

Delegate Booklet
Course Title: Computer Science
4CP0-20IO1

About this event

Course Title: Computer Science

Course Code: 4CP0-20IO1

Aims and objectives of the event:

- To identify how the qualifications are devised.
- To review the content of the qualification.
- To explore how to plan the course and/or lessons.
- To understand the assessment of the qualification and how to prepare students.
- To identify the support available from Pearson.

Agenda of Event

Time (minutes)	Item
5	Welcome
5	Aims and agenda
5	Devising a qualification
5	Overview of qualification
20	Qualification content
15	Activity 1 – Identify the topic
5	Planning for teaching the course
15	Activity 2 – Order the spec points
10	Assessment
10	Activity 3 – Identify the paper
10	Preparing students for exams
10	Available support
5	Questions

Computer Science Content (Specification)

Topic	Title	Page
Topic 1	Problem solving	9
Topic 2	Programming	11
Topic 3	Data	13
Topic 4	Computers	15
Topic 5	Communication and the internet	17
Topic 6	The bigger picture	19

Links used in the session

Item	Link
UK Department for Education – GCSE Computer Science Subject Content Criteria	https://www.gov.uk/government/publications/gcse-computer-science
Pearson International GCSE Computer Science main page	https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/international-gcse-computer-science-2017.html
Pearson International GCSE Computer Science teaching support materials	https://qualifications.pearson.com/en/qualifications/edexcel-international-gcses-and-edexcel-certificates/international-gcse-computer-science-2017.coursenmaterials.html#filterQuery=category:Pearson-UK:Category%2FTeaching-and-learning-materials

Activity 1 – Identify the topic

Here are some questions. These questions have been created by a teacher for use in the classroom.

For each question, identify the specification bullet point that you think it belongs to. Make notes in the last column to answer the question. The first one has been done for you.

	Question	Bullet	Notes
1	Convert 4 gibibytes to kibibytes.	3.3.1	$4 * 2^{30} / 2^{10}$
2	Discuss the statement 'Artificial intelligence is more than just robots'.		
3	Give 2 advantages of IPv6 over IPv4.		
4	Here is the text representation of a binary pattern stored in memory: AABBBBCDEFGGGGGHIJKLMNOPQRSTUVWXYZ Explain the effect of applying a run-length encoding (RLE) algorithm to this pattern.		
5	The stored program concept assumes that the bit patterns stored in memory can represent only two items. Name these two items.		
6	What is the minimum number of passes that a bubble sort must make through the data and why?		
7	Compare the use of variables and constants in coded programs.		

Activity 2 – Order the specification points/put into teaching order

In this activity, you are going to analyse the contents from topics across the specification. Evaluate each statement, identify the specification point, and put them in a teaching order. Keep in mind that the numbering of the bullets presented in the specification may not represent the most suitable teaching order.

These points have been chosen because they represent a basic understanding of how the machine works. This will create a good foundation for making the connection between the abstract world of programming and the world of hardware.

Order	Spec	Description
		Understand the concept of a stored program and the role of components of the CPU (control unit (CU), arithmetic/logic unit (ALU), registers, clock, address bus, data bus, control bus) in the fetch-decode-execute cycle (the Von Neumann model).
		Be able to produce logic statements for a given problem.
		Understand the function of the hardware components of a computer system (central processing unit (CPU), main memory, secondary storage, input and output devices) and how they work together.
		Understand how computers encode characters using ASCII and Unicode.
		Understand that computers use binary to represent data (numbers, text, sound, graphics) and program instructions.
		Be able to convert between binary and denary whole numbers (0–255).
		Be able to construct and interpret truth tables for a given logic statement (AND, OR, NOT).
		Understand the function of different types of memory (random-access memory (RAM), read-only memory (ROM), cache, virtual memory).
		Understand how computers represent and manipulate numbers (unsigned integers, signed integers (sign and magnitude, two's complement)).
		Understand the input-process-output model.

Activity 3 – Identify the Paper

In this activity, you are going to analyse some questions to decide if they would most likely appear in Paper 1: Principles of Computer Science or Paper 2: Application of Computational Thinking.

Evaluate each question, identify the specification point, and identify the Paper in which it would appear.

The questions in this activity have not been developed by examiners, so you should not infer that these might appear on any future examinations. The questions may also appear in either Paper, depending on how they're phrased.

Note: This activity extends to two pages.

Paper	Spec	Question	Notes
		Here is an array of 52 strings: [A, AA, B, BB, C, CC, ... X, XX, Y, YY, Z, ZZ]. You want to find the string MM. State and justify an appropriate search algorithm to use.	
		Give two advantages of using a compiler over an interpreter to translate a programming language.	
		Explain why programmers use constants in their code.	



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		State the names of the four-layer TCP/IP model in order from lowest to highest.	
		<p>Here is an example of a 'for' loop:</p> <pre>FOR index FROM 1 TO 10 DO SEND testScores[index] TO DISPLAY END FOR</pre> <p>Rewrite this logic to use a 'while' loop for any number of scores in the data structure testScores. Use your chosen programming language.</p>	
		In the ASCII table, the hexadecimal code 4B represents the letter K. What is the hexadecimal code for the letter S?	
		Discuss this statement: DNA computing will allow us to store much more information in the future than we can store now.	
		Write a subprogram that takes three integers as parameters and returns their average. Use your chosen programming language.	

ANSWERS

Activity 1 – Identify the topic (suggested answer)

Here are some questions. These questions have been created by a teacher for use in the classroom.

For each question, identify the specification bullet point that you think it belongs to. Make notes in the last column to answer the question. The first one has been done for you.

Here are the suggested answers to the questions. You should have found one question for each of the six topics in the specification. The notes, in the last column, contain information that you might find useful in answering the question.

	Question	Bullet	Notes
1	Convert 4 gibibytes to kibibytes.	3.3.1	$4 * 2^{30} / 2^{10}$
2	Discuss the statement 'Artificial intelligence is more than just robots'.	6.1.4	Natural language processing, machine learning, speech recognition.
3	Give 2 advantages of IPv6 over IPv4.	5.3.3	More addresses. Works better on mobile devices.
4	Here is the text representation of a binary pattern stored in memory: AABBBCDEFGGGGHIJKLMNOPQRSTUVWXYZ Explain the effect of applying a run-length encoding (RLE) algorithm to this pattern.	3.3.3	The encoded output would be longer than this input because every 'single' letter would become a 'letter, digit' pair. Only runs of 3 or more letters would compress.



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5	The stored program concept assumes that the bit patterns stored in memory can represent only two items. Name these two items.	4.2.3	Data. Instructions.
6	What is the minimum number of passes that a bubble sort must make through the data and why?	1.1.8	One. A single pass is needed, without swaps, to make sure the list is sorted. If the input is already sorted, it still takes one pass.
7	Compare the use of variables and constants in coded programs.	2.3.4	Constants are created and set once for the life of the program. Value of variables can change at any time.

Activity 2 – Order the specification points/put into teaching order (suggested answer)

In this activity, you are going to analyse the contents from topics across the specification. Evaluate each statement, identify the specification point, and put them in a teaching order. Keep in mind that the numbering of the bullets presented in the specification may not represent the most suitable teaching order.

These points have been chosen because they represent a basic understanding of how the machine works. This will create a good foundation for making the connection between the abstract world of programming and the world of hardware.

Here are the suggested answers to this activity. Remember, you might have chosen a slightly different order, especially if you feel it will support your students better.

Order	Spec	Description
4	4.2.3	Understand the concept of a stored program and the role of components of the CPU (control unit (CU), arithmetic/logic unit (ALU), registers, clock, address bus, data bus, control bus) in the fetch-decode-execute cycle (the Von Neumann model).
9	4.3.2	Be able to produce logic statements for a given problem.
2	4.2.1	Understand the function of the hardware components of a computer system (central processing unit (CPU), main memory, secondary storage, input and output devices) and how they work together.
10	3.2.1	Understand how computers encode characters using ASCII and Unicode.
5	3.1.1	Understand that computers use binary to represent data (numbers, text, sound, graphics) and program instructions.
7	3.1.3	Be able to convert between binary and denary whole numbers (0–255).
8	4.3.1	Be able to construct and interpret truth tables for a given logic statement (AND, OR, NOT).
3	4.2.2	Understand the function of different types of memory (random-access memory (RAM), read-only memory (ROM), cache, virtual memory).
6	3.1.2	Understand how computers represent and manipulate numbers (unsigned integers, signed integers (sign and magnitude, two's complement)).
1	4.1.1	Understand the input-process-output model.

Activity 3 – Identify the Paper (suggested answer)

In this activity, you are going to analyse some questions to decide if they would most likely appear in Paper 1: Principles of Computer Science or Paper 2: Application of Computational Thinking.

Evaluate each question, identify the specification point, and identify the Paper in which it would appear.

The questions in this activity have not been developed by examiners, so you should not infer that these might appear on any future examinations. The questions may also appear in either Paper, depending on how they're phrased.

You may well have identified a different Paper from that given.

Paper	Spec	Question	Notes
1	1.1.7	Here is an array of 52 strings: [A, AA, B, BB, C, CC, ... X, XX, Y, YY, Z, ZZ]. You want to find the string MM. State and justify an appropriate search algorithm to use.	Linear search is sufficient for this small number of items, even though it is sorted.
1	4.5.2	Give two advantages of using a compiler over an interpreter to translate a programming language.	The executable is portable across platforms. The source code is not distributed as part of the product.
2	2.3.4	Explain why programmers use constants in their code.	Constant values do not change throughout the program, so it can't be changed by accident.
1	5.1.6	State the names of the four-layer TCP/IP model in order from lowest to highest.	Data link, network, transport, application.
2	1.1.2	Here is an example of a 'for' loop:	<code>index =0</code> <code>WHILE (index < LEN(testScores)) DO</code>



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		<pre>FOR index FROM 1 TO 10 DO SEND testScores[index] TO DISPLAY END FOR</pre> <p>Rewrite this logic to use a 'while' loop for any number of scores in the data structure testScores. Use your chosen programming language.</p>	<pre>SEND testScores[index] TO DISPLAY index = index + 1</pre> <p>Note: Only pseudocode shown.</p>
1	3.2.1	In the ASCII table, the hexadecimal code 4B represents the letter K. What is the hexadecimal code for the letter S?	$4B_{16} = 75_{10}$ $S = K + 8 = 75_{10} + 8_{10} = 83_{10} = 53_{16}$
1	6.1.4	Discuss this statement: DNA computing will allow us to store much more information in the future than we can store now.	Density: 1 exabyte / mm ³ Durable: half-life = 500 yrs Not yet practical, but foreseeable. Use A, G, C, and T to encode.
2	2.6.2	Write a subprogram that takes three integers as parameters and returns their average. Use your chosen programming language.	<pre>FUNCTION findAverage (pNum1, pNum2, pNum3) BEGIN FUNCTION SET avg to (pNum1 + pNum2 + pNum3) / 3 RETURN avg END FUNCTION</pre> <p>Note: Only pseudocode shown.</p>

Personal Learning

Things to do:

Things to avoid:

Ideas to follow up: