

Examiners' Report/  
Principal Examiner Feedback

Summer 2015

Pearson Edexcel GCSE  
In Computer Science (ICP0/01)  
Paper 01 Principles of Computer  
Science

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## Introduction

This is the first time that students have sat for examinations in this unit, which requires them to demonstrate an understanding of:

- Problem solving and programming;
- Data, both representation and manipulation;
- Computers as devices and conceptual models
- Digital communications and the Internet; and
- The impact that computing technology has on society.

Students are introduced to a context for each question; unless instructed otherwise, students should apply this context when developing responses.

Additionally, students will find that 'command words' are used consistently in the paper to indicate the type of response expected. Examiners saw many detailed responses.

However, often students provided a little more than simple statements and failed to include examples and reasons where expansions or explanations were required. In a technical subject, the correct terminology should be used and sufficient detail be given to demonstrate understanding.

The specification contains items that students were seen to confuse. These include:

Client-server model	Server-side and client-side scripting
Internet	World Wide Web
Language translators (compilers and interpreters)	High-level and low-level languages

### **Q01a**

This question was well answered.

### **Q01b**

Many students correctly identified 'instructions' as the required response. However, some, instead of stating 'data', gave examples of 'data', such as integer, character, or memory location.

### **Q01c (i)**

A good many students chose line 122, the BNE instruction. The two lines in question are

```
121.          CMP R5, #0
122.          BNE LAB02
123. LAB03:   MOV R8, #0
```

One way to look at these lines is as their equivalent in a high-level language, which would be an IF statement.

```
If (R5 == 0) then
    do something here
else
    do a different thing here
endif
```

From here it is clear that the 'test' is the part in the brackets. It is the action that sets the processor flags. Therefore, line 121 is the test and Line 122 is an action performed as a result of the flags being set, as a result of the test. It is equivalent to the 'else' block of code. Line 123 is the action performed as a result of the flags being set, as a result of the test. It is equivalent to the 'then' block of code.

### **Q01c (ii)**

Many students, even those missing Q01c (i), responded correctly to this question.

### **Q01c (iii)**

This question was well answered.

### **Q01d**

This question was well answered.

**Q01e**

Many students missed this question. Some gave the binary representation of +14. Others tried to use the subtraction method of conversion and were unsuccessful. Some were confused between two's complement and sign-magnitude.

**Q01f (i)**

This question was well answered.

**Q01f (ii)**

Many students gained the mark for this question. However, there was some misunderstanding of the depth required. Merely indicating 'too big' alone is not sufficient enough to show understanding. Any notion of 'too big to represent' or 'more than 8 bits needed to store the number' gained the mark.

This response is of the appropriate depth.

Another 8-bit addition generates an overflow error.

(ii) State what is meant by the term overflow error. (1)

when the number is too big to store in 8-bit

This response lacks depth. It does not indicate too big for what.

Another 8-bit addition generates an overflow error.

(ii) State what is meant by the term overflow error.

The binary number is too large

**Q01f (iii)**

Many responses indicated compounding of errors or that the following results would be incorrect.

However, some responses indicated that the calculations "would not work."

The calculations will take place in the registers; therefore, the calculations will work. However, they will be inaccurate, incorrect, or wrong.

### **Q01g**

Overall, this question was well answered. A few students did not seem to recognise the term 'truth table' and used unrecognised notation. Some students were confused about how to label the columns of the table.

A few students responded with logic gate diagrams. The question specifically asks for a truth table, therefore, logic gate diagrams were not awarded.

### **Q01h (i)**

This question was well answered.

### **Q01h (ii)**

Many students did not understand the order of precedence rules for logic: ( ), NOT, AND, OR. For example, a large number of students responded "R OR B AND S". However, using the rules of precedence this becomes, 'R OR (B AND S)'.

The best responses used fully bracketed expressions which left no doubt as to understanding. A fully bracketed response is '(R OR B) AND S'.

### **Q02a**

Students who responded with 'spreadsheet' software did not receive a mark, because it is in the question. Naming an application, such as word processor, and giving a generic characteristic of it, such as 'writing documents' is not enough to earn both marks.

A better example would be, 'recording the date and time of his visits to the bee colonies.' Students are reminded that responses should be given in the context of the questions.

Many students were using product names such as 'Word', which are not awardable.

In this response, the student has identified two different applications and suggested how the biologist could use them in the context of the question.

2 A biologist uses application software to help him in his work.

For example, the biologist uses spreadsheet software to model the behaviour of bee colonies.

(a) Identify **two other** types of application software and give an example of how the biologist could use them in his work.

(4)

Type 1 Word processor

Use

To type up and plan experiments

Type 2 Search engine.

Use

To research and collaborate with other scientists around the world.

### Q02b

Students found this question challenging. Very few understood the concept of the source code being changed and redistributed for a fee.

This response is typical of those gaining three or more marks. Marks were awarded for:

- "redistributed legally" (1)
- "edited and changed by anyone" (1)
- "source code ... can be looked at by anyone" (1)

Software may be classified as open source or proprietary.

(b) State **four** features of open source software licensing.

(4)

1 It can be redistributed legally to other people

2 It can be edited and changed by anyone, legally

3 It is freely available to the general public on the internet, legally

4 The source code of open source software can be looked at by anyone, legally.

The use of the word 'free', unless a context was provided, did not gain a mark. Students are reminded that while the source code is 'free of monetary cost', the resulting executables and maintenance may not be 'free of monetary cost'. Therefore, using the word 'free' to mean 'free of any monetary charge' cannot gain a mark.

- "It is free to use" (1)
- "It is free to edit" (1)
- "It is free" (0)

### Q02c

Overall, this question was very well answered. However, students are reminded to read **instructions** of the questions carefully, to only draw only the specified number of arrows mentioned.

### Q02d

A surprising number of students did not attempt this question. There was some confusion between the internal components of the microprocessor (registers, ALU, buses) and the wider computer system (mouse, hard disc, RAM).  
(0391101953576)

The ALU and registers appeared frequently in those responses gaining both marks.

The microprocessor inside a computing device is made up of several individual components. These components work together to implement the fetch-decode-execute cycle in the device.

(d) Identify **one** component and its function in the fetch-decode-execute cycle. (2)

Component	Register
Function	To hold instructions or data to be used.

### Q02e

A significant number of students were unable to use the term multi-tasking and/or describe any features of multi-tasking, such as loading multiple processes into memory. They switched between processes to make it seem that all of them are running simultaneously, or holding them in a queue. Some students persisted in indicating that the microprocessor could run many programs at the same time. Priorities were the most commonly mentioned characteristic that gained marks.

Some students responded by comparing single core as slower than multi-core. Other students described the fetch-decode-execute cycle, which was addressed in the previous question.

This response below identified two correct responses

- Identifying that the microprocessor is a shared resource, divided among multiple applications. The ability to share is defined as multi-tasking. (1)
- Acknowledging that a single microprocessor cannot execute processes simultaneously is the second mark. (1)

(e) Explain how the operating system manages processes on a computer with a single microprocessor. (3)

An ~~operating~~ The operating system allows the microprocessor to be used by multiple applications. This is called multitasking. The microprocessor cannot execute different processes simultaneously.

## Q02f

Some students found this question challenging, many confused this with Q02a.

This question provided opportunities for students to demonstrate their understanding of how software can be used to find out new information.

This response demonstrates the depth of understanding required by the question.

(f) Give **two** examples of how software could be used in this situation to model the real world. (2)

- 1 multi agents could be used to imitate the individual bees and conditions they are exposed to. ~~is real~~
- 2 the ~~the~~ multi-agents ~~can~~ <sup>can</sup> interact and co-ordinate accordingly with other agents (bees) <sup>as in</sup> real life.

This response gained both marks and demonstrates the variety of appropriate responses.

The biologist collects data on a single bee colony each day. This includes the amount of available food, the number of bees in the colony, the amount of honey produced, the hours of sunshine, and the hours of rain. The biologist could use software to model the behaviour of the colony.

(f) Give **two** examples of how software could be used in this situation to model the real world.

(2)

1. He could use multi-agent modelling to represent this.
2. He could use spreadsheets to predict how much honey they will make on coming days.

(Total for Question 2 = 18 marks)

This is a typical response which gained both available marks. The responses indicate that software could be used to 'find new information' not just organise the information already known.

(f) Give **two** examples of how software could be used in this situation to model the real world.

(2)

1. To see if the amount of food available ~~is~~<sup>is</sup> affected by factors such as number of bees.
2. To compare factors; ~~if more bees produce more honey~~ if the bees produce more honey when there is less rain, ~~they could shelter the~~ They could shelter the colony.

(Total for Question 2 = 18 marks)

This response has not been framed in the context of the question.

The biologist collects data on a single bee colony each day. This includes the amount of available food, the number of bees in the colony, the amount of honey produced, the hours of sunshine, and the hours of rain. The biologist could use software to model the behaviour of the colony.

(f) Give **two** examples of how software could be used in this situation to model the real world.

(2)

1. How long, the number of <sup>staff</sup> people and the amount of work done in a work office.
2. For patients in a ~~hospital~~ hospital.

### Q03a (i)

This question was well answered.

**Q03a (ii)**

This question was well answered.

**Q03a (iii)**

This question was well answered.

**Q03b**

Many students failed to gain all three marks because they did not read the question carefully. The required response is a category of storage, not a type of storage device. Therefore, 'hard disc', 'CD', 'flash drive', 'SSD', and 'USB' cannot gain marks.

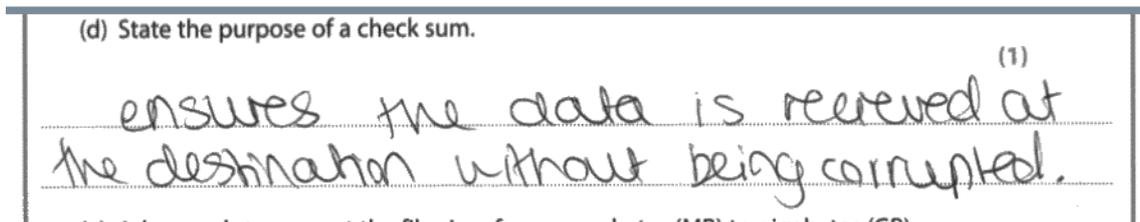
**Q03c**

Some students chose not to attempt this question. Other students responded that packets contained addresses of some sort (IP, MAC), but the addressing was in the question stem. The most popular responses were data and sequence number for reassembly.

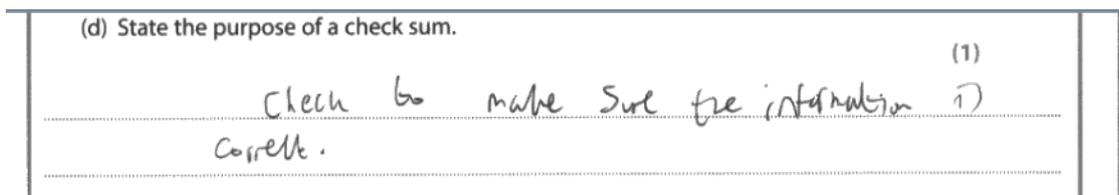
**Q03d**

Any responses expressing the idea of being able to identify whether an error has occurred during transmission of the packet gained the mark.

This response identifies the idea of some type of corruption during transmission of the data packet.



This response is typical of many. Notice that it expresses the idea of 'correctness'. A checksum cannot identify if the packet contains correct information. A checksum can only identify the possibility of corruption having taken place during transmission.



### Q03e

Overall, this question was well answered. There was some confusion between whether to multiply or divide to calculate the result. Some students used 1000 rather than 1024 in their arithmetic expressions.

### Q03f

This should have been quite an easy question with any distinction of *hardware* networks versus *data/information* stored on the hardware being eligible for marks.

Many students indicated that the 'WWW has sites', which is not detailed enough to gain a mark. Students are reminded that there are many more entities stored on the WWW than 'web pages'.

### Q03g (i)

The majority of students gained this mark for identifying the CSS code.

### Q03g (ii)

Some students were vague about the actual connections back to the CSS. Many students, however, clearly identified a tag in the given line and traced it back to the associated line in the CSS part of the page.

In this response, the student has clearly identified that the 'li' tag on line 10 in the CSS is linked to this line of HTML.

---

(ii) Here is line 18 of the code.

```
<li><a href="contact.html">Contact Us</a></li>
```

Explain how it is connected to the Cascading Style Sheet information.

(1)

In line 10 "li" is repeated linking both sections of code.

This response interprets <li> and <a> as lists and links and restates the information given in the question, mainly that it is linked back to the CSS. In order to gain the mark, the student needed to give more information that demonstrated the tracking back of the tags.

(ii) Here is line 18 of the code.

```
<li><a href="contact.html">Contact Us</a></li>
```

Explain how it is connected to the Cascading Style Sheet information.

and links (1)

The CSS defines how lists should  
be displayed on a web page.

### Q03h (i)

Many students did not attempt this question. A few attempted to describe the sampling process.

### Q03h (ii)

A large number of students' responses incorporated the idea of 'quality'. Students should understand that 'quality' is a characteristic of the playback. If the digital representation is very accurate (lots of samples), but the playback device is not so good, then the 'quality' will sound low. Some students also mentioned that increasing the sampling frequency makes the resulting file larger, but the question asks about the 'representation of the original', not the effect on file size.

This is a response that accurately states the answer to the question.

(ii) State how increasing the **sampling frequency** affects the digital representation of the original audio.

(1)

Increasing the sampling frequency makes the digital representation more accurate / closer to the original.

### Q03i

This question was well answered. Many responses included a good example that could gain marks, even when the explanation was not expressed very well.

### Q04a

Many students received two marks, with some receiving all four marks. A number of students considered it sufficient to respond with 'electricity' or 'pollution.' These are not sufficiently expanded to demonstrate the student's understanding.

Others provided responses such as "when broken, they get dumped." Although that may be true, there is no justification provided for how this is harmful to the environment.

Students are reminded that the consumption of energy is only one of the issues of concern. The use of precious metals (silver, gold) and the disposal of batteries are more specific issues that the use of computing devices raises.

This response demonstrates the minimum requirements for all four marks. The first two impacts are constructed well, with a statement and a justification. While the third impact is not expanded, the concept of 'precious' implies in short supply. The suggested action, turn them off, is the most frequently seen.

Impact 1  
go into land fill wich  
destroys natural landscape

Impact 2  
uses electricity which is got  
by burning fossil fuels, wich  
cause global warming

Impact 3  
use precious ~~to~~ metals

Action  
turn them off when not  
using them.

This response gained two of the four marks as follows:

- "CO2 emissions produced for electricity" (1)
- "thrown away into land fill" (1)
- "manufacturing ... damage environment" (0) due to lack of expansion
- "use postal service" (0) due to identification for how this will reduce the environmental impact

(a) AJ's chief executive is concerned about the environmental impact of using computers.  
Give **three** possible **environmental** impacts of using computing devices.  
Suggest **one** possible action AJ's could take to reduce the environmental impact. (4)

Impact 1

The CO<sub>2</sub> emissions that are produced when supplying the computer with electricity.

Impact 2

When the computers are broke they usually are thrown away into land fill.

Impact 3

The manufacturing of the devices will cause damage to the environment.

Action

Use the posted ~~software~~ <sup>source</sup>

#### Q04b

Although students seemed to understand that structured meant database, they gave security or backup as a justification for structuring the data. A database is not automatically secure nor is it automatically backed up. It is down to the administrator to implement those features.

#### Q04c (i)

Overall, this question was well answered. Students are reminded to use the correct terminology for computer science. The correct response is 'primary key'. A description of what a primary key is, as in 'uniquely identifies a record' is not the correct terminology.

#### Q04c (ii)

This question was answered less well than the primary key question. Students are reminded to use the correct terminology for computer science. The correct response is 'foreign key'. A description of what a foreign key is, as in 'a primary key from one table stored in another table' is not the correct terminology. A significant number of students confused a foreign key with a secondary key.

#### Q04c (iii)

This question was poorly answered by many students.

This requires the same response as 'what is the purpose of a foreign key'. Many students indicated that it had something to do with validating the input to make sure it was a number.

Question asks for 'why is this field necessary.' It does not ask for a description such as 'a primary key in one table that appears in another table'. These responses could not gain the mark.

#### Q04d

This question was very poorly answered by most students. Few students demonstrated any familiarity with SQL syntax at all.

Some students had seen SELECT statements and reproduced them here. Centres are reminded that the SQL, with which students should be familiar, is detailed in the specification appendix.

This response gained two of the three marks as follows:

- "SET OutletAddress = 360 Pinnacle Place" (1)
- "WHERE OutletID = 2" (1)
- "FROM" (0), due to introduction of incorrect keyword

(d) Construct an **SQL query** to update the location of AJ's Grill to 360 Pinnacle Place. (3)

```
FROM #Outlet SELECT SET UPDATE Outlet Address = "360 Pinnacle Place" WHERE OutletID = 2.
```

This response gained two of the three marks as follows:

- "UPDATE tblOutlet" (1)
- "SET OutletAddress TO 360 Pinnacle Place" (1), condones TO equivalent to '='

(d) Construct an **SQL query** to update the location of AJ's Grill to 360 Pinnacle Place. (3)

```
UPDATE tblOutlet  
SET Outlet Address  
WHERE 360 Pinnacle Place.  
TO
```

#### Q04e

The majority of students identified that Unicode could represent characters in non-English alphabets.

#### Q04f

Many students responded with  $2^8$  or 256. Others responded with only 255. The question asks for a **range**. That means 0 to 255.

## Q04g

Many responses incorporated vague words such as 'fast' and 'secure' with no expansion. These responses cannot gain marks.

Some students appear to be confused between server-side scripting and the client-server model. In some cases, the characteristics overlapped, so marks could be gained.

This response gained two of the three marks as follows:

- "less load on the client computers" (1)
- "more secure ... all operations are done on server ... rather than clients" (1)
- "Further ... abstraction" (0), the focus of the question is the server.

<p>(g) The head office of AJ's has decided to use server-side scripting to allow the individual outlets to access the new database.</p> <p>Give <b>three</b> features of server-side scripting. (3)</p> <p>1 It <del>process</del> means all the processing can be done <del>on</del> server-side so that there is less load on <sup>the</sup> client computers.</p> <p>2 It is more secure because all the operations are done on the server rather than on the clients.</p> <p>3 It offers a further level of abstraction to users in the individual outlet.</p>
--

This response demonstrates the confusion between client-server model and server-side scripting. Therefore, it did not gain any marks.

<p>(g) The head office of AJ's has decided to use server-side scripting to allow the individual outlets to access the new database.</p> <p>Give <b>three</b> features of server-side scripting. (3)</p> <p>1 Allows databases to be edited by other users</p> <p>2 Allows database to be shared to other users</p> <p>3 Allows databases to be updated by other users for them</p>
--

## Q05a

Few students gained all six marks for this question. Many students confused the topic with high-level and low-level programming languages, often describing compiled languages as high level and interpreted languages as low level. Some argued the reverse.

The best responses were from students who just contrasted what a compiler does with what an interpreter does.

This response gained all six marks, as indicated in the marked up image.

Compiled languages such as Java are useful as they work on any machine. However, they are harder to identify errors in as all the code is translated into machine code before it is run. This is a contrast to interpreted high level languages like Python where the code is translated and run a line at a time - this allows for easier debugging for a beginner who is likely to make a lot of mistakes. However, a downside to interpreted languages are they are slower and require a special environment from which to run unlike a compiled language. Overall,

This response gained four of the six marks.

Compiler

- "... original code creates an executable file ..." (1)
- "... it can work on a computer even lacking the language ..." (1)
- "... trouble shooting is harder ... new exe must be compiled every time a change is made ..." (1)

Interpreter

- "... main code is always kept and is always necessary" (1)

In interpreted languages troubleshooting is much easier as it simply runs through the main code. Variables can be traced, the piece of code causing the error can be highlighted, one step at a time debugging techniques can be used and the main code is always kept but is always also necessary. In compiled languages the original code creates an executable file meaning it can work on any computer even lacking the language, no specialist interpreter software is needed and the original code can be discarded but troubleshooting is much harder and a new .exe must be compiled every time a change is made to the main code.

This response is an example of the commonly seen confusion between high-level/low-level languages and compiled/interpreted languages. These responses could not gain marks.

There are two different types of programming language: High level and low level so interpreted and compiled. High-level (interpreted) will be suitable for a student because it is more recognizable to humans as it isn't that close to machine code. Low level (compiled) will be hard to learn as a person will find it hard to understand as it is close to machine code as it's already compiled. Interpreted you can tell as it is more like commands which is suited to human language. Compiled is what the CPU uses.

This response did not gain any marks. However, there is a potential to have gained some marks if the student had explained why statements were made. For example, the student states that compiled languages are more secure. A mark could be awarded if the statement had been justified with "... because no source code is distributed."

(6)  
compiled is very hard to be able to learn as it's not like English like interpreted. However, it's also very hard to find errors due to how complicated the language is. However, compiled is a lot more secure as it's harder to decode. Furthermore, interpreted is a lot simpler to learn and find errors. But it's not as secure as compiled.

### **Q05b (i)**

This question was well answered.

### **Q05b (ii)**

This question was well answered.

### **Q05c**

Some students did not attempt this task. On the other hand, many students gained both marks. Of those who did not, a large number missed out the final value of 5 in the column for the variable 'i'. Alternatively, students losing a mark, filled the column for 'i' with numbers greater than 5.

### **Q05d**

This question was challenging for most students. Many students copied the existing line and rearranged the brackets.

### **Q05e**

Some students identified the algorithm as looping through an array. They responded with purposes such as 'to find 75 in an array' or 'to check if a number is in the array.' These are not accurate answers because the return value from the function was the index of the value.

Some students described the algorithm in a step-by-step fashion, which again cannot gain marks.

Other students did not focus on the context of the question instead they gave a definition for the term 'algorithm'.

### **Q05f**

Most students who attempted this question gained some marks. Common errors leading to the loss of marks included:

- Using a variable as a running total without first setting it to 0
- Not understanding how to calculate a mean, and
- Not understanding how to use repetition (loop).

Students are reminded to use blocking and indentation accurately. In some cases, those attempting to write in Python allowed their lines to drift left,

Thereby moving them outside the loop. Although the instructions clearly stated "do not use a flowchart", a few students drew flowcharts.

This 6 mark example is very easy to read because the indentation has been used consistently to indicate blocking.

```

total = 0
number = input(print("How many weights do you want to enter?"))
for for loopcounter. in range(0, number):
    w = input(print("Enter a weight: "))
    total += w.

total = total / number
print("Average weight is: " + total)

```

This response gained the full 7 marks due to the attempt at formatting the final answer to 2 decimal places.

```

WeightTotal = 0
NumWeights = int(input("How many weights do you want to enter?"))
for count in range(NumWeights):
    currentweight = int(input("Enter a weight:\n"))
    Totalweight
    WeightTotal += currentweight

Average = ((WeightTotal / NumWeights).format[0.:.2])
print("Average weight is:", Average)

```

## Paper Summary

Based on their performance on this paper, students are offered the following advice:

- Attempt every question.
- Be sure to read the entire question, including any contextual information that may come before the actual question number.
- Respond with the context of the question in mind; try not to give general responses.
- Use appropriate subject specific terminology and key words.
- Identify key words and command words in the question to ensure responses reflect what the question asks.
- Continue to develop the good practice of expanding and explaining answers using examples and reasons, where more than a simple statement or list is required.
- Do not repeat responses when more than one example/reason is required.
- Be able to distinguish between the same term used in different contexts (server, client, programming language, program translator)

## **Grade Boundaries**

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