

GCSE (9–1)

Sample SAM Taster Booklet

# COMPUTER SCIENCE

J276

For first teaching in 2016



# GCSE (9–1)

# COMPUTER SCIENCE

Our new GCSE (9–1) Computer Science specifications provide a dynamic, contemporary and exciting opportunity for students to engage with the world around them.

Our Sample Assessment Material (SAM) taster booklet introduces you to the style of assessment for our new qualification.

The booklet features the questions and mark schemes for the three assessments that make up this qualification. The complete set of sample assessment materials is available on the OCR website <http://www.ocr.org.uk/qualifications/gcse-computer-science-j276-from-2016/>

## SUBJECT SPECIALIST SUPPORT

OCR Subject Specialists provide information and support to schools including specification and controlled assessment advice, updates on resource developments and a range of training opportunities.

You can contact our Computer Science Subject Specialists for specialist advice, guidance and support.

Meet the team at [ocr.org.uk/qualifications/by-subject/computing/meet-the-team](http://ocr.org.uk/qualifications/by-subject/computing/meet-the-team)

## CONTACT THEM AT:

01223 553998

[computerscience@ocr.org.uk](mailto:computerscience@ocr.org.uk)

## @OCR\_ICT

OCR Computing (GCSE) – Facebook group  
<https://www.facebook.com/groups/266581410111152/>

## WHAT TO DO NEXT

- Sign up for regular updates, including news of our autumn calendar of events:  
<http://www.ocr.org.uk/updates>
- Book onto a free GCSE reform training event to help you get to grips with the new qualification:  
<https://www.cpdhub.ocr.org.uk/>
- View our new range of resources that will grow throughout the lifetime of the specification:  
<http://www.ocr.org.uk/qualifications/gcse-computer-science-j276-from-2016>

# COMPONENT 1 COMPUTER SYSTEMS

## QUESTION 1 (c)

Explain **one** reason why the cache size affects the performance of the CPU.

[2]

## MARK SCHEME FOR QUESTION 1 (c)

Question	Answer	Marks	Guidance
1 c	<ul style="list-style-type: none"> <li>• data is transferred faster (1)...</li> <li>• ...which makes a CPU more efficient (1)</li> <li>• It is faster to transfer to and from cache (1)...</li> <li>• ...than transferring to and from RAM (1).</li> </ul>	2 (AO2 1a)	1 mark to be awarded for each correct identification and 1 mark to be awarded for the associated explanation to a maximum of 2 marks.

## TEACHER TIPS

It is vital that learners fully understand what cache is and how it affects the performance of a CPU. They must understand and be able to communicate what cache is and how it forms part of the CPU and to what extent the size can affect the performance of the CPU.

## QUESTION 1 (d)

Identify **four** events that take place during the fetch-execute cycle.

[4]

## MARK SCHEME FOR QUESTION 1 (d)

Question	Answer	Marks	Guidance
1 d	<ul style="list-style-type: none"> <li>• An instruction is fetched from memory</li> <li>• The instruction is then decoded</li> <li>• The decoded instruction is then executed so that the CPU performs continuously</li> <li>• The process is repeated</li> <li>• The program counter is incremented</li> <li>• The instruction is transferred to the MDR</li> <li>• The address of the instruction to be fetched is placed in the MAR</li> </ul>	2 (AO1 1a)	1 mark is to be awarded for each correct answer to a maximum of 4 marks.

## TEACHER TIPS

Learners must have studied the fetch execute cycle and have an understand of the process and what elements of the CPU are involved at each stage. There are lots of resources around teaching the fetch execute cycle such as the Little Man Computer, Crunch (Codio) as well many others. These resources enable learners to visualise the process and this gives a much better understanding of the whole process.

**QUESTION 3 (a)**

Gareth has a satellite navigation system (Sat Nav) in his car that uses RAM and ROM.

(a) Fig. 2 lists some characteristics of computer memory. Tick (✓) **one** box in each row to show whether each of the statements is **true** for the RAM or ROM in Gareth's Sat Nav.

**Fig 2.**

	RAM	ROM
Stores the boot up sequence of the Sat Nav.		
The contents are lost when the Sat Nav is turned off.		
Holds copies of open maps and routes.		

[3]

**MARK SCHEME FOR QUESTION 3 (a)**

Question		Answer			Marks	Guidance
3	a		RAM	ROM	3 (AO2 1a)	Award 1 mark for each correct tick. No marks should be awarded if ticks are in both boxes in a given row.
		Stores the boot up sequence of the Sat Nav.		✓		
		The contents are lost when the Sat Nav is turned off.	✓			
		Holds copies of open maps and routes.	✓			

**TEACHER TIPS**

This is an application question and learners can practice this style of question using the OCR Computer Science revision App. This type of question looks straightforward but requires learners to carefully read the question.

## QUESTION 9

Even though the computer devices they own still work, people often want to buy the most up-to-date models, such as the latest smartphone.

Discuss the impact of people wanting to upgrade to the latest smartphone.

In your answer you might consider the impact on:

- stakeholders
- technology
- ethical issues
- environmental issues

[8]

## MARK SCHEME FOR QUESTION 9

Question	Answer	Marks	Guidance
9	<p><b>Mark Band 3–High Level</b> (6–8 marks)</p> <p>The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed.</p> <p>The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation.</p> <p>The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Mark Band 2–Mid Level</b> (3–5 marks)</p> <p>The candidate demonstrates reasonable knowledge and understanding of a range of considerations in relation to the question; the material is generally accurate but at times underdeveloped.</p> <p>The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation.</p> <p>The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.</i></p>	<p><b>8</b> (AO2 1a) <b>4</b></p> <p><b>8</b> (AO2 1b) <b>4</b></p>	<p>The following is indicative of possible factors/ evidence that candidates may refer to but is not prescriptive or exhaustive:</p> <p><b>Indicative Content</b></p> <p><i>Stakeholders</i></p> <ul style="list-style-type: none"> <li>• Can adversely affect people in this country and abroad: <ul style="list-style-type: none"> <li>– health issues</li> <li>– financially</li> <li>– socially</li> <li>– culturally</li> </ul> </li> <li>• The phone manufacturers</li> <li>• The phone shops/networks</li> </ul> <p><i>Technology</i></p> <ul style="list-style-type: none"> <li>• The type of devices that are disposed of</li> <li>• Modern phones poorly designed for durability</li> <li>• Phones hardware not upgradeable/replaceable</li> <li>• Proprietary technology used by some manufacturers</li> </ul> <p><i>Environmental</i></p> <ul style="list-style-type: none"> <li>• Reference to e-waste (people dispose of their devices in landfill even if they are in good working order)</li> <li>• Some equipment is also sent abroad to be disposed of</li> <li>• Leads to excessive landfill (in this country and/ or abroad, e.g. Africa and Asia)</li> <li>• Toxic waste released into land, ground water, air (in this country and/or abroad, e.g. Africa and Asia)</li> <li>• Waste of resources</li> <li>• Precious metals in phones</li> </ul>



**MARK SCHEME FOR QUESTION 9 (continued)**

Question	Answer	Marks	Guidance
<b>9</b>	<b>Mark Band 1–Low Level (1–2 marks)</b>	<b>8</b>	<i>Ethical Issues</i>
	<p>The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided.</p> <p>The candidate provides nothing more than an unsupported assertion.</p> <p><i>The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</i></p>	<b>(AO2 1a)</b>	<ul style="list-style-type: none"> <li>• Contributes to ill health</li> <li>• Contributes to the digital divide</li> <li>• Contributes to social divide</li> </ul>
		<b>4</b>	
		<b>8</b>	
		<b>(AO2 1b)</b>	<ul style="list-style-type: none"> <li>• Problem of confidential data stored on the devices</li> <li>• Puts social pressure on parents to pay for their children to upgrade</li> <li>• Puts social pressure on the public to upgrade</li> <li>• Can lead to bullying of those who cannot afford the latest technology</li> <li>• Phone manufacturers intentionally designing fragile phones so they need to be replaced more often</li> <li>• High cost of new devices.</li> </ul>
		<b>4</b>	
	<b>0 marks</b>		
	No attempt to answer the question or response is not worthy of credit.		

**TEACHER TIPS**

This is a level of response (LOR) question and learners should be prepared using the LOR framework resources. As these are the high tariff questions (6–12 marks) learners need to practice answering essay style questions in this way. We tweet stimulus material (@OCR\_ICT) every week and we are creating a wealth of resources to help deliver this type of material. SPAG is also assessed in these questions!

# COMPONENT 2 COMPUTATIONAL THINKING, ALGORITHMS AND PROGRAMING

## QUESTION 1 (a)

Kofi uses his computer to record an audio file of himself playing his guitar.  
Outline what happens when the computer converts the music into a file.

[2]

## MARK SCHEME FOR QUESTION 1 (a)

Question	Answer	Marks	Guidance
1 a	<ul style="list-style-type: none"> <li>The height of the wave is measured/sampled (at regular/set intervals)</li> <li>Turned into/stored as binary</li> </ul>	2 (AO1 1b)	1 mark for each bullet, to a maximum of 2.

## TEACHER TIPS

This question requires learners to demonstrate understanding (AO 1 1b) so a solid description of the conversion is required. This is best taught and understood through practical exercises where the process is demonstrated. This is best looked at in conjunction with 1.8 and 2.6.

## QUESTION 3 (b)

Explain the effect of performing a 2 place right shift on the binary number 11001011.

[2]

## MARK SCHEME FOR QUESTION 3 (b)

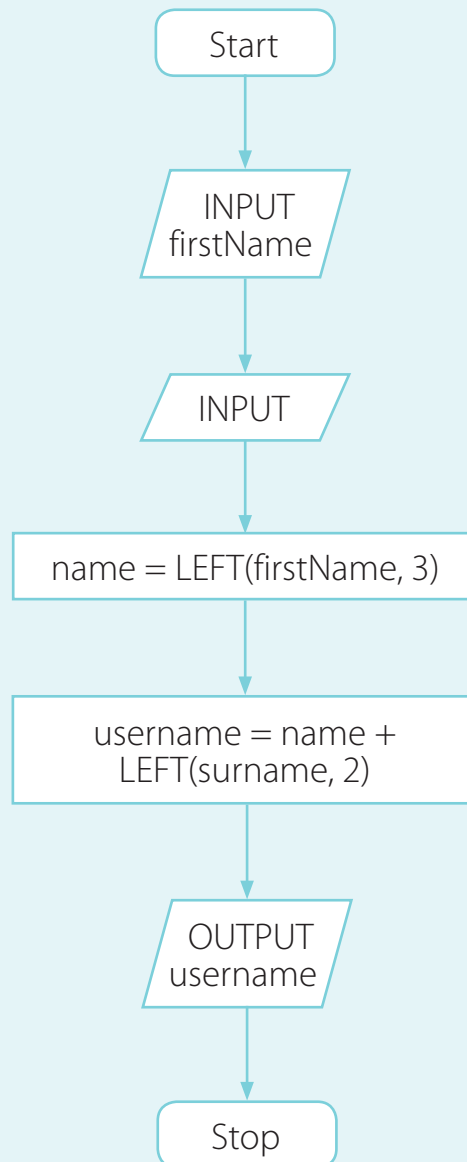
Question	Answer	Marks	Guidance
3 b	<ul style="list-style-type: none"> <li>The number is divided by 4</li> <li>Loss of accuracy ...</li> <li>... the bits on the right are removed</li> </ul>	2 (AO2 1b)	1 mark per bullet to a maximum of 2.

## TEACHER TIPS

The hardest thing to remember is which operator links to which direction. A simple mantra to help remember the process could be "At the right times, the divide is left to the power". In general shifting N places right is the same as dividing by 2 to the power N (written as  $2^N$ ).

**QUESTION 4**

Johnny is writing a program to create usernames. The first process he has developed is shown in the flowchart in **Fig. 1**.

**Fig. 1**

For example, using the process in **Fig. 1**, Tom Ward's user name would be TomWa.

**(a)** State, using the process in **Fig. 1**, the username for Rebecca Ellis.

**[1]**

**(b)** Johnny has updated the process used to create usernames as follows:

- If the person is male, then their username is the last 3 letters of their surname and the first 2 letters of their first name.
- If the person is female, then their username is the first 3 letters of their first name and the first 2 letters of their surname.

**(i)** What would be the username for a male called Fred Biscuit using the updated process?

**[1]**

**(ii)** Write an algorithm for Johnny to output a username using the updated process.

**[6]**



## MARK SCHEME FOR QUESTION 4

Question			Answer	Marks	Guidance
4	a		<ul style="list-style-type: none"> <li>RebEl</li> </ul>	1 (AO2 1b)	Correct Answer Only (allow any case)
	b	i	<ul style="list-style-type: none"> <li>UitFr</li> </ul>	1 (AO2 1b)	Correct Answer Only (allow any case)
		ii	<ul style="list-style-type: none"> <li>Taking firstname, surname and gender as input</li> <li>Checking IF gender is male/female (using appropriate selection)</li> <li>For male ...Generating last 3 letters of surname using appropriate string manipulation</li> <li>...Generating first 2 of letters of firstname and adding to previous</li> <li>For female.... correctly calculating as before</li> <li>Correct concatenation and output</li> </ul> <pre> input firstname, surname, gender if gender = "Male" then     username = RIGHT(surname, 3) +     LEFT(firstname,2) else     username = LEFT (firstname,3) +     LEFT(surname,2) end if print (username) </pre>	6 (AO3 2b)	<p>1 mark for each correct bullet to a maximum of 6.</p> <p>If used, a flowchart should represent the bulleted steps in the answer column</p>

## TEACHER TIPS

This style of algorithm question will be used frequently when assessing computational thinking and candidates should frequently practice reading, interpreting and then re-factoring/adapting algorithms. This style of computational thinking expression needs to be practiced and built into schemes of work as it is the corner stone of the subject and learners need to be proficient and confident in solving algorithmic problems. A good way to practice these skills is to use the 100-coding challenges published by OCR on the website (<http://www.ocr.org.uk/qualifications/gcse-computer-science-j276-from-2016/>).

## QUESTION 6

Heath is researching how long, to the nearest minute, each student in his class spends playing computer games in one week (Monday to Friday). He is storing the data in a 2D array.

**Fig. 2** shows part of the array, with 4 students.

**Fig. 2**  
**Students**

		Students			
		0	1	2	3
Days of the week	0	60	30	45	0
	1	180	60	0	60
	2	200	30	0	20
	3	60	10	15	15
	4	100	35	30	45

For example, student 1, on Monday (day 0), played 30 minutes of computer games.

**(a)** Explain why Heath is using an array to store the data. [2]

**(b) (i)** Identify a data type that could be used to store the number of minutes in this array. [1]

**(ii)** State why this data type is the most appropriate. [1]

**(c)** Heath wants to output the number of minutes student 3 played computer games on Wednesday (day 2). He writes the code:

```
print (hoursPlayed[3,2])
```

The output is 20.

**(i)** Write the code to output the number of minutes student 0 played computer games on Wednesday. [1]

**(ii)** State the output if Heath runs the code:

```
print (hoursPlayed[2,1])
```

[1]

**(iii)** State the output if Heath runs the code:

```
print (hoursPlayed[3,1] + hoursPlayed[3,2])
```

[1]

**(iv)** Write an algorithm to output the total number of minutes student 0 played computer games from Monday (day 0) to Friday (day 4). [3]

**(d)** Heath has the day of the week stored as a number e.g. 0 = Monday, 1 = Tuesday.

Write a sub-program that takes the number as a parameter and returns the day of the week as a string. [5]

**(e)** Heath needs to work out the average number of minutes spent playing computer games each day for the class, which contains 30 students. Write an algorithm to output the average number of minutes the whole class spends playing computer games each day. [8]

## MARK SCHEME FOR QUESTION 6

Question	Answer	Marks	Guidance
<b>6 a</b>	<ul style="list-style-type: none"> <li>Allows multiple items of data to be stored ...</li> <li>..... under one identifier/name</li> <li>Can store a table structure</li> <li>Reduces need for multiple variables</li> </ul>	<b>2</b> <b>(AO1 1b)</b>	1 mark for each bullet to a maximum of 2.
<b>b i</b>	Integer	<b>1</b> <b>(AO2 1b)</b>	Any data type that stores a whole number only
<b>ii</b>	It is a whole number/ no decimals/ to the nearest minute.	<b>1</b> <b>(AO2 1b)</b>	
<b>c i</b>	print (hoursPlayed[0,2])	<b>1</b> <b>(AO2 1b)</b>	Correct Answer Only
<b>ii</b>	0	<b>1</b> <b>(AO2 1b)</b>	Correct Answer Only
<b>iii</b>	80	<b>1</b> <b>(AO2 1b)</b>	Correct Answer Only
<b>iv</b>	<ul style="list-style-type: none"> <li>Adding all correct elements</li> <li>Outputting correctly</li> <li>Using a loop – e.g.  total = 0  for x = 0 to 4  total = total + hoursPlayed[0,x]  next x  print (total) </li> </ul>	<b>3</b> <b>(AO3 2b)</b>	1 mark per bullet to a maximum of 3.  If used, a flowchart should represent the bulleted steps in the answer column
<b>d</b>	<ul style="list-style-type: none"> <li>Appropriate declaration of a function that takes day number as parameter and returns day</li> <li>Use of selection (if/switch)</li> <li>Appropriate comparison</li> <li>Correct identification of each day</li> <li>Case default – e.g.  function returnDay(dayNo As String) As String  switch dayNo  case 0:  returnDay = "Monday"  case 1:  returnDay = "Tuesday"  case 2:  returnDay = "Wednesday"  case 3:  returnDay = "Thursday"  case 4:  returnDay = "Friday"  case default:  returnDay = "Invalid"  endswitch  endfunction </li> </ul>	<b>5</b> <b>(AO3 2b)</b>	1 mark per bullet to a maximum of 5.  If used, a flowchart should represent the bulleted steps in the answer column.

**MARK SCHEME FOR QUESTION 6 (continued)**

Question			Answer	Marks	Guidance
6	e		<ul style="list-style-type: none"> <li>• Loop 0 to 29</li> <li>• Loop 0 to 4</li> <li>• Accessing hoursplayed[x,y]</li> <li>• Addition of hoursplayed[x,y] to total</li> <li>• Calculating average correctly outside of loops</li> <li>• Outputting the results – e.g.</li> </ul> <pre> total = 0 for x = 0 to 29   for y = 0 to 4     Total = total + hoursPlayed[x,y]   next y next x average = total / (30*5) print (average) </pre>	6 (AO3 2b)	<p>Accept any type of average calculation (mean, median, mode).</p> <p>If used, a flowchart should represent the bulleted steps in the answer column.</p>

**TEACHER TIPS**

This again is a context driven algorithm question with a given data set so brings in elements of array theory. Learners should practice using datasets in their algorithm practice questions and this element can be easily added to any scenario or context as any algorithm can be extended to include the use of data. The learners are also assessed on their knowledge of loops in 6 (c (iv)) and knowing when it is appropriate to use them is a vital skill that needs to be learned through applying loops to lots of different situations. A good way to practice these skills is to use the 100-coding challenges published by OCR on the website (<http://www.ocr.org.uk/qualifications/gcse-computer-science-j276-from-2016/>).









## OCR customer contact centre

General qualifications

Telephone 01223 553998

Facsimile 01223 552627

Email [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)



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