms: Instead of giving the program detailed step-by-step instructions, we provide it with a set of examples and data to learn from and independently figure out how to solve the problem.

Dear student: Artificial Intelligence includes several types of algorithms, each with its own way of learning. Let us explore them together in a simple, updated way.

1. Machine Learning

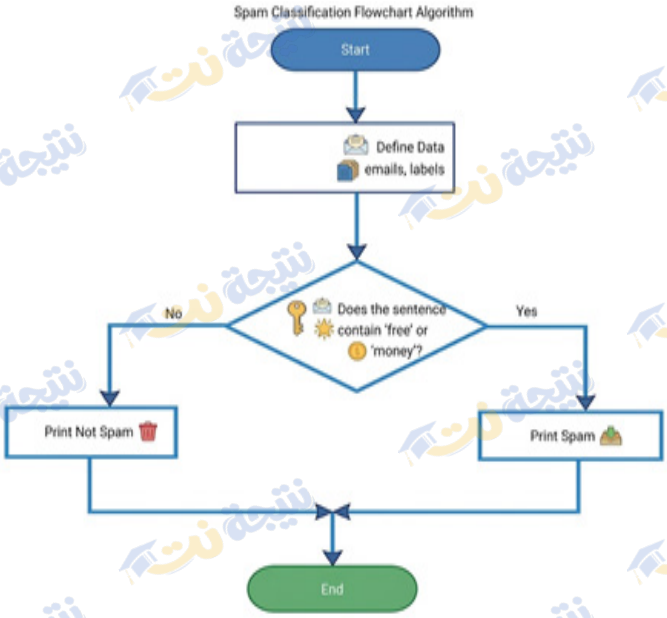
Concept: It is a type of artificial intelligence that enables computers to learn from data and make decisions without being programmed for every step in detail.

Imagine that you are teaching a young child to tell the difference between an **apple** and an **orange.** You show the child many pictures and tell them, **"This is an apple"** and **"This is an orange."** Over time, the child learns to distinguish between them. Artificial intelligence does something similar, but using algorithms and data!

Example: A program learns to distinguish between:

- Spam email
- Regular email

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Code

```
# Training data
emails = [“win money”, “hello friend”, “free prize”]
labels = [“spam”, “not spam”, “spam”]
# Test
test = “free money”
if “free” in test “ormoney” in test:
    print(“ Spam”)
else:
    print(“Not Spam”)
```

This is a simplified example of the idea of learning.

Dear student: This is similar to learning from a teacher. You learn from previous examples and then apply what you have learned to new situations

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2. Deep Learning

Concept: Deep learning is an advanced type of machine learning that uses **neural networks** to imitate some aspects of how the human brain works.

Examples:

•**Image recognition** (distinguishing cats from dogs)

•**Speech recognition** (such as voice assistants)

Dear student: This type is used in smart applications such as **facial recognition on mobile phones and language translation.**

Dear student: (Summary)

•**Machine Learning** = Learns from data.

•**Deep Learning** = An advanced type of machine learning that uses neural networks.

Dear student: It is like training a player or a robot to improve its performance over time.

The Difference Between Traditional Algorithms and Artificial Intelligence Algorithms

Dear student: It is important to understand the difference between the two types.

Traditional Algorithms	AI Algorithms
Fixed steps	Learn from data
unchanging	Improve over time
Fully programmed	Depend on training

Example

A simple program predicts:

Is the student passing or failing?

```
score = int(input("Enter score: "))
if score >= 50:
    print("Pass")
else:
    print("Fail")
```


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Dear student: Try to improve this program so that it gives more detailed results, such as

Excellent – Good – Weak.

Interesting Fact

The algorithm behind **ChatGPT,** which amazed the world, was trained on vast amounts of text from sources such as books, articles, and websites. Thanks to this extensive training, it can understand complex questions and respond to them in a human-like way.

Lesson Summary

- **Algorithm** = Steps for solving a problem.
- **Types:** Sequential – Conditional – Iterative – Search – Sorting.
- **Artificial Intelligence:** Learns from data and includes different types, such as supervised, unsupervised, and reinforcement learning.

Dear student: The more you practice writing algorithms, the better programmer you will become, and the more easily you will be able to solve problems.

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Questions and Exercises

First: Put (✓) next to the correct statement and (✗) next to the incorrect statement.

1.An algorithm is a set of ordered and logical steps for solving a specific problem. ( )

2.The oval shape in a flowchart is used for calculations. ( )

3.Sequential algorithms depend on each step following the previous one. ( )

4.The if statement in programming is used only in iterative algorithms. ( )

5.The rectangle in a flowchart represents calculations or fixed steps. ( )

6.Iterative algorithms perform an operation only once. ( )

7.Search algorithms are used to find a specific element within a set of data. ( )

8.The sort() function in Python is used to reverse the order of a list of numbers. ( )

9.Artificial intelligence algorithms depend on fixed, predefined steps. ( )

10.Machine learning is a type of artificial intelligence that enables computers to learn from data. ( )

11.Deep learning uses neural networks to imitate how the human brain works. ( )

12.Traditional algorithms improve their performance over time without intervention from the programmer. ( )

13.The parallelogram in a flowchart is used for input and output. ( )

14.Deep learning is used for image and speech recognition. ( )

15.A conditional algorithm is like reading a book from the first page to the last. ( )

16.In machine learning, a program is provided with examples and data to learn from. ( )

17.The diamond shape in a flowchart is used to make decisions (conditions). ( )

18.Sorting algorithms help organize data from smallest to largest. ( ) all of them correct

19.A program that predicts whether a student will pass using if score >= 50 is an example of artificial intelligence. ( )

20.Reinforcement learning is one of the types of artificial intelligence mentioned in the lesson. ( )

Second: Choose the correct answer from a, b, c, or d:

1. What is the correct definition of an algorithm?

A) A ready-to-run computer program

B) A set of random steps for solving a problem

C) A set of ordered and logical steps for solving a specific problem

D) A programming language specialized in solving equations

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2. Which shape is used for the beginning and end of a flowchart?

A) Rectangle B) Oval

C) Diamond D) Parallelogram

3. Which shape is used to make a decision (condition) in a flowchart?

A) Oval B) Rectangle

C) Diamond D) Parallelogram

4. Which type of algorithm executes one step after another in a fixed order?

A) Conditional algorithm B) Iterative algorithm

C) Sequential algorithm D) Search algorithm

5. What is the purpose of using a parallelogram in a flowchart?

A) Calculations B) Making decisions

C) Input and output

D) The beginning and end of the programTraditional Algorithms

6. Which type of algorithm uses an if statement to check a condition?

A) Sequential B) Conditional

C) Iterative D) Sorting

7. What is the expected result of the following code?

```
for i in range(3):
  print("Hello")
```

A) Hello is printed once. B) Hello is printed three times.

C) Hello is printed five times. D) An error occurs.

8. In a search algorithm, what is the main purpose?

A) To sort data in ascending order

B) To repeat a calculation

C) To find a specific element within a set of data

D) To make a decision based on a condition

9. Which Python function is used to sort a list of numbers?

A) reverse() B) find()

C) sort() D) search()

10. Which type is like "reading a book from the first page to the last"?

A) Conditional algorithm B) Sequential algorithm

C) Iterative algorithm D) Artificial intelligence algorithm

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Artificial Intelligence and Machine Learning

11. What is the fundamental difference between traditional algorithms and artificial intelligence algorithms?

A) Traditional algorithms are faster to execute.

B) Artificial intelligence algorithms learn from data.

C) Artificial intelligence algorithms do not need data.

D) Traditional algorithms are more complex.

12. What is Machine Learning?

A) Teaching people how to use computers

B) Programming every step in detail to get the result

C) A type of artificial intelligence that enables computers to learn from data and make decisions

D) A new programming language for artificial intelligence

13. In the spam email classification example, what principle does machine learning rely on?

A) Writing fixed rules for every type of email

B) Providing the program with previous examples to learn from

C) Using only a sorting algorithm

D) Relying on simple arithmetic operations

14. What is Deep Learning?

A) Learning programming in depth and detail

B) A simple type of machine learning

C) An advanced type of machine learning that uses neural networks

D) A sequential algorithm for big data

15. Which of the following applications uses deep learning?

A) Printing simple text on the screen

B) Collecting data from the user

C) Facial recognition on a mobile phone

D) Calculating the sum of two numbers

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Applications and Analysis

16. In the student-passing prediction program (if score >= 50), what type does it represent?

A) Artificial intelligence algorithm
B) Iterative algorithm
C) Traditional conditional algorithm
D) Deep learning algorithm

17. What is the correct result of the following code?

```
num = 4
if num % 2 == 0:
   print("Even")
else:
   print("Odd")
```

A) Odd
B) Even
C) An error in the program
D) Nothing is printed

18. Which of the following is an example of an iterative algorithm?

A) Entering a number and determining whether it is positive or negative
B) Printing the word "Hello" 10 times
C) Sorting a list of names alphabetically
D) Searching for a number in a list

19. What is the difference between machine learning and deep learning?

A) Machine learning always uses neural networks.
B) Deep learning does not need data.
C) Deep learning is an advanced type of machine learning that uses neural networks.
D) There is no difference between them.

20. Which statement represents a common characteristic of traditional algorithms?

A) They learn from new data.
B) They improve over time.
C) They use fixed steps and are fully programmed.
D) They depend on continuous training.

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Lesson 3: Strings and Lists in Python

Lesson Objectives

By the end of this lesson, students will be able to:

1.Understand the concept of strings and lists.

2.Distinguish between working with strings and characters.

3.Write a simple program using loops with strings and lists.

Dear student, remember that in previous lessons you learned how to use variables to store only a single value. Today, we take a new step forward by learning how to handle long texts and how to store a collection of values inside a single variable using **Lists.**

First: Strings

Dear student, we begin with strings because they form the foundation for processing user-entered text.

Definition: A String is a sequence of characters (letters, numbers, symbols) enclosed within double quotes " " or single quotes " ' .

```
name ="Ahmed"
```

Key Properties:

Now that we understand what a string is, let us explore the most important operations we can perform on them:

1.String Length — len ( )

```
text = "hello"
print(len(text))
```

- **Output**: 5 → because the word contains 5 letters.

2- Accessing Characters (Index)

- **Based on what we have learned about ordering, we can access any character within the string using the number (Index).**

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Based on what we learned about ordering, we can access any character inside the text using its Index number.

```
text = “hello”
print(text[0])
```

Dear student, remember Indexing starts from zero!

(needs modifications and to be checked)

characters	h	e	l	1	1
Positive index	0	1	2	3	4
Negative index	5-	4-	3-	2-	1-

If the index is -1

```
text = “hello”
print(text[-1])
```

We can also use negative numbers to access characters from the end:

print(text[-1]) # output: o (last character)

Output: If the index is a negative number, it starts at -1 and moves from right to left, where -1 refers to the first character from the right.

3- Iteration Using For

After learning how to access a single character, we can now go through all the characters using loops:

```
for letter in “hello”:
    print(letter)
```


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output:

h

e

l

l

o

4. Searching Within Text

To check whether a specific character exists within a string, we use a search operation:

```
text = “hello”
print(text.upper())
```

Output: HELLO

Second: Lists

Dear Student: After learning how to work with strings, we may sometimes need to store more than one value together. This is where lists come in.

Definition: A list is an ordered collection of values enclosed in square brackets [ ] that can be modified after it is created.

```
numbers = [1, 2, 3, 4]
names = [“Ahmed”, “Ali”, “Sara”]
```

List Properties:

Now, let us learn about the most important operations that we can perform on lists:

1- Accessing Elements

```
names = [“Ahmed”, “Ali”, “Sara”]
print(names[0])
```

Output: Ahmed

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2- Adding an Element: If we want to add a new element to the list, we use:

```
names = [ "Ahmed",  "Ali"]
names.append(«Sara")
print(names)
```

Output: ['Ahmed', 'Ali', 'Sara']

3- Deleting an Element: If we want to delete an element from the list:

```
names = [ "Ahmed",  "Ali",  "Sara"]
names.remove( "Ali")
print(names)
```

Output: ['Ahmed', 'Sara']

4- Iterating Through a List

In the same way we used loops with strings, we can use loops to iterate through the elements of a list:

```
numbers = [1, 2, 3]
for num in numbers:
    print(num)
```

Connecting Strings and Lists

Dear Student: After learning about strings and lists separately, we can now connect them.

Example: Convert a string into a list of characters to make it easier to work with.

```
text =  "hello"
letters = list(text)
print(letters)
```

Output: ['h', 'e', 'l', 'l', 'o']

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The Difference Between a String and a List

Property	List	String
Data Type	Any type	Characters only
Mutability	Mutable	Immutable
Enclosure	[ ]	“ or”
Changing an Element	Allowed	Not allowed

Third: Practical Application (Developed Program) (Enrichment)

Example 1: In this example, we will apply what we have learned to check the strength of a password.

Algorithm

1.Enter the password.

2.Convert it into a list of characters.

3.Check the conditions.

4.Calculate the score.

5.Display the result.

Code

```
password = input(“Enter password: ”)
chars = list(password)  # Convert text to list
score = 0

# Condition 1: Length
if len(chars) >= 8:
score += 1

# Condition 2: digit #
for ch in chars:
    if ch.isdigit():
        score += 1
        break

# Condition 3: Uppercase Letter
for ch in chars:
    if ch.isupper():
        score += 1
        break

# Condition 4: Symbol
symbols = “@#$%&”
```


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```
for ch in chars:
    if ch in symbols:
        score += 1
        break

# Result
if score == 4:
    print("Very Strong")
elif score == 3:
    print("Strong")

elif score == 2:
    print("Medium")
else:
    print("Weak")
```

Explanation

Here, we can see that we have combined more than one idea that we have learned:

•Converting a string into a list

chars = list(password) allows us to work with each character easily.

•Loop → for ch in chars: → Iterates through each character.

•Break → stops the loop when the condition is met for the first time.

Example 2: Now, a simple example that combines lists and conditions:

Dear Student, here is a simple example that combines lists and conditions:

Algorithm for Printing Names That Start with the Letter "A"

1.Start.

2.Create a list containing a set of names: ("Ahmed", "Ali", "Sara", "Alaa").

3.Loop through each name in the list:

- **Check condition:** Is the first letter of the current name equal to "A"?
- **If Yes (condition met): Print the name.**
- **If No (condition not met):** Move to the next name without taking any action.

4.Repeat the previous step until all names in the list have been processed.

5.End.

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Code:

```
names = ["Ahmed", "Ali", "Sara", "Alaa"]
for name in names:
    if name[0] == "A":
        print(name)
```

Questions & Exercises

First: Put (✓) next to the correct statement and (✗) next to the incorrect statement:

1.A String is a sequence of characters (letters, numbers, symbols) enclosed within double quotes.

2.Both double quotes " " and single quotes ' ' can be used to define a string. ( )

3.The len() function is used to calculate the number of characters in a string. ( )

4.In the string "hello", text[1] returns the letter "h". ( ) (It returns "e")

5.Indexing inside a string starts at 1 instead of 0. ( ) (It starts at 0)

6.Negative numbers can be used to access characters from the end of a string. ( )

7.text[-1] returns the last character in a string. ( )

8.A for loop can be used to iterate through all characters of a string one by one. ( )

9.Searching inside a text using the in operator returns either True or False. ( )

10.The upper ( ) method converts all string characters to lowercase. ( ) (It converts them to uppercase)

11.A List is an ordered collection of values inside square brackets [ ]. ( )

12.A list can contain any data type (numbers, text, etc.). ( )

13.Strings are mutable after creation. ( ) (Strings are immutable)

14.Lists are mutable, meaning elements can be added or removed. ( )

15.The append() method is used to add a new item to the end of a list. ( )

16.The remove() method is used to delete a specific item from a list. ( )

17.A string can be converted into a list of characters using the list( ) function. ( )

18.In the list names = ["Ahmed", "Ali", "Sara"], names[0] returns "Ali". ( ) (It returns "Ahmed")

19.Break can be used inside a loop to terminate it as soon as a condition is met. ( )

20.Lists and strings use the exact same type of enclosing brackets. ( ) (Lists use [ ], strings use quotes)

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Second: Choose the correct answer from a, b, c, or d:

1. What is the correct definition of a String in Python?

A) A variable that stores a single numerical value

B) A sequence of letters, numbers, and symbols enclosed in quotation marks

C) A list containing numbers only

D) A built-in function in Python

2. Which of the following brackets is used to enclose a List in Python?

A) ( ) Parentheses

B) { } Curly braces

C) [ ] Square brackets

D) " " Quotation marks

3.What is the expected output of the following code?

```
text = "Python"
print(len(text))
```

A) 5

B) 6

C) 7

D) Program error

4. In the string text = "hello", which character does text[0] return?

A) "e"

B) "l"

C) "h"

D) "o"

5.What is the expected output of the following code?

```
text = "hello"
print(text[-1])
```

A. "h"

B. "e"

C. "l"

D. "o"

6. Which function is used to convert all characters of a string to uppercase?

A) lower()

B) small()

C) capitalize()

D) upper()

7.What is the expected output of the following code?

```
text = "hello"
print("z" in text)
```

A) True

B) False

C) Program error

D) "z"

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Lists and Their Operations

8. What is the expected output of the following code?

A) [“Ahmed”, “Ali”]
B) [“Sara”, “Ahmed”, “Ali”]
C) [“Ahmed”, “Ali”, “Sara”]
D) Program error

9. What is the expected output of the following code?

```
names = [“Ahmed”, “Ali”, “Sara”]
names.remove(“Ali”)
print(names)
```

A) [“Ahmed”, “Ali”, “Sara”]
B) [“Ahmed”, “Sara”]
C) [“Ali”, “Sara”]
D) Program error

10. In the list numbers = [10, 20, 30, 40], what value does numbers[2] return?

A) 10
B) 20
C) 30
D) 40

11. Which of the following correctly describes a List?

A) Cannot be modified after creation
B) Can be modified (Mutable), and elements can be added or removed
C) Contains only characters
D) Cannot be iterated over using for

Linking Strings and Lists

12- What is the expected output of the following code?

```
text = “hello”

letters = list(text)

print(letters)
```

A) [“hello”]
B) [‘h’, ‘e’, ‘l’, ‘l’, ‘o’]
C) (“h”, “e”, “l”, “l”, “o”)
D) Error in the program

13- What is the fundamental difference between a String and a List?

A) String uses [ ] and List uses ”
B) List is Mutable and String is Immutable
C) String contains numbers only

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D) List cannot contain strings

14- In a password strength checking program, what is the purpose of the line chars = list(-password)?

A) to Print the password

B) To calculate the length of the password

C) To convert the (string) text into a list of characters to facilitate handling each character

D) To encrypt the password

15- What is the purpose of using break inside the loop in the password-strength checking program?

A) To repeat the loop indefinitely

B) To stop the loop when the condition is first met and avoid unnecessary checking

C) To delete an element from the list

D) To add a new element to the list

16- What is the expected output of the following code?

```
names = [“Ahmed”, “Ali”, “Sara”, “Alaa”]
for name in names:
    if name[0] == “A”:
        print(name)
```

A) Sara, Alaa

B) Ahmed, Ali, Alaa

C) Ahmed only

D) All names

17- Which of the following produces the same result as text.upper() for the String text = “abc”?

A) text.lower()

B) text.capitalize()

C) “ABC”

D) text.replace(“a”, “A”)

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Lesson 4: Functions with Parameters in Python

Lesson Objectives

By the end of the lesson, students will be able to:

- Explain the meaning of a **Function.**
- Create a function containing **Parameters.**
- Use functions to solve simple problems.

Introduction

Dear student... in previous lessons we learned how to:

- Use variables to store data.
- Use conditions and loops.
- Work with lists and strings.

Today, we will move on to a very important concept in programming: organizing code using **Functions** to make the program easier and faster to write and understand.

First: What is a Function?

Dear Student, after you become able to write several lines of code, you may notice that you repeat the same code more than once. Therefore, we use **functions** to avoid repetition and organize the program.

Definition:

A function is a set of instructions written once and used multiple times within a program.

Real-Life Example

A button on a calculator → You press it → It gives you a result.

This is exactly like a function: you give it an instruction, and it executes it immediately.

Second: What are Parameters?

Dear student, now that we understand functions, we need to know how to make them work with different data. This is where **parameters** come in.

Definition: Parameters are values that we pass to a function so that it can operate on them.

Example

If we have a function that adds two numbers, we need to provide it with those two numbers so that it can perform the addition.

So, parameters are the inputs that a function relies on to perform its task.

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Third: Function Syntax in Python

Dear Student, now that we understand the concept, let us see how to write a function in a Python program.

```
def function_name(parameters):
    # code
```

A Simple Example of a Function with Parameters

Now, let us apply what we have learned through a simple example:

```
def add_numbers(a, b):
    result = a + b
    print(result)
add_numbers(3, 5)
```

Explanation:

Here, we can see how several concepts we learned previously are connected:

- **def** → Used to define the function.
- **add_numbers** → The name of the function.
- (a, b) → Parameters (values passed to the function).
- a + b → An arithmetic operation we learned earlier.
- **When calling the function, we pass the values (3 and 5) to it.**

Dear student, notice how we used variables and arithmetic operations inside the function. This clearly shows how our lessons build upon one another.

Important Application: Calculating the Area of a Circle

Dear Student, now we will use functions in an important practical application that combines what we have learned in mathematics and programming.

Formula:

Circle Area = π × radius × radius

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Code:

```
def circle_area(radius):
    pi = 3.14
    area = pi * radius * radius
    print("Area =", area)
circle_area(5)
```

Code Explanation Step by Step

Dear Student, let us explain the code in an organized way:

Defining the Function

```
def circle_area(radius):
```

- **Function name:** circle area
- **Parameter:** radius — the radius

Defining the Value of π

```
pi = 3.14
```

- **A constant value used for the calculation.**
- **Calculating the area**

```
area = pi * radius * radius
```

- **Multiply:**

  π × radius × radius

Printing the result:

```
print("Area =", area)
```


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•**Display the result to the user.**

Calling the Function

```
circle_area(5)
```

•**We pass the radius value of 5 to the function.**

•**The function performs the calculation and prints the result.**

Output:

```
Area = 78.5
```

Important Note:

Dear Student, you can easily change the value to get different results:

You can change the number:

```
circle_area(10)
```

It will calculate the area of a larger circle.

This demonstrates the importance of parameters, as they allow the function to work with any given value.

Student Practice: Now, dear student, having understood how functions work, try updating the code yourself.

Task:

•**Instead of printing the result**

•**Modify the function to return the value using the return statement**

Solution

```
def circle_area(radius):
pi = 3.14
area = pi * radius * radius
return area
result = circle_area(5)
print(result)
```


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Dear Student, in this lesson, you:

- Used variables inside functions.
- Applied arithmetic operations.
- Connected programming with mathematics.
- Learned how to make your code organized and reusable.

Questions & Exercises

First: Put (✓) next to the correct statement and (✗) next to the incorrect statement:

1. A function is a set of code instructions written once and used multiple times. ( )
2. Parameters are values returned by a function after it is executed. ( )
3. The keyword def is used to define a function in Python. ( )
4. When calling the function **add_numbers(3, 5),** the values 3 and 5 are called Arguments, not Parameters. ( )
5. A function can contain a maximum of only one parameter. ( )
6. In the code def circle_area(radius):, radius is the name of the function. ( )
7. The keyword return is used to return a value from a function to the place where it was called. ( )
8. A function that uses print() inside it returns a value that can be stored in a variable. ( )
9. The area of a circle = π × radius × radius. ( )
10. Parameter values can be changed on each function call to produce different results. ( )
11. The following code is correct: def add(a, b): print(a + b) then result = add(2, 3). ( )
12. The variable pi = 3.14 inside the circle_area function can be accessed from outside the function. ( )
13. Functions help avoid code repetition and organize the program. ( )
14. circle_area(5) and circle_area(10) produce the same result. ( )
15. You can use return more than once inside the same function. ( )
16. result = circle_area (5) stores the value 78.5 in the variable result if the function uses return. ( )
18. Parameters are written inside parentheses () when defining a function. ( )
19. The function add_numbers(a, b) can be called using add_numbers(3) only. ( )
20. Using functions makes code easier to understand and maintain. ( )

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Second: Choose the correct answer from the following options:

1- What is the correct definition of a function in programming?

A) A variable that stores a single value

B) A loop that executes specific instructions

C) A set of code instructions written once and used multiple times

D) A condition that checks whether a certain value is valid

2- What are parameters in a function?

A) The values returned by the function after execution

B) The names of variables created inside the function

C) The values passed to the function for it to operate on

D) The errors that appear when the program runs

3- Which keyword is used to define a function in Python?

A. function B. define

C. def D. func

4- In the code def greet(name):, what is name?

A) The function name B) A parameter of the function

C) A data type D) A constant value

5- What is the expected output of the following code?

```
def add_numbers(a, b):
    result = a + b
    print(result)
add_numbers(3, 5)
```

A) Nothing is printed B) 8

C) 35 D) A program error

6- What is the difference between print( ) and return inside a function?

A) There is no difference between them

B) print( ) is faster than return

C) print() displays the value on the screen, while return returns the value so it can be stored in a variable

D) return displays the value on the screen only

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7- What is the expected output of the following code?

```
def circle_area(radius):
    pi = 3.14
    area = pi * radius * radius
    return area
result = circle_area(5)
print(result)
```

A) 15.7 B) 31.4

C) 78.5 D) 314.0

8- If the function circle_area(10) is called, what is the expected result?

A) 31.4 B) 78.5

C) 314.0 D) 628.0

9- In the function call add_numbers(3, 5), what are the values 3 and 5 called?

A) Parameters B) Arguments

C) Variables D) Constants

10- Which of the following code defines a function with only one parameter?

A) def add(a, b) B) def multiply()

C) def square(x) D) def calc(a, b, c)

11- What is the expected output of the following code?

```
def greet(name):
    print("Hello", name)
greet("Ahmed")
```

A) Hello B) Ahmed

C) Hello Ahmed D) name Ahmed

12- What is wrong with the following code?

```
def add(a, b):
    return a + b
result = add(5)
```

A) There is an error in writing def

B) A parameter is missing (one value is provided instead of two)

C) There is an error in using return

D) There is no error

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13- In the following code, can pi be accessed from outside the function?

```
def circle_area(radius):
    pi = 3.14
    area = pi * radius * radius
    return area
```

A) Yes, always

B) No, because it is a local variable inside the function

C) Yes, if print() is used

D) It depends on the value of radius

14- What is the expected result of the following code?

```
def test():
    x = 10
    return x
print(x)
```

A) 10

B) An error: NameError because x is not defined outside the function

C) None

D) 0

15- What is the purpose of using return instead of print() in a function?

A) To make the program slower

B) To display the result only on the screen

C) To return the value so it can be stored in a variable and used in other operations

D) To create a new variable inside the function

16- Which of the following code represents a function that returns a value and stores it in a variable?

A) def show(x): print(x) then show(5)

B) def double(x): return x * 2 then result = double(5)

C) def calc(): x = 5 then calc()

D) def info(): print("Hello") then info()

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17- What is the expected output of the following code?

```
def max_number(a, b):
    if a > b:
        return a
    else:
        return b
print(max_number(7, 3))
```

A) 3 B) 7

C) 10 D) False

18- In a program that calculates the area of a circle, why do we use radius as a parameter?

A) To make the program longer

B) To create a permanent variable in the program

C) To make the function work with any value of the radius

D) To display the value on the screen

19- What is the expected output of the following code?

```
def multiply(a, b):
    return a * b
x = multiply(4, 5)
y = multiply(2, 3)
print(x + y)
```

A) 15 B) 23

C) 26 (20 + 6) D) 46

20- Which of the following statements represents the main benefit of using functions with parameters?

A) Making the program contain more lines

B) Creating only global variables

C) Avoiding code repetition, organizing the program, and making it reusable

D) Eliminating the need to use variables

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Lesson 5: Handling User Input Errors in Python

Lesson Objectives

By the end of this lesson, students will be able to:

•Explain why errors occur when data is entered.

•Use try and except to handle errors.

•Write simple programs that do not stop when an error occurs.

Dear student… in the previous lessons we learned the following:

•How to receive data from the user using input.

•Converting data into numbers using int.

•Using conditions and loops.

But what happens if the user enters invalid data? At that point the program may stop and display an error! This is why, today, we will learn how to make the program smarter, so that it deals with errors without stopping.

First: What Is the Problem?

Dear student, when writing any program, we usually ask the user to enter data such as:

•a number,

•a word,

•an age.

The problem, however, is that the user may enter incorrect data without meaning to.

Example:

•The program asks: enter a number.

•The user types: Ahmed.

At this point, an error occurs!

An example without error handling

```
age = int(input("Enter your age: "))
print("Next year you will be:", age + 1)
```

What happens here? Dear student, we notice the following:

•The program expects a number to be entered.

But if the user types a word such as ahmed,

an error called **ValueError** will appear.

ValueError

input → "ahmed"

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↓

int("ahmed")

↓

Error (a word cannot be converted into a number)

The Solution: Use try and except

Dear student… now that we understand the problem, we need a way to solve it — and here we use try and except.

The general statement

```
try:
    # the code that might cause an error
except:
    # what to do if an error occurs
```

Example 1

```
try:
    age = int(input("Enter your age: "))
    print("Next year you will be:", age + 1)
except:
    print("Please enter a valid number!")
```

Explanation

Dear student… we notice here:

- try → attempt to run the code.
- If an error occurs → move to except.
- Instead of the program stopping, a suitable message is displayed

Example 2 : checking a division

And now, having learned to handle a simple error, let us look at another example that combines input with arithmetic operations.

```
try:
    num1 = int(input("Enter number 1:"))
    num2 = int(input("Enter number 2:"))
    result = num1 / num2
    print("Result =", result)
except:
    print("Error! Invalid input or division by zero.")
```


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Explanation

Dear student, there are two kinds of error here:

1. Entering text instead of a number.

2. Division by zero: 10 ÷ 0 → an error.

This shows how important error handling is in programs.

Example 3 : identifying the type of error

Dear student…we can make the program more precise by specifying the type of error.

```
try:
    num = int(input("Enter a number: "))
    result = 10 / num
    print(result)
except ValueError:
    print("Please enter numbers only!")
except ZeroDivisionError:
    print("You cannot divide by zero!")
```

Explanation

•ValueError → when text is entered.

•ZeroDivisionError → when dividing by zero.

Here the program has become smarter, because it identifies the type of error and gives a suitable message for each case.

Example 4 : The "try again" Pattern

Dear student… after you learned how to handle errors, you can improve the program further so that it asks the user to "try again".

```
while True:
num = int(input("Enter a number:"))
        print("You entered:", num)
        break
    except:
        print("Invalid input! Try again.")
```

Explanation

•The program keeps asking for input.

•It stops only when a valid value is entered.

Dear student…in previous lessons you learned about functions and parameters. You can now

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use handle errors inside functions as well, to make your programs stronger and more professional.

Questions & Exercises

First: Put (✓) next to each correct statement and (✗) next to each incorrect one.

1. When the user enters text instead of a number in int(input()), a ValueError occurs. ( )
2. The keyword try is used to attempt to run code that might cause an error. ( )
3. The code inside except is executed only if no error occurs in try. ( )
4. Division by zero in Python produces a ZeroDivisionError. ( )
5. try and except are used to make the program stop when an error occurs. ( )
6. except can be used without try in the same program. ( )
7. The type of error can be specified after except, as in except ValueError:. ( )
8. except: without a specified error type handles all kinds of errors. ( )
9. Using while True with try and except allows the user to keep trying until a valid value is entered. ( )
10. break inside try ends the while loop once the input succeeds. ( )
11. The program stops automatically when an error occurs if we do not use try and except. ( )
12. ValueError occurs only when dividing by zero. ( )
13. try and except can be used inside functions. ( )
14. The following code is correct: try: print(10/0) except: print("Error"). ( )
15. ZeroDivisionError occurs when the user enters a word instead of a number. ( )
16. The message inside except is displayed to the user instead of the default error message. ( )
17. int("123") produces a ValueError. ( )
18. More than one type of error can be handled in the same try block by using multiple except clauses. ( )
19. try must contain only a single line of code. ( )
20. Using try and except makes the program smarter and gives the user clear messages. ( )

Second: Choose the correct answer from a, b, c, or d:

Which error appears when the user enters a word instead of a number in int(input())?

a) TypeError
b) NameError
c) ValueError
d) SyntaxError

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2. Which two keywords are used to handle errors in Python?

a) if and else b) for and while

c) try and except d) def and return

3. What is the main purpose of using try and except?

a) Speeding up the execution of the program

b) Preventing the program from stopping when an error occurs and giving a suitable message

c) Creating new variables

d) Repeating the code several times

4. Which of the following errors occurs when dividing by zero?

a) ValueError b) TypeError

c) ZeroDivisionError d) IndexError

5. What is the correct form for using try and except?

a) except: ... try: ... b) try: ... except: ...

c) try: ... else: ... d) if try: ... except: ...

6. What is the expected result of the following code?

```
try:
    num = int("abc")
except:
    print("Error!")
```

a) abc b) It prints nothing

c) Error! d) An error occurs and the program stops

7. In the following code, when is the code inside except executed?

```
try:
    age = int(input("Enter age:" ))
    except:
    print("Invalid input! ")
```

a) Always, whenever the program runs

b) Only when a valid number is entered

c) When the user enters invalid data

d) When a number greater than 100 is entered

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8. What is the expected result of the following code?

```
try:
    result = 10 / 0
    print(result)
except:
    print("Cannot divide! ")
```

a) 0 b) 10

c) Cannot divide! d) Infinity

9. Which of the following pieces of code handles two different types of error separately?

a) try: ... except: ...

b) try: ... except Error: ...

c) try: ... except ValueError: ... except ZeroDivisionError: ...

d) try: ... finally: ...

10. What is the expected result of the following code?

```
try:
    num = int("50")
    print(num * 2)
except ValueError:
    print("Wrong input!")
```

a) Wrong input! b) 50

c) 100 d) An error occurs and the program stops

11. What is the purpose of using while True with try and except?

a) Executing the code only once

b) Asking the user for input again until a valid value is entered

c) Stopping the program immediately

d) Speeding up the execution of the program

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12. What is the role of break in the following code?

```
while True:
    try:
        num = int(input("Enter number:"))
        break
    except:
        print("Try again!")
```

a) Stopping the program entirely
b) Moving to except
c) Exiting the while loop once the input succeeds
d) Repeating the loop once more

13. What is the expected result of the following code if the user enters "hello" and then "5"?

```
while True:
    try:
        num = int(input("Enter: "))
        print("You entered:", num)
        break
    except:
        print("Invalid! Try again.")
```

a) You entered: hello — then it stops
b) Invalid! Try again. — then it stops
c) Invalid! Try again. — then You entered: 5
d) It stops immediately at the first error

14. In the division program, which possible errors must be handled?

a) Only an error in writing print
b) Entering text instead of a number, and division by zero
c) Only spelling mistakes in variable names
d) Using int instead of str

15. What is the expected result of the following code?

```
try:
    num1 = int("10")
    num2 = int("2")
    print(num1 / num2)
except:
    print("Error")
```

a) Error
b) 5
c) 102
d) 20

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16. Which of the following pieces of code gives a different message for each type of error?

a) try: ... except: print("Error")

b) try: ... except ValueError: print("Numbers only!") except ZeroDivisionError: print("No zero!")

c) try: ... print("Error")

d) if error: print("Error")

17. What is the error in the following code?

```
try:
    x = int(input("Enter:"))
except ValueError:
    print("Not a number!")
except:
    print("Error!")
```

a) There is no error — the code is correct

b) except: must come before except ValueError:

c) try: must contain else:

d) int(input()) is incorrect

18. What is the expected result of the following code if the user enters "0"?

```
try:
    num = int(input("Enter:"))
    result = 100 / num
    print(result)
except ValueError:
    print("Enter numbers only!")
except ZeroDivisionError:
    print("Cannot divide by zero!")
```

a) 100

b) Enter numbers only!

c) Cannot divide by zero!

d) 0

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19. In the following code, which message appears if the user enters “abc”?

```
try:
    age = int(input(“Enter age:”))
    print(“Next year:”, age + 1)
except ValueError:
    print(“Please enter a valid number!”)
except:
    print(“Unknown error!”)
```

a) Next year: abc1
b) Unknown error!
c) Please enter a valid number!
d) The program stops without a message

20. What is the main benefit of using try and except inside functions?

a) Making the function slower
b) Creating global variables
c) Making the function stronger and more professional, and able to deal with unexpected input
d) Removing the need to use return

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Unit 2:

Artificial Intelligence and Cybersecurit



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Lesson 1: Prediction Using Artificial Intelligence Models.

Lesson Objectives

By the end of this lesson, students will be able to:

- Distinguish between traditional programming and machine learning.
- Discuss the concept of prediction using data (patterns).
- Interpret a simple linear model in Python.

Dear student… in the previous lessons you learned how to build systematic thinking, and how to analyze problems in clear steps using algorithms and programming to reach a specific, guaranteed result.

In this lesson we move to a deeper level of thinking. Instead of writing every command explicitly, we will learn how to make the computer learn from data and infer patterns, so that it can predict results by itself.

Imagine you had a complete record of a student's grades over the previous school years. Could you predict their performance in the current year? That is exactly what artificial intelligence does: it analyses historical (past) data to uncover hidden patterns and forecast future results.

Dear student… let us distinguish between a program and an artificial intelligence model.

First: Traditional Programming (Rule-Based Systems)

Dear student… before we look at the artificial intelligence model, let us first review together what we have learned about traditional programs, so that we can compare them with artificial intelligence.

Key Term: traditional programming is a set of instructions — fixed rules — that are always executed step by step to obtain a specific result.

```
a = 5
b = 3
print (a + b)
```

The result: the output is always 8.

Characteristics of a program

- It relies on fixed commands written by the programmer.
- It gives the same result every time.
- It does not learn from data.

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Example: the calculator

Second: What Is an Artificial Intelligence Model (Machine Learning)?

Dear student… now that we understand that a program relies on fixed commands, let us look at a different kind of system — one that does not merely follow commands but learns by itself.

Key Term:

Artificial Intelligence **Model** – a system that learns from data — we do not write the rules manually — and uses what it has learned to predict new results; what it learns is referred to as a **pattern**.

Key idea: an artificial intelligence model learns from the past in order to predict what will happen in the future.

Example 1: we have the following data

Study hours	Grade
1	50
2	60
3	70

Note that every time the study hours increase by 1, the grade increases by 10. That is the pattern (the model).

The difference between a program and a model

Point of comparison	Program	Artificial intelligence model
Relies on	Commands	Data
Learning	No	Yes
Results	Fixed	May change
Example	Calculator	Grade prediction

Dear student, you may have noticed that there is a relationship between the number of study hours and the grade — and that leads us to a very important concept which is prediction.

Prediction means estimating an unknown value on the basis of:

- previous data
- the existence of a certain pattern

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First: «previous data» means past information — things that have actually happened.

Examples:

- a student›s grades in the past months
- gold prices on previous days
- the weather over the past days

Such data helps us understand what used to happen, so that we can use it to anticipate the future.

Second: «the existence of a certain pattern.»

A pattern can be defined as a recurring relationship within the data.

Examples:

- The more study hours → the higher the grade.
- The higher the temperature → the greater the electricity consumption.

This is called a «pattern» because the relationship recurs in a clear way.

So prediction means: we use the old data + we discover the pattern → and then we estimate a new value.

Dear student, now you understand the idea of prediction, one question remains: how do we turn all of this into a mathematical model that the computer can use?

Building a Simple Model

To build a model that links the number of study hours (x) to the grade (y), we use the simplest model in artificial intelligence which is the Linear Model.

The Linear Model

- The number of study hours (x).
- The grade (y).

The mathematical equation of the model

y = w * x + b

The elements of the equation

- x: the number of study hours (the input).
- y: the predicted grade (the output).
- w: the amount by which the grade changes for each hour of study.
- b: the grade the student starts from before studying (the constant — the bias).

What is the value w (effect size)?

It is the amount by which the grade increases when study time increases by one hour.

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Example: if y = 10x + 40, this means that every hour of study raises the student›s grade by 10 marks. Therefore w = 10.

Illustration:

Number of hours	Grade
1	50
2	60
3	70

We notice that the grade increases by a fixed amount — the weight (10) — each time.

Now that we understand the meaning of the increase (w), let us look at the second part of the equation: the constant value b.

What is the constant value b (bias)?

It is the grade the student obtains when they do not study at all (x = 0).

Example: in the equation y = 10x + 40, imagine:

- a student who did not study (number of hours = 0), will they get a grade of 0?

Not necessarily — they may earn a few marks from:

- attendance,
- participation,
- prior knowledge.

That grade is b → if x = 0, then y = 40.

This means the student starts from 40 marks even without studying.

Dear student…we now has a clear mathematical model — let us turn it into a Python program.

Example 2

```
# Define the model
def predict_grade(x):
    w = 5   # the effect of the number of hours
    b = 10  # the constant value (the bias)
    y = w * x + b
    return y
# Try out the model
hours = 3
grade = predict_grade(hours)
```


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print("Study hours:", hours)

print("Predicted grade:", grade)

Explanation

1. Defining the function

def predict_grade(x):

- We created a function named predict_grade.
- It receives the number of study hours, x.

2. Setting the parameters

w = 5

b = 10

- w: every hour = 5 marks.
- b: even without studying = 10 marks.

3. Applying the equation

y = w * x + b

- This is the very same mathematical equation.

4. Returning the result

return y

5. Testing the model

hours = 3

- The student studied for three hours.

grade = predict_grade(hours)

- We compute the grade.

6. Displaying the result

print("Predicted grade:", grade)

The output: Study hours: 3 — Predicted grade: 25.

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Questions & Exercises

First: Place a tick (✓) next to each correct statement and a cross (✗) next to each incorrect one.

1. Traditional programming relies on fixed commands written by the programmer step by step. ( )
2. An artificial-intelligence model learns from data and does not require the rules to be written by hand. ( )
3. A traditional program learns from data and improves its performance over time. ( )
4. An artificial-intelligence model gives the same result every time, without change. ( )
5. Prediction means estimating an unknown value on the basis of previous data and the existence of a certain pattern. ( )
6. Previous data means past information that has actually happened and can be used for prediction. ( )
7. A pattern is a rule or recurring relationship within the data. ( )
8. In the linear model mentioned in the lesson, the more the study hours increase, the lower the grade becomes. ( )
9. The linear model uses the mathematical equation $y = w \times x + b$. ( )
10. In the equation $y = w \times x + b$, the symbol x represents the predicted grade. ( )
11. The value w in the linear model represents the amount by which the grade increases for each additional hour of study. ( )
12. The value b in the linear model is called the bias, and it is the grade when $x = 0$. ( )
13. If the equation is $y = 10x + 40$, the student obtains 40 marks when they do not study ($x = 0$). ( )
14. The value $w = 5$ in the model means that every hour of study is worth 10 marks. ( )
15. The function predict_grade(x) in the lesson returns the predicted grade based on the number of study hours. ( )
16. An artificial-intelligence model analyses historical data to uncover hidden patterns and forecast future results. ( )
17. The calculator is considered an example of an artificial-intelligence model. ( )
18. Predicting grades based on study hours is considered an application of prediction in artificial intelligence. ( )
19. In the linear model, if the study hours increase by 1, the grade increases by a fixed amount w. ( )

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20. An artificial-intelligence model requires every rule to be written by hand by the programmer. ( )

Second: Choose the correct answer from a, b, c, or d:

1. What is the fundamental difference between traditional programming and machine learning?

a) Traditional programming is faster to execute

b) Machine learning requires writing more commands

c) Traditional programming relies on fixed commands, whereas machine learning learns from data

d) Machine learning does not need data

2. What is the correct definition of an artificial-intelligence (machine-learning) model?

a) A program that always gives the same result

b) A set of fixed commands

c) A system that learns from data and uses what it has learned to predict new results

d) An electronic calculator

3. What is the concept of «prediction» in artificial intelligence?

a) Writing new programming commands

b) Storing data in a database

c) Estimating an unknown value on the basis of previous data and a certain pattern

d) Deleting old data

4. Which of the following examples represents «previous data» that can be used for prediction?

a) The weather forecast for next week

b) A student›s grades in the past months

c) The names of the new students

d) The colors of the pens in the classroom

5. What is a «pattern» in the context of artificial intelligence?

a) An attractive design for the program

b) A rule or recurring relationship within the data

c) A new programming language

d) A type of file

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6. In the following table, what is the pattern?

Study hours	Grade
1	50
2	60
3	70

a) The fewer the hours, the higher the grade

b) Every time the hours increase by 1, the grade increases by 10

c) There is no relationship between the hours and the grade

d) The grade is always fixed

7. What is the mathematical equation of the linear model mentioned in the lesson?

a) $y = x + w + b$ b) $y = w - x - b$

c) $y = w \times x + b$ d) $y = x \div w + b$

8. In the equation $y = w \times x + b$, what does the symbol x represent?

a) The predicted grade b) The amount of change in the grade

c) The number of study hours (the input) d) The fixed grade

9. In the equation $y = w \times x + b$, what does the symbol y represent?

a) The number of study hours b) The predicted grade (the output)

c) The constant value d) The size of the effect

10. In the equation $y = 10x + 40$, what is the value of w (the weight / the effect)?

a) 40 b) 10

c) x d) y

11. In the equation $y = 10x + 40$, what is the value of b (the bias / the constant value)?

a) 10 b) x

c) 40 d) y

12. What does the value $w = 10$ mean in the linear model?

a) The student starts with 10 marks

b) Every hour of study increases the grade by 10 marks

c) The student studies for 10 hours

d) The maximum grade is 10

13. In the equation $y = 10x + 40$, what is the predicted grade when $x = 0$?

a) 0 b) 10

c) 40 d) 50

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14. In the equation y = 10x + 40, what is the predicted grade when x = 2?

a) 42 b) 50

c) 60 d) 80

15. In the following code, what is the expected result?

```
def predict_grade(x):
    w = 5
    b = 10
    y = w * x + b
    return y
hours = 3
grade = predict_grade(hours)
print(grade)
```

a) 15 b) 25

c) 35 d) 40

16. If we want to modify the model so that every hour of study is worth 8 marks and the base grade is 20, what is the correct equation?

a) y = 20x + 8 b) y = 8 + 20x

c) y = 8x + 20 d) y = 28x

17. Which of the following examples represents traditional (rule-based) programming?

a) A program that learns from pictures of cats and dogs

b) A calculator that adds two numbers according to fixed commands

c) A system that predicts share prices

d) A program that recognizes handwriting

18. Which of the following examples represents an artificial-intelligence model?

a) A program that prints «Hello World»

b) A simple calculator

c) A system that predicts a student›s grades based on study hours

d) A program that adds two matrices

19. What is the main benefit of using the linear model for prediction?

a) Giving results that are always 100% accurate

b) Simplifying the relationship between the variables and enabling the prediction of future values

c) Replacing the need for any data

d) Making the program slower

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20. In the following table, what are the values of w and b for the linear model?

Study hours (x)	Grade (y)
0	30
1	35
2	40
3	45

a) w = 30, b = 5

b) w = 35, b = 30

c) w = 5, b = 30

d) w = 45, b = 0

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Lesson 2: Artificial Intelligence and Intellectual Property Rights

Lesson Objectives

By the end of this lesson, students will be able to:

- Discuss the protection of intellectual property when using artificial intelligence applications.
- Explain how to protect one's personal data when using artificial intelligence applications.
- Identify intellectual property and the Terms of Service (TOS) of artificial intelligence applications.

Dear student… we have already become familiar with the concepts of intellectual property rights and artificial intelligence, so let us begin from here.

When you type a question or an idea, or share a story with an artificial intelligence, that data does not disappear the moment you close the browser. Imagine someone recording every word you say and then going off to repeat those words to thousands of other people — your ideas would be lost. That, roughly, is what can happen when artificial intelligence tools are used without caution.

You must therefore protect your intellectual property and your personal data when using artificial intelligence applications. To protect yourself and your family, consider anything you type into an artificial intelligence as a "public post". Avoid sharing any of the following entirely:

- **Personally Identifiable Information (PII):** your full name, your home address, your telephone number, or the name of your school.
- **Private** family matters: any details about your parents' work, or private family problems.
- **Private photographs and videos:** do not upload your own photographs or those of your friends, to artificial intelligence photo-editing tools unless you completely trust the application.
- **Passwords:** never ask an artificial intelligence to organize or store your passwords.

Intellectual Property and the Terms of Service (TOS) of Artificial Intelligence Applications

In the age of artificial intelligence, there are three essential points in the terms of service of any artificial-intelligence application, such as ChatGPT or Gemini:

- **The minimum age requirement:** most of these tools require you to be of a suitable age to use the application.
- **Protecting the intellectual property of digital content:** make sure you know who owns the image being used, and who owns the written text.

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•**The right to deletion:** make sure there is an option to delete your chat history permanently from the application›s servers — through the «Privacy Settings» or «Clear Data» option.

Protecting Data and Intellectual Property with the Three Sources Rule for Verifying Information

Dear student, you must review the output of artificial intelligence and follow the three sources rule:

•**The first source is the artificial intelligence:** use it only to obtain the initial idea or general outlines. Artificial intelligence is an assistant to you — not a substitute for your own mind.

•**The second source is a search engine / an encyclopedia:** look up the correct information on trustworthy sites such as Wikipedia, government websites, or scientific journals. Artificial intelligence may quote passages from other books without citing their source, which could lead you into the trap of «plagiarism» without intending it. So protect yourself: ask the artificial intelligence to give you links to the reliable sources and references from which it drew the information, and click on those links to make sure they are genuine.

•**The third source is a book or an expert opinion:** verify the information in a third, completely different source — for example, by looking for the book in the library or for an article in a newspaper.

Citation and Intellectual Property When You Use Artificial-Intelligence Applications

•Transparency: if you used artificial intelligence (AI) to search for information, you must state this in a footnote or in the references section.

For example: ChatGPT was used to obtain this information.

•**Avoiding plagiarism:** remember that artificial intelligence may quote passages from other books without citing their source, which could lead you into the trap of «plagiarism» without intending it.

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Questions & Exercises

Choose the correct answer from a, b, c, or d:

1.What is meant by the three sources rule when using artificial intelligence?

a) Relying only on artificial intelligence as the main source

b) Verifying the information through three different sources (AI, a search engine, a book/expert)

c) Sharing personal data with three different applications

d) Using three different passwords for each application

2. Which of the following pieces of information should you avoid sharing with artificial intelligence applications?

a) An idea for a school project

b) Your full name and home address

c) A general question about mathematics

d) A short story you have written

3. What is the purpose of stating that you used artificial intelligence in your research or writing?

a) To avoid plagiarism and academic theft

b) To show that you rely entirely on artificial intelligence

c) To obtain higher marks in the examination

d) Because the artificial intelligence always demands it

4. What is the minimum age requirement for using most artificial intelligence applications?

a) At least 10 years old

b) At least 13 years old

c) At least 21 years old

d) There is no age requirement

5. If you design an image using an artificial intelligence application, who usually owns the intellectual property rights to that image?

a) The company that developed the application

b) The person who designed the image (the user)

c) Anyone who uses the application

d) Nobody owns it

6. What is the principal danger of sharing personal photographs with untrusted artificial intelligence applications?

a) A loss of image quality

b) The possibility of their being misused or published without your permission

c) Being unable to edit them later

d) Increased storage space on the device

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7. What is meant by the right to deletion in the terms of service of artificial intelligence applications?

a) Deleting the application from the phone

b) Deleting the chat history permanently from the application›s servers

c) Deleting your password

d) Deleting the photographs from the phone›s gallery

8. Why should you avoid sharing private family matters with artificial intelligence applications?

a) Because they are unimportant

b) Because they could be used or leaked, affecting the family›s privacy

c) Because they are not stored in the application

d) Because they are deleted automatically after use

9. What helps you avoid «plagiarism» when using artificial intelligence?

a) Copying texts as they are

b) Not mentioning the sources

c) Citation — stating that you used artificial intelligence

d) Sharing your password with the application

10. Which of the following statements about the role of artificial intelligence in research is correct?

a) It is the sole, final authority for information

b) It is merely an assisting tool for obtaining initial ideas

c) It cannot be used in education

d) It always guarantees the accuracy of the information

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Lesson 3: Cyber Awareness and Dangerous Video Games

Lesson Objectives

By the end of this lesson, students will be able to:

1. Distinguish between the different types of video games and identify their benefits and risks.
2. Explain the measures taken to limit the negative impact of video games at the global level.
3. Propose practical solutions for managing the time spent playing video games
4. Encourage alternative activities that promote psychological and social well-being.

Video games are programs or digital applications designed for entertainment, education or training, played on electronic devices such as computers, smartphones, or dedicated game consoles (PlayStation, Xbox, Nintendo).

The characteristics of video games:

- They rely on digital interaction between the player and the device.
- They may be individual or played in groups over the internet.
- They range across educational, entertainment, strategy, simulation and sports games.
- They combine animated graphics, sound and artificial intelligence to deliver a realistic or imaginary experience.

Types of video games include:

Educational Games: Develop mental skills, such as mathematics and language skills.

Strategy Games: Teach planning, alternative thinking, and making quick and correct decisions under pressure.

Multiplayer Games: Promote cooperation, role distribution, and communication to achieve a common goal.

Simulation Games: Simulate real-life activities, such as driving cars or flying airplanes.

Entertainment Games: Designed for fun and enjoyment, such as adventure and racing games.

The benefits of video games:

Video games are useful for developing mental and problem-solving skills, for activating regions of the brain and stimulating the growth of new nerve cells. They also teach creative structural planning and patience, promote cooperation and teamwork, and improve reaction speed and concentration.

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Cyber Awareness of the Negative Impact of Dangerous, Violence-Inciting Video Games

These are games that contain scenes of violence or inappropriate language. They also use psychological tricks **(Dark Patterns)** to keep the child addicted; they rely on pay-to-win mechanics **(Pay to Win),** which harm children; and they include loot boxes **(Loot Boxes),** which resemble legalized gambling. They may lead to social isolation and psychological problems if they are not kept under control. Examples include Carbone, PUBG and Fortnite.

Limiting the Negative Impact of Video Games Worldwide

Agreement has been reached on a number of measures intended to curb the risks of video games classified as posing a danger to children under 18 years of age. They are as follows:

- Limiting playing time for children and adolescents (one hour only, at the weekend, with a maximum of three hours per week).
- Banning play at school or outside the specified times.
- Prohibiting loot boxes in games aimed at children.
- Banning games that use psychological tricks harmful to public health.
- Banning games that rely on pay-to-win mechanics.

Cyber Awareness and Security for the Family

Since the family is the first firewall protecting the child, and since technology cannot be banned nor the use of video games ignored altogether, parents and families must try to manage and control it. The family's role is therefore essential in protecting children, through the following measures:

- Agreeing on a fixed time for play.
- Using parental-control tools such as Family Link (Google) and Screen Time (Apple).
- Playing together with the child, in order to understand the content and monitor it indirectly.
- Encouraging alternative activities such as sport, drawing, reading and innovation.
- Making the child aware that game companies exploit tricks such as Loot Boxes and FOMO (the Fear of Missing Out) to drain money and time.

A practical activity using parental-control tools:

- Research tools such as Google Family Link and Apple Screen Time, and explain how they can be used to set playing time or monitor content.

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Questions & Exercises

Choose the correct answer from a, b, c, or d:

1. Which of the following is a benefit of strategy games?
   a) Increasing social isolation
   b) Teaching the child to think and to devise alternative plans
   c) Merely wasting time
   d) Inciting violence
2. What is meant by loot boxes in games?
   a) Educational tools
   b) A form of legalized gambling
   c) A means of cooperation between players
   d) A means of reducing playing time
3. Which of the following is one of the global measures to limit the negative impact of video games?
   a) Allowing play all day long
   b) Banning play at school entirely
   c) Encouraging pay-to-win
   d) Ignoring parental supervision
4. What is the role of parental-control tools such as Family Link and Screen Time?
   a) Increasing playing time
   b) Switching the game off when the set time runs out
   c) Allowing play without restrictions
   d) Sharing passwords with friends
5. What is the best way to protect a child from the negative impact of video games?
   a) Banning them from playing altogether
   b) Family and community awareness, and managing playing time
   c) Leaving them to play alone
   d) Buying them every new game
6. Which of the following is a benefit of non-violent multiplayer games?
   a) Fostering cooperation and communication between players
   b) Increasing social isolation
   c) Inciting violence
   d) Merely wasting time
7. What is meant by psychological tricks (Dark Patterns) in video games?
   a) Innovative teaching methods
   b) Hidden techniques for keeping the child addicted to playing
   c) Tools for reducing playing time
   d) Means of encouraging cooperation between players

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8.Which of the following is one of the global measures to limit the negative impact of video games?

a) Allowing play all day long

b) Limiting playing time for children and adolescents to a maximum of three hours per week

c) Encouraging pay-to-win

d) Ignoring parental supervision

9. What is the role of parents playing together with their children?

a) Only increasing playing time

b) Building a shared language of dialogue and monitoring the content indirectly

c) Allowing the child to play without restrictions

d) Reducing the child›s interest in playing

10. What is the purpose of making the child aware that games companies use loot boxes and FOMO tricks?

a) Encouraging them to buy more games

b) Helping them understand the commercial tricks and avoid falling into exploitation

c) Banning them from playing altogether

d) Increasing their addiction to games

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Lesson 4: Artificial Intelligence and Deepfakes

Lesson Objectives

By the end of this lesson, the student will be able to:

- Explain the concepts of artificial intelligence and Deepfake.
- Know Deepfakes and GANs techniques.
- Use tools and applications to detect Deepfakes.

Dear student: we live today in an age in which technology has become an essential part of our daily lives. We use smartphones and social media to view photographs and videos and to communicate with others. With the great advances in artificial intelligence, these technologies have become capable of accomplishing astonishing tasks, such as recognizing faces, translating languages, and even creating new content.

But, dear student, just as this technology brings great benefits, it also has some negative uses. Among the most dangerous of these is what is known as **Deepfake**, whereby videos or images can be generated that look entirely real — but are, in fact, fake!

Dear student: in this lesson we will set out together on an enjoyable journey to understand how artificial intelligence works, how Deepfakes are generated, and — most importantly — how we can distinguish real content from fake content, so that we become aware, responsible users of technology.

Deepfakes:

Deepfakes are the use of artificial intelligence to generate fake images, videos or voices that look very real.

Example: a video of a famous person saying things they never actually said.

Dear student: in order to understand how Deepfakes are generated, we must first get to know a very important technology — **Generative Adversarial Networks (GANs).**

What Are GANs (Generative Adversarial Networks) Technology?

GANs technology consists of two parts:

1.The Generator: creates fake data and tries to make it look as real as possible.

2.The Discriminator: tries to detect whether the data is real or fake.

The competition between the two continues thousands of times within a few seconds: the generator improves its forgery each time, and the discriminator improves its ability to detect it, until the generator reaches a result so realistic that an ordinary person finds it hard to tell apart.

And that is how fake videos are generated!

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The more the competition between the two develops, the more accurate the forgery becomes!

A simple analogy: it is as if there were a «forger» trying to imitate a picture, and a «detective» trying to uncover the forgery.

Exposing DeepFake Videos

Signs that help you detect DeepFakes:

1. The rate of eye blinking in videos: in many cases, the people in fake videos do not blink naturally, or blink very slowly.

2. Inconsistent lighting on the face: you may notice that the shadows on the face do not match the lighting of the room or the background.

3. **The sound does not match the lip movements:** focus on the movement of the mouth; if the words do not match the lip movements precisely, the video is probably fake.

4. Distortions of the face during movement: look for blurring or distortion around the edges of the face.

5. An unclear or distorted background.

Techniques and Applications for Detecting Deepfakes

Dear student: do not worry — however much artificial intelligence advances in forgery, it also advances in detecting it. There are techniques we can use to verify the credibility of content.

Examples of detection tools:

- Deepware Scanner
- Sensity AI
- Hive Moderation
- InVID
- Microsoft Video Authenticator

How do these tools work?

They analyze the video or image and detect unnatural alterations using artificial intelligence.

The Risks of Deepfakes

Dear student: we must be aware of how dangerous this technology is.

These risks are:

- Spreading false news.
- Damaging people›s reputations.
- Online fraud.
- Harming society.

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How Do We Protect Ourselves?

Dear student: here are some important pieces of advice:

- Do not believe everything you see on the internet.
- Verify the source of the video or image.
- Use detection tools.
- Consult specialists if you have doubts about any content.

Note: as an aware student, you bear a great responsibility. You must be a critical thinker who does not believe everything seen on the internet, and you must refrain entirely from sharing any content that might be fake, because it could harm others.

Exercise: what would you do if you saw a video whose authenticity you doubted?

Practical activity: dear student, search for a video on the internet, then try to analyze it:

- Is it real or fake?
- What evidence did you rely on?

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Questions & Exercises

First: Put (√) next to each correct statement and (✗) next to each incorrect one.

1. Artificial intelligence is the ability of a computer or a machine to think, learn and make decisions like a human being. ( )
2. Deepfake is the use of artificial intelligence to create fake images, videos or voices that look very real. ( )
3. GANs stand for Generative Adversarial Networks. ( )
4. GANs consist of only one part: the Generator. ( )
5. The Generator in GANs tries to detect whether the data is real or fake. ( )
6. The Discriminator in GANs tries to detect whether the data is real or fake. ( )
7. The competition between the generator and the discriminator continues thousands of times within a few seconds, until the forgery becomes very realistic. ( )
8. In fake videos, the people often do not blink naturally, or blink very slowly. ( )
9. The lighting of the face in fake videos is always perfectly consistent with the lighting of the background. ( )
10. The sound in fake videos always matches the lip movements precisely. ( )
11. Distortions of the face during movement, and blurring around the edges of the face, can be signs of Deepfakes. ( )
12. Deepware Scanner is one of the tools for detecting Deepfakes. ( )
13. Microsoft Video Authenticator is a tool that analyses video and detects unnatural alterations. ( )
14. Deepfake detection tools do not use artificial intelligence in their work. ( )
15. The risks of Deepfakes are spreading false news, damaging people's reputations, and online fraud. ( )
16. Everything seen on the internet should be believed without verifying its credibility. ( )
17. Detection tools and the help of specialists can be used to verify content whose authenticity is in doubt. ( )
18. A phone that recognizes your face is an example of artificial intelligence. ( )
19. A voice assistant such as Siri or Google Assistant is an example of artificial intelligence. ( )
20. The aware student bears the responsibility of refraining from sharing any content that might be fake, because it could harm others. ( )

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Second: Choose the correct answer from a, b, c, or d:

1. What is the definition of artificial intelligence (AI)?
   a) The computer›s ability to store files only
   b) The computer›s ability to run games
   c) The ability of a computer or a machine to think, learn and make decisions like a human being
   d) The computer›s ability to print
2. What is a Deepfake?
   a) A technology for storing data securely
   b) The use of artificial intelligence to create fake images, videos or voices that look very real
   c) An anti-virus program
   d) A technology for speeding up the internet
3. What are GANs?
   a) An anti-virus protection program
   b) Generative Adversarial Networks
   c) A new programming language
   d) A type of hardware
4. How many parts does a GAN system consist of?
   a) One part
   b) Two parts
   c) Three parts
   d) Four parts
5. What is the role of the Generator in GANs?
   a) Detecting fake data
   b) Creating fake data and trying to make it look real
   c) Analyzing videos
   d) Deleting suspicious files
6. What is the role of the Discriminator in GANs?
   a) Creating fake data
   b) Detecting whether the data is real or fake
   c) Storing data
   d) Encrypting files

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7. What is the aim of the competition between the generator and the discriminator in GANs?
   a) Speeding up the computer
   b) The more the competition develops, the more accurate the forgery becomes
   c) Reducing file sizes
   d) Encrypting data
8. Which of the following signs may detect a fake video?
   a) Natural eye movement and blinking
   b) Perfectly consistent lighting
   c) The people do not blink naturally, or blink very slowly
   d) Clear sound that matches the picture
9. Which of the following signs may detect a fake video?
   a) Lighting consistent with the background
   b) The lighting of the face is inconsistent with the lighting of the room or the background
   c) Natural lip movement
   d) A clear background
10. Which of the following signs may detect a fake video?
   a) The sound matching the lip movements
   b) The sound not matching the lip movements
   c) Natural eye movement
   d) Consistent lighting
11. Which of the following signs may detect a fake video?
   a) A clear face during movement
   b) Distortions of the face during movement, or blurring around the edges of the face
   c) A clear background
   d) Matching sound
12. Which of the following tools is used to detect Deepfakes?
   a) Microsoft Word
   b) Deepware Scanner
   c) Google Maps
   d) Calculator

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13. Which of the following tools is used to detect Deepfakes?

a) Photoshop b) Sensity AI

c) Excel d) PowerPoint

14. Which of the following tools is used to detect Deepfakes?

a) Notepad b) Microsoft Video Authenticator

c) Paint d) Media Player

15. How do deepfake detection tools work?

a) By deleting the video immediately

b) By analyzing the video or image and detecting unnatural alterations using artificial intelligence

c) By sending an alert to the police

d) By encrypting the file

16. Which of the following is considered one of the risks of Deepfakes?

a) Improving video quality

b) Spreading false news, damaging people's reputations, and online fraud

c) Speeding up the internet

d) Improving the sound

17. What is the safe course of action when watching a video whose authenticity is in doubt?

a) Sharing it immediately with friends

b) Verifying the source of the video, using detection tools, and not believing everything seen

c) Only deleting it from the device

d) Sending it to everyone

18. What responsibility does the aware student bear?

a) Sharing every piece of content they see

b) Refraining from sharing any content that might be fake, because it could harm others

c) Creating fake content for amusement

d) Ignoring content that is in doubt

19. What is the appropriate analogy for the way GANs work?

a) A doctor and a patient

b) A forger trying to imitate a picture, and a detective trying to uncover the forgery

c) A teacher and a student

d) A driver and a passenger

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20. What is the essential message of the lesson about dealing with Deepfakes?

a) Believing all content on the internet

b) To be aware, responsible users who verify sources, use the tools, and refrain from spreading fake content

c) Creating fake content for amusement

d) Ignoring technology altogether

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