Session 20

ALGORITHMS. PROGRAMMING LANGUAGES

1. Match the words with their definitions.

1) loop

a) a person's name written in a distinctive way as a form of identification in authorizing a document

2) flowchart

b) an activity of buying and selling, especially on a large scale, on the Internet

3) to execute

c) a particular order in which related events, movements, or things follow each other

4) ubiquitous

d) the science or study of analyzing and deciphering codes, ciphers

5) e-commerce

e) a diagram, often using geometric symbols, showing steps in a sequence of operations, as in manufacturing or in a computer program

6) cryptography

f) having the ability to be everywhere

7) sequence

g) to carry out, to perform

8) signature

h) a series of instructions in a program, performed repeatedly until some specified condition is satisfied

2. Match the synonyms given below.

- 1. selection
- 2. ubiquitous
- 3. sophisticated
- 4. to allocate
- 5. scarce
- 6. beneficial
- 7. core
- 8. to assign
- 9. profit
- 10. crew
- 11. to extract

a. to place
b. main
c. insufficient
d. team
e. widespread
f. choice
g. to retrieve
h. advanced
i. useful
j. income
k. to appoint

3. Use the words in the box to complete the sentences and make any necessary changes.

> sophisticated, ubiquitous, flowchart, allocate, feature, scarce, determine, enterprise, execute

1. I've added some new ____ to my website.
2. Skilled workers were becoming increasingly ____.
3. A large sum has been ____ for buying new books for the library.
4. The software translates program from one language a human can read and understand to language a computer can ____.
5. I think a more ____ approach is needed to solve this problem.
6. My aim was first of all to ____ what I should do next.
7. They run a family ____ in their local town.
8. The company's logo has become ____ all over the world.
9. Work instructions are documents, often in the form of ____, which guide individual designers in performing tasks.

4. Complete the table with the appropriate derivatives. Pay attention to the meaning of the words.

Verb	Noun	Adjective / Participle
	execution	
		representative
select		
		repetitive
	privacy	
digitize		
	analysis	
		manipulative
		signed
continue		

5. Complete the sentences with the appropriate derivative of the word given in capitals.

- 1. We need to _____ what went wrong. (ANALYSIS)
- 2. The project is a joint venture between the public and _____ sectors. (PRIVACY)
- 3. You must put your _____ on the document. (SIGNED)
- 4. Today's personal computers can _____ instructions in less than one millionth of a second. (EXECUTION)
- 5. Once you have made your _____, click Save Changes. (SELECT)
- 6. The _____ age has transformed how information is accessed and retrieved. (DIGITIZE)
- 7. Special software is needed to _____ the mass of data. (MANIPULATIVE)
- 8. The _____ of the meeting was delayed until the next day. (CONTINUE)

Algorithms

An algorithm can be defined as "A sequence of steps to be carried out for a required output from a certain given input". There are 3 main features of an algorithm from its definition:

1. The essential aim of an algorithm is to get a specific output.
2. An algorithm involves several continuous steps.
3. The output comes after the algorithm finished the whole process.

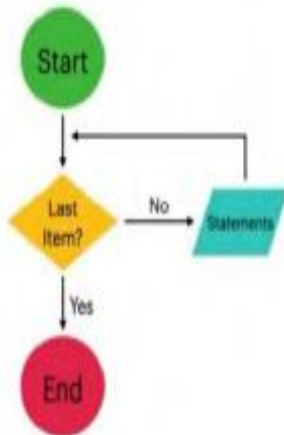Algorithms can be classified into 3 types based on their structures:

1. Sequence: this type of algorithm is characterized with a series of steps, and each step will be executed one after another.
2. Branching: this type of algorithm is represented by the "if-then" problems. If a condition is true, the output will be A, if the condition is false, the output will be B. This algorithm type is also known as "selection type".
3. Loop: for this type, the process might be repeatedly executed under a certain condition. It is represented by "while" and "for" problems. But make sure the process will end after a number of loops under the condition. This algorithm type is also known as "repetition type".

Name the types of algorithms presented in the pictures:

A)

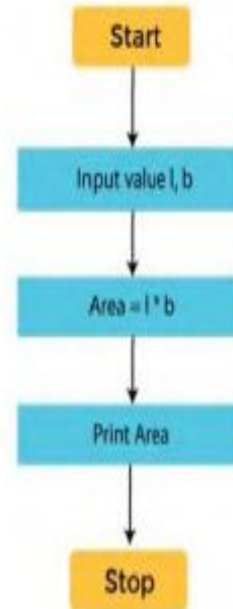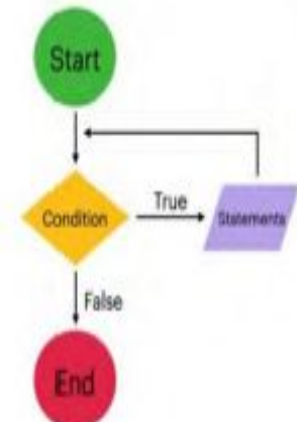Start

Last Item? — No → Statements

Yes

End

B)

START

CAN YOU ANSWER THIS SIMPLE QUESTION

YES — DO SOMETHING

NO — DO SOMETHING

C)

Start

Input value l, b

Area = l * b

Print Area

Stop

D)

Start

Condition — True → Statements

False

End

Applications of algorithms

Algorithms can be used in many areas, and they are often represented in flowchart form for visual understanding. In other words, a flowchart is a diagram that represents an algorithm, showing the steps in various boxes and displays the process by connecting the boxes together.

Practical applications of algorithms are ubiquitous and include the following examples:

The Human Genome Project has made great progress toward the goals of identifying all the 100,000 genes in human DNA, determining the sequences of the 3 billion chemical base pairs that make up human DNA, storing this information in databases, and developing tools for data analysis. Each of these steps requires sophisticated algorithms. The savings are in time, both human and machine, and in money, as more information can be extracted from laboratory techniques.

The Internet enables people all around the world to quickly access and retrieve large amounts of information. With the aid of clever algorithms, sites on the Internet are able to manage and manipulate this large volume of data. Examples of problems that make essential use of algorithms include finding good routes on which the data will be, and using a search engine to quickly find pages on which particular information resides.

Electronic commerce enables goods and services to be ex-changed electronically, and it depends on the privacy of personal information such as credit card numbers, passwords, and bank statements. The core technologies used in electronic commerce include public-key cryptography and digital signatures which are based on numerical algorithms and number theory.

Manufacturing and other commercial enterprises often need to allocate scarce resources in the most beneficial way. An oil company may wish to know where to place its wells in order to maximize its expected profit. An airline may wish to assign crews to flights in the least expensive way possible, making sure that each flight is covered and that government regulations regarding crew scheduling are met. An Internet service provider may wish to determine where to place additional resources in order to serve its customers more effectively. These are just a few examples where algorithms are most useful [20, 32].

True or false

- 1. An algorithm follows the steps to get an input for a given output.
- 2. A sequence algorithm is repeatedly executed under a certain condition.
- 3. Branching is an example of "repetition type" algorithm.
- 4. Practical applications of algorithms are limited.
- 5. Sophisticated algorithms save time and human and machine resources.
- 6. Electronic commerce makes use of the core technologies including public-key cryptography and digital signatures.
- 7. Public information includes credit card numbers and passwords.
- 8. An Internet service provider may wish to assign crews to flights in the least expensive way.

3. Match the words that go together in the text.

1.	human	a.	cryptography
2.	to be represented by	b.	of clever algorithms
3.	to maximize	c.	under a certain condition
4.	to get	d.	great progress
5.	public-key	e.	of steps
6.	to allocate	f.	DNA
7.	a sequence	g.	profit
8.	to be executed	h.	a specific output
9.	to make	i.	scarce resources
10.	with the aid	j.	"if-then" problems

PERFECT TENSE FORMS

We use the **Present Perfect** to talk about past events with a connection to the present (focus on the result but not on the time).

*I **have** already **fixed** the printer fault (now I can print my report).*

Time words with the **Present Perfect**: *just, already, yet, ever, this week, all my life, lately, recently, since, for.*

	Positive	Negative	Questions
Present Perfect Active	They / he **have / has translated** the program into machine language	They / he **haven't / hasn't translated** the program into machine language	**Have / has** they / he **translated** the program into machine language?
Present Perfect Passive	The program / programs **has / have been translated** into machine language.	The program / programs **hasn't / haven't been translated** into machine language.	**Has / have** the program / programs been **translated** into machine language?

We use the **Past Perfect** to describe an activity that happened earlier than another activity in the past or an action completed by a certain time in the past.

*By the time we arrived they **had** already **installed** software.*

Time words with the **Past Perfect**: *by, by the time, after, before, as soon as* and many of the time words used with the Present Perfect.

	Positive	Negative	Questions
Past Perfect Active	They **had translated** the program into machine language	They **hadn't translated** the program into machine language	**Had** they **translated** the program into machine language?

	Positive	Negative	Questions
Past Perfect Passive	The program **had been translated** into machine language.	The program **hadn't been translated** into machine language.	**Had** the program **been translated** into machine language?

We use the **Future Perfect** to describe an action that will be completed by a certain time in the future.

*They **will have reinstalled** the application by 5 pm tomorrow.*

Time words with the **Future Perfect**: *by next year, by tomorrow, by the time, after, before etc.*

	Positive	Negative	Questions
Future Perfect Active	They **will have translated** the program into machine language	They **will not (won't) have translated** the program into machine language	**Will** they **have translated** the program into machine language?
Future Perfect Passive	The program **will have been translated** into machine language	The program **will not (won't) have been translated** into machine language	**Will** the program **have been translated** into machine language?

1. Say what these people have done using Present Perfect.

- Example: Anton / send / the latest changes to the project / just
- He has just sent the latest changes to the project.
- 1. I / start / learning Python / already.
- 2. Denis / create / his first Unity 3D project / just.
- 3. They / be / interested in web development / several years / for.
- 4. Dota 2 / be / part of my life / 2015 / since.
- 5. JavaScript / gain / a lot of popularity / the last few years / over.
- 6. Google / give / more than $250 million toward education / 2005 / since.
- 7. Many organizations / incorporate / AI into key processes and services / recently.
- 8. I / not develop / the algorithm to test the code / yet.

2. Complete the sentences with _for_ or _since_.

1. We've been friends ____ we started learning at the university.
2. I haven't seen Victor ____ ages.
3. He has worked for this company ____ January.
4. Lisa has been at the laboratory class ____ this morning.
5. A new app has been developed by a programming team ____ a month already.
6. A group of students has worked on this project ____ the beginning of the term.
7. I have known him ____ 5 years.
8. They've learnt Python ____ several weeks already.

4. Think of explanations for these situations. Use the verb given.

Example: There's oil on Nick's hands. (*repair the car*)

He has repaired the car.

1. Sergey is looking for his key. He can't find it. (*lose*)
2. Helen looks very tired. (*work hard*)
3. Your boss looks irritated. (*learn the data on the company's income*)
4. The car has stopped. (*run out of petrol*)
5. Andrew is very happy. (*pass a driving test*)
6. Your boss feels satisfied. (*sign a business contract*)

5. Fill in the gaps with a verb from the box in the correct Present Perfect form (Active or Passive).

> be, develop, build, recommend, convert, introduce, use, share

1. Being a Java developer, it _____ easy for me to get started with Kotlin.
2. I _____ to learn Python because it's a good language for beginners.
3. – _____ you ever _____ Android Studio? – Sure, I _____ already _____ my first app using Android Studio tools.

4. Kotlin is a cross-platform programming language, so we _____ Kotlin code with all of the target platforms.
5. Pinterest _____ successfully _____ Kotlin in their application, used by 150M
people every month.
6. Keepsafe App Lock _____ to 100% Kotlin leading to 30% decrease in source line count.
7. JavaScript is a popular language for web development. Popular sites like eBay, PayPal and Uber _____ using JavaScript.

7. Change the verb into the correct form of Past Perfect or Past Simple (Active or Passive):

1. I _____ (look) through a lot of guides before I _____ (find) the most useful one.
2. Ann _____ (apply) to many companies before she _____ (invite) for an interview.
3. When Ivan _____ (decide) to sell his laptop he _____ already (have) it for 5 years.
4. By 2012 Google _____ (scan) more than 15M books.
5. Before Victor _____ (learn) to program in Java he _____ (learn) Python.
6. After I _____ (complete) a tutorial I _____ (write) simple code in C#.
7. Julia _____ (try) a free trial with Unity Learn before she _____ (buy) a full version.
8. The game _____ (adjust) before we _____ (release) it.

8. Choose the correct form of the verb using Perfect Tenses.

1. After the lecturer *has explained / had explained / will have explained* the basics of relational databases, he gave the task to the students.

2. Misha *has been prepared / will have prepared / had prepared* the report by next week.

3. C++ programming language *had been learnt / will have learnt / has been learnt* by the students since the beginning of the term.

4. Before the app was released, its functionality *had enhanced / will have been enhanced / had been enhanced*.

5. Andrew *had completed / has been completed / will have completed* testing the app by deadline last week.

6. All technical documentation *had been analyzed / will have been analyzed / have been analyzed* by next Tuesday.

7. After the developers *have been used / will have used / had used* ReactJS library the website development process was accelerated.

9. Choose the best option.

1.   Valve _____ many classic games like Counter-Strike, Dota 2 that will be played for years to come.
      a)   have been created
      b)   has created
      c)   had created

2.   Java Script _____ one of the most dominant languages over the last few years for front-end work.
      a)   had become
      b)   have become
      c)   has become

3.   New content _____ on the website by this time tomorrow.
      a)   has been uploaded
      b)   will have been uploaded
      c)   have uploaded

4. They _____ a lot of research before they finally solved the problem.
   a) had conducted
   b) has been conducted
   c) will have conducted
5. I _____ in Czech Republic for a year before I moved to Greece.
   a) has been
   b) had been
   c) have been
6. Our developers _____ new features to the game mechanics by next month.
   a) had been brought
   b) will have brought
   c) have brought
7. Recently, I _____ on a variety of developer tools at Facebook.
   a) has been worked
   b) will have worked
   c) have worked
8. The project _____ by the deadline last week.
   a) have been completed
   b) had completed
   c) had been completed

9. Next year I _____ for the company for three years.
   a) have been worked
   b) will have worked
   c) will have been worked
10. Android _____ the choice of phones available around the world.
   a) will have expanded
   b) had been expanded
   c) has expanded
11. By next September Mark _____ C++ for a year.
   a) will have been studied
   b) will have studied
   c) have been studied
12. Kotlin _____ successfully by major companies.
   a) has been adopted
   b) had adopted
   c) will have adopted

10. Correct the mistakes.

- 1. Some of the popular games like Counter-Strike, World of Warcraft will have made with C++.
- 2. Recently, big tech companies has been chosen Python as their primary back-end programming language.
- 3. Last week I downloaded a Java Tutorial for Complete Beginners. I has never used Java before.

- 4. By next October, Pavel has learnt Python for a year.
- 5. Alexander have applied to many companies before he got the job.
- 6. For a student who have never been programmed before, using a statically typed language seems unnatural.
- 7. After Julia has been followed a style guide for Python code she started to program in Python more productively.
- 8. By this time tomorrow we have wrote a simple program to control a simulated robot.