

Examiners' Report

Principal Examiner Feedback

Summer 2017

Pearson Edexcel GCSE In Computer Science (1706) Paper 01 Principles of Computer Science



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Introduction

This is the third time that candidateshave 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
- the impact that computing technology has on society.

This untiered paper has been specifically designed so more accessible questions are more prevalent earlier in the paper, with gradually more challenging questions later on. However, candidates across the ability range will find questions that are both challenging and interesting throughout.

Candidates are introduced to a context for each question. Unless instructed otherwise, candidates should apply this context when developing responses. Additionally, candidates will find that 'command words' are used consistently in the paper to indicate the type of response expected.

Examiners saw many detailed responses. However, candidates often provided little more than simple statements and failed to include examples and reasons where expansions or explanations were required. It is imperative that in a technical subject, the correct terminology be used and that sufficient detail be given to demonstrate understanding. Candidates are reminded to learn the subject specific terms and their meanings as set out in the specification.

A misunderstanding of the rules of precedence (BODMAS, BIDMAS) resulted in some marks not being awarded. Candidates are advised to revise the subject related Mathematics.

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

- Open source software and network topologies
- Cookies are confused with browser cache or password vaults
- Checksum as a syntax checker or debugging tool to be used with coding
- Multi-agent computational model with multi-tasking or multi-user operating systems
- Subprogram confused with language libraries

There was some confusion between the use of SI units and base 2 units. For capacity, base 2 units are used. For transmission speeds, SI units are used. There is additional guidance on the website to help centres understand how to interpret these terms in the context of the questions set.

The fetch, decode, and execute cycle is always challenging for students. This year saw an increased understanding of this fundamental concept. Although some candidates described using the MAR, PC, and CIR there is no requirement for that depth.

By focusing their responses on the area of computer science, candidates will have the opportunity to gain more marks. Question 05c was a good example of this. Many responses incorporated discussions of DNA for medical or legal purposes rather than as a potential storage or computational device. Although this was a challenging question, there were some excellent responses seen.

Candidates are reminded to take care with their penmanship during the exam. Joined up writing is not required. Sometimes printing is easier to read. In some cases, marks could not be awarded simply because it was unreadable.

When revising a response, be sure to strike out the unwanted one. Writing over top of responses, particularly with 0 and 1, makes the intention difficult to discern.

1b

The terms for capacities are stated as kilobyte, megabyte, and gigabyte. Because these terms are interpreted as capacity, they have the values of 1024, 1024², and 1024³.

(0, 1, 0)

Term	Capacity in bytes
Kilobyte	1024KB
Megabyte	10242 24576Mb 1048576M
Gigabyte	10243 gb/25125824gb

'kb' on end of first row is incorrect. 'Megabyte' is awarded. 1024² would be awarded, except that although calculation is correct, the inclusion of the Mb introduces a contradiction. This is also demonstrated in the next row.

(0, 1, 0)

Term	Capacity in bytes		
Kilobyte	256-1024		
megabyte	- # 10242		
Gigabyte	= ×10243		

Although part of this response is correct, the inclusion of extraneous symbols means those marks cannot be awarded.

(1,2,1,)

Term	Capacity in bytes		
Kilobyte	1024		
Megabyte	10242		
Gigabyte	10243		

This is a good example of a response that expresses the desired relationship

1ci

A field or attribute is a column in a table. Some candidates circled only a single field in a single record.

1cii

A record is a full row in a table. Some candidates circled only a single field in a single record.

1ciii

Some candidates interpreted the `%' wildcard to be the string found anywhere in the field.

1civ

A variety of responses were awarded for this question. The exact SQL syntax did not need to be reproduced. Examples awarded included:

- fibre LIKE '%wool'
- fibre is 'wool'

(0)

SELECT *
FROM carpets
WHERE TIPLE WODI

There is no relational operator in this response.

(0)

```
SELECT *
FROM carpets
WHERE description Like % o Hool
```

The wrong field/attribute has been used.

1dii

This was well answered by many students.

(0)

the person or cipher Stopped shifting

The response does not indicate that the candidate understands that the algorithm loops back to the front of the alphabet.

(1)

Decayle it didn't bop back round to 'a' offer 2

An example of a very good answer.

1ei

Most candidates earned marks for responses to this question.

(2)

1.	60 ju	cars	dent	c	rash	`
2	automatic	\$	no - orf	has	to	stand
	those					

This is a straightforward response that earned both marks. 'Cars don't crash' (1) awarded for safer. 'No one has to stand there' (1) awarded for freeing up workers for other activities.

1 Because the automated system is more visible 2 Because an autometed system apesnit held to trike breaks like a humen

The first item did not earn a mark. The second item earned a mark for 24/7 operation.

1eii

This question was well answered. The majority of candidates could describe how a sensor and microcontroller could work together to implement this system.

(2)

A micro controller can be used to process the data 1 that the automated system receives. Sensors can be used as input dences, to allow the system to detect the admity of cors, therefore the system an process the data and respond with an output. A micro controller an autom cors to write single openiare, by huming green astronomics deter may as

This response incorporates the concept of the sensors as input devices that detect, a process taking place, and the microcontroller actually changing the lights as output.

(1)

INSTRICEd Scanners to detect cars, OF # Microcontroller to detect IS the car is Waiting to go, so this is saver and more accurate

This response incorporates the idea of using infrared sensors to detect cars. However, the microcontroller does not detect cars.

2ai

This was very well answered by most students.

(0)

to experience what the weather is like

Common responses which did not gain a mark did not express their understanding well.

2aii

This was very well answered by most students.

(0)

weather date or a wind anten a or statulight

(1)

Previous weather data was often seen in a response. This, however, can be surmised from the question.

2aiii

This was well answered by many students. The most common responses acknowledged the large amount of data and complex algorithms required.

(1)

1 There are lots of factors that have to be taken into

2 The simulation must be very precise and accurate inits results.

'Lots of factors' (1) was awarded as equivalent to many different data variables. However, 'precise and accurate' is not quite enough to imply mathematically complex.

(1)

1 A good output device must be used so the andience know exactly what is going to happen and where 2 The algorithms are long and complicated

Some responses included this notion of a high-res output device. That might be useful, but is not really required to support the algorithms.

(2)

1 Because they have to take is to accoupt many variables

2 Because they conduct abt stoppontions and calculations

This is a very good response indicating both many variables and complex mathematical calculations.

2bii

Many candidates received the mark for this question. The ones that did not, either did not understand the term Boolean expression or did not use a conventional notation.

(0)

If Starm = "R" AND "L" "AND "L" = print ("Stamm Q")

This is Python code, not a generalised Boolean expression.

(0)

RLW=Q

This is an unconventional notation.

(0)

there is a storm of 2, L and W

This is an unconventional notation.

2c

Few candidates were awarded full marks on this question. Candidates confused all three different categories of storage, magnetic, solid-state, and optical. On occasion, they mixed all three together.

(0)

Data T is physically stored on a mynetic hard disc through the we of lasers which write date onto He magnetic hord disk. These lasers Sorm grooves which represent I's and o's. When He data shored is on the magnetic hard dist needs to be read faters read the grooves and read/understand the I's and O's (machine language (code /binary)

This response indicates confusion with optical devices and media.

(1)

Data is stored as Is and Os, so the is are magnetised as North and the magnet picks up the magnetised I are.

This response earned a mark for identifying that the state of the magnetisation indicates 1s and 0s.

(2)

An electro magnate on a movable arm is used to make parts of Each disk magnatised and ports non magnatised to represent binny values. These areas of magnotism and nonmugnetism can then be read and interpreted data. 15

This response earned marks for 'magnitised and non-magnitised represent binary values' (1) and 'parts are interpreted as data' (1)

2di

This was very well answered by most students.

(1)

1 Put 5	ub prog	romms (Δ		
2 Add	Spaces	between	the	lines	١٥
Shaw	d.ffert	- Commo	nd r		

This response appeared several times. While adding subprograms may make some code easier to read, adding them to this particular code would not help.

2dii

Some candidates did not seem to connect the term 'declaration' to predefining a data type. It was often confused with an assignment.

2diii

The most common error here was not including the 'END IF' statement as part of the conditional.

2e

Candidates seemed to confuse the benefits of a subprogram with the benefits of a library.

(0)

					1-1
1	Γ۲	hel	p \$ +	rine	pro gran
	to	tecome	eas	i er	
2	5	horaci	re	program	corpray
194444444444444444444444444444444444444	to	normal p	rograms		

The lack of subject-specific terminology means that the meaning of this response is not clear.

(1)

1 breaks down the code into here managable
problems
2 More people con work on individual tasks realing
the two twos to solve a publica.

The mark is awarded for item one, decomposition of the problem (1). However, the second item is not awardable, although it was seen frequently.

(2)			
-			5-1
1 lo be	able	to find t	Le error
in It f	aster		
2 Passer	to find	and read	When gaing
over			, U J

This response identifies making debugging easier and making the code easier to read. Both of these are awardable.

2f

This was not very well answered by students. Responses that indicated that global was 'the whole world' were common, but not awardable. Responses that indicated that a local variable was 'in a part of a program' were also common, but not awardable.

(2)

It global variable can be accessed or modified by any part of the program, whereas a too local variable and is only accessible and modifiable by the subprogram or function that created it.

This response has used the terminology of 'accessed' and 'subprogram' correctly. It indicates a good level of understanding.

(0)

Global Variable is to do with the whole code itself, where as cocal Variable will be apart of a small part of the code.

This response uses vague terminology. It is unclear to what a 'whole code' and 'small part of the code' actually refer.

(0)

A local variable only effects part of The program, whereas a global variable only effects the whole of The program

This is another use of terminology that is not specific enough. There is no indication of what 'effect' or 'part of the program' actually means.

3a

A frequent incorrect response was hexadecimal.

3b

Very well answered by many students. The most common error was coalescing the two r2' items.

(0)

3b 2r 3y 2r = 3b4r3y

Although the first entry is correct, the second is a contradiction, so neither can be awarded.

3с

Most candidates received some marks for this question.

(2)



This response lost the first input box and the two processes for incrementing the count.



This response was awarded one mark for the two decision boxes. The values 'Red' and 'Blue' were assumed to be questions.





This response has indicated a user prompt in the input box (1), Blue and Red in the decision boxes (1), and an increment to each colour counter (1). However, the final output box should indicate an invalid input, not a no change.

3d

Not very well answered by students. The mark scheme did allow for partial marks on this question. Very few candidates received all four marks.

(2)

40, 20, 45, 10, 30, 5, 15, 35

It continues to search after 30 incose there are two 30:

This candidate demonstrates some understanding of the breadth-first search. However, not knowing when to stop demonstrates a gap in that understanding.

(2)

40,20,10,5,15,30

This response is a pre-order traversal. However, it does result in a pattern that can be awarded some of the marks.

(0)

first - 60, 45, 40, 20, 30, 35, 30, 20, 10, 15, 10, 5 - Last

There were a significant number of responses similar to this, to which no marks could be awarded.

3eiii

(0)

The Analogue is the 24 hour clock and is represented "16:00" and digital is the 12 hour and is represented "6:00An"

This response was very commonly seen.

Analogive signals are continuous data com the real world. Digital signals are discrete and mult be and exact number, so t

It was common to see the use of the word 'discrete' in a description of a digital signal. This does not imply that it only has two states.

3fi

Most candidates received marks for responses to this question. The most common errors was missing one of the numbers, such as 1000 or 2.

(1)

Bitter Juegr = Belter. 16 x 99.1 KHz (Destroyments) = Bitmate

This response neglected to multiply by 1000.

(1)

In an one of the second second of the spectra of the second of the second s		1000p+100001.001.001
bitrate -	44.1 1000	x16
(bits per second)	2	

A mark was lost because of the division by 2.

3fii

This was not answered very well. Candidates made mathematical errors, especially in the order of precedence.

(1)



In this response, the candidate has dropped the 1024×1024 lower down, but this does not change the fact that, following the rules of arithmetic, the multiplication is in the numerator of this expression.

(1)

(1)

There is confusion with the units in this response.

(1)

Do not carry out the calculation.

128000 × 180 ÷ 102000

Another example of an arithmetic expression that is not quite correct.

4a

Many candidates failed to focus their response on the two items requested in the question. Most candidates were awarded some in this question.

(0)

Using open source software can be beneficial because users the around the world are will be able to access the program and access the support that is available to them. However, in order to keep make sure the program 6 will not be interf interferred with any problems such as stealing detai personal details, the programme will thave t need to make sure his software is and data must be encrypted a so no one else can tampered with it.

This response acknowledges the presence of support for open source software, but that can be discerned from the question. Some responses express the idea that the program the charities use could be tampered with or modified while they are using it. This demonstrates a lack of understanding of how software development works.

(3)

Open source programs allow users to hely modify source code of the program to fater to their specific charities needs, and can even redestribute to chanties with similar needs. Given the nature of the program, open source alldus it to either be redustributed for free, meaning it can help more charities. Open source programs also tend to have a luider support community (meaning that if a poblem arises, not anly can the charity solve it themselves (open saine) but they rely on support ham atter users of the software.

This response identifies the specific client needs, the ability to redistribute the newly made program, and the support community of other users.

(1)
The programmers' decision of using
Open-source will allow them
to choose a suitable programme
and can change the same code
to suit it to their uses and
needs. The program is free and
they can find and squash bugs
to make it an enjoyable experience

In common with many responses, this one identifies that open-source software is free. However, that does not answer the question. It was awarded a mark for the ability to change code to suit the needs of the charity.

4bi

Most candidates could describe the purpose of CCS. Some provided an example of how it is used.

(1)

CSS is for the layout of a page.

This is a good response using the correct terminology.

(1)

Hallows you to change the Style of the text

This response includes only an example.

(0)

It adds customisation was solar to the website.

Responses that received no marks usually reflected the use of vague terms. Customisation could be JavaScript. CSS is not applied to a website, but to a web page.

4c

This was well answered my most students.

(2)

1 50 they can share information,

2 So they can work together

The second mark is for the idea of people being able to work together or collaborate.

(0)

1	So t	be co	MUNICELION	Chanels
	عرو	clear		
2	50	he	- SSICRAT	when
	10	use		ana ini na mananana na manana 2 6 (nj. p.) ama anj

Candidates who received no marks usually supplied vague responses.

4d

Candidates who read the question carefully and identified the context of `network transmission' answered this question well. Those that saw the word `network' or `media' often supplied incorrect responses.

(0)

1 Media (scord) 2 Text 3 imagni

This is response indicates a confusion between different parts of the specification. Alternatively, the candidate may not have read the question carefully, as the context is transmission media.

(0)

1 Wan

- 2 Lan
- 3 VÝN

Candidate supplied three different types of network models.

(0)

1 Stevr. 2 Ring 3 Bus.

Candidate supplied three different types of network topologies.

4e

Candidates most commonly confused cookies with web browser cache or password vaults.

(0)

they^{get} Stored in the Coche Memory, Auowing the Web Page to OPen Much More quicker the More Greaventry its used.

Candidate has confused cookies with browser cache, which is the facility to enable pages to load quicker.

(1)

They are there to monitor what you are cloing on the Website

Any concept of monitoring, tracking, or storing information about the user was awarded.

(2)

Cookies an 'virtual trackers' - pieces of data from the user's computer that are stored in the user's web biouser. They are used in order to personalise web pages to the user according to their information e.g. to show them relevant adverts.

Full marks were awarded for a description of a cookie and what it might be used for.

4f

This was not well answered. Very few candidates associated a checksum with the result of a calculation being appended and sent with the original data. Many attempted to express the idea of comparing an original something to a received something. They just could not express what that something was.

(0)

It will go to the line that it is has an error and we this will let the User know that there is something wrong or whether the user has entered the wrong character in by mistake.

This response indicates that a checksum is carried out in a programming environment, rather than during network data transmission.

(0)

ence tone there has been a transmittee

This response demonstrates a familiarity with the term 'checksum', but has not described it sufficiently to be awarded marks.

(0) A checksum will count how many^{dula}packets are in the body of a transmission and the number will be added to the end by the sender device. The recteiver device will then count the dinnumber of data packets it secreved and compare it to the number from the checksum and iff if they are different then the rectives receiver know something has gone wrong so can send an error message to the sender to have it resent.

This response confuses a checksum with a packet id. This was a common response.

(2)

Is Before the packet is Sent the data is added together and a number is given. The this This number is Put in the faster of the packet. After the packet is Sent the data is added up again by the receiver. It it does not equal to the checksum on the packet the packet is resent.

This response explains the idea of a checksum.

4gi

Many responses confused an IP address with a MAC address.

(2)

This is a unique address of a peice of hardware and is never changed from the moment it is manufactured.

This is a very good response that demonstrates a good understanding.

(1)

It is a uniquel mumber given to every device so it can be detected when sending and revening device Diverse a netwonk.

The candidate has used the word 'unique' that is interpreted to mean no more like it. This distinguishes it from an IP address, which can be duplicated on different subnets.

4gii

A frequent incorrect response was TCP/IP.

4h

This was not well answered. There was confusion between multi-agent, parallel, and distributed processing models.

(1)

A nullifi-againt computational made 1 is and that were several conjected to warts together and complete a god. An example of this is swarm what, areased to wank together (or a summ' to complete toles the mering blecks.)

This is a good response that, although not required, includes an example.

(0)

An model that processes two or more " photructions at once what is really aseful.

This is confusion with parallel processing.

(0)

An algorithm is applicate the becomposed to subprograms that are excerned on dissevent hardware simultaneandy and brought together in the end.

This is probably an attempt to describe a distributed processing model.

5a

Many candidates identified the overflow as the error, but the question was looking for the idea that the sign of the output would be changed. The majority of candidates included an example which helped to provide understanding and improve marks awarded.

(3)

you may use an example as part or your explanation. This is because the sign - magnitude model uses an additional lor Q to decide the state of the number e.g in the q bit ne binary, 0101 which represents denery 5, an additional | would be added to the left fightificant to state it is peyatine. So 10101 Would be -5. The addition of two negative humbers using sign-Magnitude is not possible as the the sign bit will prese more during addition e.g. 10101 (-5) + 10101 (-5) = 01010 which is denery positive 10. This is because the two sign bits will not make some

This is a good response which defines sign-magnitude, gives examples, does the addition, and interprets the result has having the sign changed.

(1)

Because the first value of the Binery Name has to be a 'l' to represent Negative, le two are added Then this Value would Changes

This response expresses the understanding that a 1 is used to represent negative. The candidate hasn't said what the change would be when two are added.

(0)

HAC address is the address of the device of which data is transferred to.

Although a MAC address can be used as a destination, there is nothing in this response to indicate that the candidate understands the distinction between a MAC and any other address type on a network.

5b

Some candidates used the long multiplication as shown, which is correct and was awarded.

(2)



Row 2 (1) and follow through addition (1)

(1)



Row 3 (1)

(3)



Row 1 (1), Row2 (1), Row 4 (1).

5c

Most candidates could describe the purpose of some of these component.

(4)

Control unit a perfect address from registers The
address is serv along the Address bus to main
memory.) The Instructions are sent from main memory
to CPU (along data bus, The [cannol unit) decomposes
and decodes the instructions of It then executes
it. If the it requires on operation, it is
Sent to the ALU where it decodes and
then executes

This clip demonstrates a simple and straightforward response to the question.

(3)



Although this response is inaccurate in places, there are enough accurate descriptions to award marks.

(0)

Although this response has attempted to use the terminology in the question, the ordering and the relationships are not accurately expressed.

5e

Some candidates confused the use of DNA in computing for storage with the use of DNA to track criminals or the use of DNA in fighting or causing disease.

(6)

One of the advantages of DNA computers are that there is plenty DNA meaning they at a lot can an be made. Asecond advantage is that with DNA computers a lot of data can be stored All of DNA small amount of DNA which means storage come derrees could reduce in physical sur size Athin's advantage is that it could help us medically because it would allow these DNA computers to work within our body making locating on dhess easier and therefore airing it quicker and with more precision. One disadirantage 'is thad DNA computers are trand to make and expensive meaning there aren't many of them

This response discusses DNA as a storage device, with some potential to work inside the human body.

(3)

(6) (onputing) The advantages of DNA Autophy is that it Con (Silve hand Alog problems very quickly. The Standard of the DNA Longuling is Similar to our brain so we can study more & DAVA is made from Silicon deside which is Poind very ecoly and there is about of amoute in quartity so making more imputant would not use in any of the worlds \$100 Finite recorrect. (theward building

Mine congiters and very Appenne, they require very
good Venurredge & sure to produce & also it danged
Can be very worthy to repair. Also DNA coupling
tender the take long to work out egoiner equators)
prothens so have may be a issue when needed to work
Suple instructions. And the DNA conjung has very difficult
Setting (the une broken) which would make it hand
to the alter & improve how the computer works with

without maybe domaging the congeter or massing of some of the functions, the Overall DNA computing is A good for hand publisher, but plack producing & purchasing these an be a second back of the second s

Although this response includes some inaccuracies, there is enough accurate information provided to demonstrate that the candidate has some understanding of DNA computing.

(2)

(6) Advantage Can Stove Computers CVAZY amon derta Έľ also rall Meaning insomely have reonte Cane Storage Sparce, with Sica) Space /MOSE likely Silent, compared havedrives which can 10,000 RPM 10 huge advantage por people who like quice a vantag Canto Possibly produce have 10 Lalvage around for Stevens Slower COMPO be SSD'S, which Means some people bother With Might not even Holm. It conid also NOT COST lang as vormal 0 Component reave, Joeaking and witht even Cost not that the orane / (Total for Question 5 = 18 marks) it

This response is not well focused, but does discuss the potential of using DNA for storage and for computation.

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