

Sample question paper and mark scheme

**DRAFT**

**LEVEL 3 CAMBRIDGE ADVANCED NATIONAL (AAQ) IN**

# **COMPUTING: APPLICATION DEVELOPMENT**

**Extended Certificate H129**

For first teaching in 2025

**F161: Developing application software**

# Introduction

**This is Sample Assessment Material (SAM). It is an example exam paper that we publish alongside a new specification to help illustrate the intended style and structure of our question papers.**

During the lifetime of the qualification, updates to the question paper template may happen. We always recommend you look at the most recent set of past papers where available.

We also produce two further specific resources to support you with using this SAM:

- An assessment story. We explain the research we have undertaken during the development of the qualification and how consultation with teachers, students and schools have helped shape our assessment approach.
- Annotated SAMs. We take you through the key points of the assessment and highlight the different types of questions your students will experience in the exam.

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Designed and tested with teachers and students



Helping young people develop an ethical view of the world



Equality, diversity, inclusion and belonging (EDIB) are part of everything we do

## Summary of updates

Date	Version	Page number	Summary of change
July 2023	1 DRAFT	All	Creation of document

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- Updates on resource developments and training opportunities
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- challenge prejudicial views and unconscious biases
- promote a safe and supportive approach to learning
- are accessible and fair, creating positive experiences for all
- provide opportunities for everyone to perform at their best
- are contemporary, relevant and equip everyone to live and thrive in a global, diverse world
- create a shared sense of identity in a modern mixed society with one humanity.

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**If you prefer to use a printed copy of the SAMs, consider printing a selection of pages.  
The following are the pages which you might find useful to print:**

**Question paper pages 5-16**

**Mark scheme pages 17-32**



Oxford Cambridge and RSA

## Level 3 Cambridge Advanced National (AAQ) in Computing: Application Development (Extended Certificate)

H129 F161: Developing application software

### Sample Assessment Material (SAM)

Time allowed: 1 hour 15 minutes

No extra materials are needed.

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

Candidate number

First name(s) \_\_\_\_\_

Last name \_\_\_\_\_

Date of birth

### INSTRUCTIONS

- Use black ink.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- In the live exam there might be lined pages at the end of the question paper for you to use if you need extra space. Remember, you must clearly show the question numbers.
- Answer **all** the questions.

### INFORMATION

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets [ ].
- This document consists of **12** pages.

### ADVICE

- Read each question carefully before you start your answer

An application is being developed to help primary school students with their maths. The application will be accessed through a website both in school and remotely.

1 (a) Explain **one** advantage and **one** disadvantage to a user of accessing an application through a website.

Advantage .....

.....

.....

.....

Disadvantage .....

.....

.....

.....

[4]

Students could use a desktop device when accessing the maths application.

(b) Identify **two** characteristics of desktop devices that make them suitable to access applications.

1 .....

2 .....

[2]

(c) (i) Identify **one** device that students could use to access the maths application at home other than a desktop device.

..... [1]

(ii) Explain why the device you have chosen in 1(c)(i) is suitable to access the maths application at home.

.....

.....

.....

..... [2]

The website and maths application will be stored in a private cloud. To access the private cloud, schools need to register and pay a subscription. When the subscription has been paid, schools receive a school username and auto-generated password. Each teacher and student will have their own log-in details to access the application. Students can be added or removed at any time during the subscription.

2 Explain **one** advantage and **one** disadvantage to schools of the maths application being stored in a private cloud.

Advantage .....

.....

.....

.....

.....

.....

Disadvantage .....

.....

.....

.....

[4]

3 The maths application will use the JavaScript Object Notation (JSON) data format.

(a) State **two** characteristics of JSON.

1 .....

2 .....

[2]

(b) Describe how JSON could be used in the maths application.

.....

.....

.....

.....

[2]

When students are using the maths application, the data will be in the state of **in transit**.

(c) State **two** characteristics of **data in transit**.

1 .....

.....

2 .....

.....

[2]

(d) Describe how the integrity of the data used in the maths application could be maintained when using Transport Control Protocol (TCP) during transit.

.....

.....

.....

.....

[2]



Students will be provided with access details for the maths application by their school. When the access details are input, students gain access to their progress saved on the maths application. Students will also need to input data when they answer questions in the maths application.

**4 (a) (i)** Identify **one** data input that could be entered into the maths application.

..... [1]

**(ii)** Describe how the data input you have chosen in **4(a)(i)** will be used in the maths application.

.....  
.....  
.....  
..... [2]

The maths application will store the contact details of each school.

**(b) (i)** Identify the Act that the developers must comply with.

..... [1]

**(ii)** Explain the purpose of the Act identified in **4(b)(i)**.

.....  
.....  
..... [1]

**5** The maths application will include an Application Programming Interface (API).

**(a)** What is the role of an API?

.....  
.....  
..... [1]

**(b)** Analyse the advantages for developers of using the private certification of API when developing the maths application.

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..... [6]

**6** Teachers will need to enter their access details to begin using the maths application. The digital security mitigation of Two-Factor Authentication (2FA) will be used to maintain the security of the maths application.

Explain why 2FA should be used to maintain the security of the maths application.

.....

.....

.....

..... **[2]**

**7** One threat to the website hosting the maths application is a Distributed Denial of Service (DDoS).

**(a)** Complete the sentence to explain how a DDoS can threaten a website.

A DDoS is an attempt to make a website unavailable to authorised users by \_\_\_\_\_ it

with useless \_\_\_\_\_ traffic from a range of different systems and locations.

**[2]**

The website hosting the maths application will be protected by a firewall.

**(b)** Explain how a firewall reduces the threat of a DDoS on a website hosting an application.

.....

.....

.....

..... **[2]**

8 The maths application will be offered to schools as a stand-alone application. The stand-alone application will need to be tested before being released to schools. Normal and erroneous test data will be used during the testing.

(a) (i) What is **normal** test data?

.....  
..... [1]

(ii) Explain **one** way normal test data could be used to test the stand-alone maths application.

.....  
..... [1]

(iii) What is **erroneous** test data?

.....  
..... [1]

(iv) Explain **one** way erroneous test data could be used to test the stand-alone maths application.

.....  
..... [1]



A user guide will be created for the stand-alone maths application. The user guide will need to include the maths application’s technical requirements.

**9 (a) (i)** Identify **one** example of a technical requirement for the maths application.

.....  
..... [1]

**(ii)** Explain why the technical requirement you have chosen in **9(a)(i)** should be included in the user guide.

.....  
.....  
.....  
..... [2]

**(b)** Explain **two** advantages to schools of the stand-alone maths application being installed as a cloud download.

1 .....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [4]

- (c) Identify **one other** type of application software installation that could be used other than a cloud download.

.....[1]

**END OF QUESTION PAPER**

Sample

Sample

This is sample assessment material for our specification. It is to help show how the live assessment materials will look. During the lifetime of the qualification you might see small adjustments to the assessment materials. This is part of continuous improvement, designed to help you and your students. We recommend you look at the most recent set of past papers where available.

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## **OCR Level 3 Cambridge Advanced National (AAQ) in Computing: Application Development (Extended Certificate)**

### **F161: Developing application software**

#### **Sample assessment material**

#### **Mark scheme**

This document has **16** pages.

Sample

# MARKING INSTRUCTIONS

## Crossed-out answers

If a student has crossed out an answer and written a clear alternative, do **not** mark the crossed-out answer.

If a student has crossed out an answer and **not** written a clear alternative, give the student the advantage of the doubt and mark the crossed-out answer if it's readable.

## Multiple choice question answers

When a multiple choice question has only one correct answer and a student has written two or more answers (even if one of these answers is correct), you should **not** award a mark.

## When a student writes more than one answer

### 1. Questions that ask for a set number (including 1) of short answers or points

If a question asks for a set number of short answers or points (e.g. **two** reasons for something), mark only the **first set number** of answers/points.

**First** mark the answers/points against any printed numbers on the answer lines, marking the **first** answer/point written against each printed number. **Then**, if students have not followed the printed numbers, mark the answers/points from left to right on each line and **then** line by line until the set number of answers/points have been marked. Do **not** mark the remaining answers/points.

### 2. Questions that ask for a single developed answer

If a student has written two or more answers to a question that only requires a single (developed) answer, and has **not** crossed out unintended answers, mark only the first answer.

### 3. Contradictory answers in points-based questions

When a student has written contradictory answers, do **not** award any marks, even if one of the answers is correct.

## Levels of Response marking

**1. To determine the level** start at the highest level and work down until you reach the level that best describes the answer

**2. To determine the mark within the level**, consider the following:

Quality of the answer	Award mark
Consistently meets the criteria for this level	At the top of the level (6 and 9 mark questions)
Meets the criteria but with some inconsistency	At the middle of the level (9 mark questions)
On the borderline of this level and the one below	At the bottom of the level (6 and 9 mark questions)

## ANNOTATIONS

Annotation	Meaning

## MARK SCHEME

<b>1a</b>	
<b>Max mark</b>	4
<b>Answer</b>	<p>Up to <b>two</b> marks <b>each</b> for <b>one</b> advantage and <b>one</b> disadvantage:</p> <p><b>One</b> mark for identifying the advantage/disadvantage.</p> <p><b>One</b> mark for saying how the advantage/disadvantage affects a user accessing an application through a website.</p> <p><b>Advantage</b> e.g.:</p> <ul style="list-style-type: none"> <li>• The application website can be located using a search engine (1) so users are not restricted to accessing the application on a single device (1)</li> <li>• The application website can be accessed at any time on a range of devices in any location (1) so it's both convenient and accessible for users (1)</li> <li>• The website address can be bookmarked (1) meaning users can go directly to the website through a shortcut (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p> <p><b>Disadvantage</b> e.g.</p> <ul style="list-style-type: none"> <li>• The website may be spoofed (1) so users may access a fake website if the web address is not checked (1)</li> <li>• If the website is not search engine optimised (1) then it may not appear at the top of search results/be found by the user (1)</li> <li>• If security measures are not maintained (1) a virus/example could be attached leading to a cyber-attack on users (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<p>Up to <b>two</b> marks <b>max</b> for explaining an advantage and <b>two</b> marks <b>max</b> for explaining a disadvantage.</p> <p>The focus of the question is generic. The answer does not have to be applied to the context but accept answers that are applied.</p>

<b>1b</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• Can be linked in a cabled network (1)</li> <li>• Includes a monitor to view websites (1)</li> <li>• Increased screen size to see icons more clearly (1)</li> <li>• Includes Wi-Fi capability (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<b>One</b> mark for <b>each</b> correct answer. Max <b>two</b> marks.

<b>1c (i)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<p>Any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• Tablet/hybrid (1)</li> <li>• Smart device (1)</li> <li>• Laptop (1)</li> <li>• Console (1)</li> </ul>
<b>Guidance</b>	

<b>1c (ii)</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks <b>max</b> for an explanation of the suitability of the device selected in <b>1(c)(i)</b>.</p> <p><b>One</b> mark for identifying a relevant characteristic of the chosen device</p> <p><b>One</b> mark for saying why this makes the device suitable for students accessing the maths application at home</p> <ul style="list-style-type: none"> <li>• Has integrated wi-fi connectivity (1) so students can connect to their home wi-fi without extra connectivity equipment (1)</li> <li>• Includes a screen and on-screen keyboard (1) so students can interact with the maths application without connecting any external peripherals (1)</li> <li>• The device is portable (1) so students can use the device under supervision of their parents in different rooms in their home. (1)</li> <li>• The devices can be loaned to students by the (1) and, because they are portable, the students can carry them home (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<p>Up to <b>two</b> marks <b>max</b> for explaining why the device chosen is suitable.</p> <p>Answer must link to the device identified in part <b>1(c)(i)</b>.</p>

<b>2</b>	
<b>Max mark</b>	4
<b>Answer</b>	<p>Up to <b>two</b> marks <b>each</b>, for <b>one</b> advantage and <b>one</b> disadvantage.</p> <p><b>One</b> mark for identifying the advantage/disadvantage.</p> <p><b>One</b> mark for saying how the advantage/disadvantage affects schools.</p> <p><b>Advantage</b> e.g.:</p> <ul style="list-style-type: none"> <li>• There is an increased level of security (1) so the school can be assured that the risk of data breaches is reduced and student data will not be leaked (1)</li> <li>• Schools know that pupil data is stored securely in line with data protection legislation. (1) This means that the school can have confidence that it is protecting the personal information of the students appropriately (1)</li> <li>• Greater scalability (1) so extra students can be added within the constraints of the subscription with no risk of running out of storage space for their progress (1)</li> <li>• Increased reliability (1) so the school can be assured of access to the website/application at any time if students/teachers are working from home (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p> <p><b>Disadvantage</b> e.g.:</p> <ul style="list-style-type: none"> <li>• Remote access may be limited due to the increased security (1) meaning students/teachers may not always have access when needed as devices used may not be trusted (1)</li> <li>• The subscription may be more expensive than other storage options (1) meaning with limited school budgets the cost may be prohibitive (1)</li> <li>• The links to the private cloud/password may go into teacher spam/junk folders (1) meaning access to the cloud for students may be limited (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for explaining an advantage and <b>two</b> marks <b>max</b> for explaining a disadvantage.

<b>3a</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>• Scalable (1)</li> <li>• Simple to read/write (1)</li> <li>• Lightweight (1)</li> <li>• Text-based human - readable format (1)</li> <li>• Language independent (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<b>One</b> mark for <b>each</b> correct answer. Max <b>two</b> marks.

<b>3b</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks for a description of how JSON could be used in the maths application.</p> <p><b>One</b> mark for identifying a use of JSON.</p> <p><b>One</b> mark for saying how this could be applicable to the maths application.</p> <ul style="list-style-type: none"> <li>To store school/student data in a non-specific language format (1) meaning the school does not have to use specified/specialist operating systems/web browsers (1)</li> <li>Shorter transmission time (1) so the student centric data will be shown quicker to teachers/students (1)</li> <li>To transmit data from the server to the users' devices (1) so that the correct data will be shown on the application based on students' access details (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for a description of the use of JSON.

<b>3c</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Any <b>two</b> from:</p> <ul style="list-style-type: none"> <li>Data is being sent to one or more authorised users (1)</li> <li>Data is actively moving from one location to another (1)</li> <li>Data is more susceptible to security attacks (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<b>One</b> mark for <b>each</b> correct answer. Max <b>two</b> marks.

<b>3d</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks for a description of how TCP can be used to maintain integrity of data in transit.</p> <p><b>One</b> mark for identifying the TCP characteristic.</p> <p><b>One</b> mark for saying how this characteristic will help maintain the integrity of the data in transit in the maths application.</p> <ul style="list-style-type: none"> <li>TCP establishes a secure connection between the website and the user's device (1) so all data input by students will be logged by the maths application to ensure their progress through the application content is accurate (1)</li> <li>TCP ensures that all data packets arrive in sequence (1) so that as students input their answers, they match the questions attempted (1)</li> <li>TCP initialises and maintains status information for data in transit (1) so the next question cannot be accessed until the answer has been recorded on the maths application (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for a description of TCP and integrity maintenance during transit.

<b>4a (i)</b>	
<b>Max mark</b>	1
<b>Answer</b>	Any <b>one</b> from: <ul style="list-style-type: none"> <li>• Number (1)</li> <li>• Text (1)</li> </ul>
<b>Guidance</b>	

<b>4a (ii)</b>	
<b>Max mark</b>	2
<b>Answer</b>	Up to <b>two</b> marks for a description of how the data input chosen in <b>4(a)(i)</b> will be used in the maths application. <b>One</b> mark for identifying the use. <b>One</b> mark for saying how the data input will be used in the maths application. e.g. <ul style="list-style-type: none"> <li>• Students will need to input answers to the maths questions. (1) Answers to maths questions are usually in numeric form, but some will require text (1)</li> <li>• Students will access their own account/their saved progress. (1) Access details/user names/passwords will need to be input which could include text/numbers (1)</li> </ul> <b>Credit any other appropriate response.</b>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for a description of how the data input will be used. Answer must link to the data input identified in <b>4(a)(i)</b> .

<b>4b (i)</b>	
<b>Max mark</b>	1
<b>Answer</b>	Any <b>one</b> from: <ul style="list-style-type: none"> <li>• UK GDPR (1)</li> <li>• Data Protection Act (DPA) (1)</li> </ul>
<b>Guidance</b>	

<b>4b (ii)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<b>One</b> mark for an explanation of the purpose of Act e.g: <ul style="list-style-type: none"> <li>• To set out the key principles/rights/obligations for the processing of personal data. (1)</li> </ul> <b>Credit any other appropriate response.</b>
<b>Guidance</b>	<b>One</b> mark <b>max</b> for an explanation of purpose of the UK GDPR/DPA Answer must link to the Act identified in <b>4(b)(i)</b> .



<b>5a</b>	
<b>Max mark</b>	1
<b>Answer</b>	<p><b>One</b> mark for stating the role of an API e.g.:</p> <ul style="list-style-type: none"><li>• To set the rules that enable the communication between a server and an application (1)</li><li>• To transfer requested data/information between a server and an application (1)</li><li>• To increase security between an application and server (1)</li></ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<p><b>One</b> mark <b>max</b> for stating the role of an API.</p> <p>Details relating to the certification of an API are not required but can be credited if correct.</p>

<b>5b</b>	
<b>Max mark</b>	6
<b>Levels of Response</b>	<p><b>Level 3 (high) 5-6 marks</b> A <b>thorough</b> analysis, which includes:</p> <ul style="list-style-type: none"> <li>• identification of a <b>range</b> of characteristics or elements</li> <li>• <b>detailed</b> knowledge and understanding in the context of the question</li> <li>• <b>clear</b> explanation</li> <li>• <b>consistent</b> use of appropriate subject terminology.</li> </ul> <p><b>Level 2 (mid) 3-4 marks</b> An <b>adequate</b> analysis, which includes:</p> <ul style="list-style-type: none"> <li>• identification of <b>some</b> characteristics or elements <b>sound</b> knowledge and understanding in the context of the question</li> <li>• <b>adequate</b> explanation</li> <li>• <b>some</b> use of appropriate subject terminology.</li> </ul> <p><b>Level 1 (low) 1-2 marks</b> A <b>basic</b> analysis, which includes:</p> <ul style="list-style-type: none"> <li>• identification of <b>at least one</b> characteristic or element <b>limited</b> knowledge and understanding in the context of the question</li> <li>• <b>basic</b> explanation</li> <li>• use of appropriate subject terminology is <b>limited</b>.</li> </ul> <p><b>0 marks</b> Answer is <b>not</b> worthy of credit.</p>
<b>Indicative content</b>	<p>Answers can include some of the following:</p> <p>Characteristics of private certification:</p> <ul style="list-style-type: none"> <li>• Only available to the developers so copyright/Intellectual Property (IP) can be secured.</li> <li>• Provides access to back end data used in the maths website which should not be accessed by other teams/other companies.</li> <li>• Remote working developers can have access to the website if credentials permit and need to access the development confidential information.</li> <li>• Can increase internal communication between development team so developers can work remotely whilst maintaining security of the development.</li> </ul> <p>Advantages of private certification:</p> <ul style="list-style-type: none"> <li>• Leads to reduced development costs so developers will be able to pass these savings on to schools i.e. the cost of access can be decreased for schools.</li> <li>• Full and complete testing can be completed before removing private API to ensure website works as intended so schools can be confident in the product keeping the reputation of the development team/company high</li> <li>• Website can be internally tested as a 'customer' before going live which can show the school and student journey through the product</li> <li>• All creative and innovative ideas will only come from the development team so they can be confident that the product is unique and attractive to schools</li> <li>• Less risk of leaks of Intellectual property as Non-Disclosure Agreement (NDA) can be implied from using a private API</li> </ul> <p><b>Credit other relevant conclusions, points and examples.</b></p>

<b>6</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks for an explanation of why 2FA should be used to maintain the security of the maths application. e.g.:</p> <p><b>One</b> mark for identifying a relevant characteristic of 2FA  <b>One</b> mark for saying how the characteristic improves the security of the maths application</p> <ul style="list-style-type: none"> <li>• To guarantee authentic user access by sending a code to the teachers email address/phone number provided (1) which verifies the details provided during registration/login (1)</li> <li>• 2FA increases the level of security beyond just using a password. (1) This ensures potentially sensitive student data is better protected (1)</li> <li>• An audit log is created of who is attempting to access the maths application (1) meaning potential unauthorised access can be highlighted thus better protecting potentially sensitive student data (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for an explanation of why 2FA should be used.

<b>7a</b>	
<b>Max mark</b>	2
<b>Answer</b>	A DDoS is an attempt to make a website unavailable to authorised users by <u>flooding</u> (1) it with useless <u>network</u> (1) traffic from a range of different systems and locations.
<b>Guidance</b>	Correct answers only

<b>7b</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks <b>max</b> for an explanation of how a firewall reduces the threat of a DDoS on a website.</p> <p><b>One</b> mark for identifying a relevant characteristic of a firewall.  <b>One</b> mark for saying how the characteristic reduces the threat of DDoS.</p> <ul style="list-style-type: none"> <li>• Examines data packets to ensure they follow the pre-set rules (1) as the pre-set rules will meet the security protocols of a network (1)</li> <li>• Monitors traffic masquerading as a website (1) so website visitors will not access a fake/spam website by typing in/clicking a link to the website address (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	Up to <b>two</b> marks <b>max</b> for an explanation of how a firewall reduces the threat of a DDoS.

<b>8a(i)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<b>One</b> mark for stating what normal test data is: <ul style="list-style-type: none"> <li>Data that should not cause errors when input (1)</li> </ul>
<b>Guidance</b>	

<b>8a (ii)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<b>One</b> mark <b>max</b> for an explanation of how normal data could be used: <ul style="list-style-type: none"> <li>To ensure that the correct feedback is provided based on the answers input by students (1)</li> <li>To ensure the learner journey follows the structure of the application so maths questions are not missed out/shown in the correct order (1)</li> </ul> <b>Credit any other appropriate response.</b>
<b>Guidance</b>	Up to <b>one</b> mark <b>max</b> for an explanation of how normal test data could be used.

<b>8a(iii)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<b>One</b> mark for stating what erroneous test data is: <ul style="list-style-type: none"> <li>Data that should not be accepted by the application/cause an error message (1)</li> </ul>
<b>Guidance</b>	

<b>8a (iv)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<b>One</b> mark for an explanation of how erroneous data could be used: <ul style="list-style-type: none"> <li>To ensure that incorrect data entry by students is not accepted in the incorrect format (1)</li> <li>To ensure that the correct error message is provided when incorrect data is input by students (1)</li> <li>The results can be used to take remedial action before retesting to ensure that the stand-alone application is fit-for-purpose for the schools to use (1)</li> <li>Can identify conflicts between different parts of the application so the student journey is as originally planned (1)</li> </ul> <b>Credit any other appropriate response.</b>
<b>Guidance</b>	Up to <b>one</b> mark <b>max</b> for an explanation of how erroneous data could be used.

<b>8b</b>	
<b>Max mark</b>	9
<b>Levels of Response</b>	<p><b>Level 3 (high) 7-9 marks</b></p> <p>A <b>thorough</b> discussion which shows <b>detailed</b> evaluation, which includes:</p> <ul style="list-style-type: none"> <li>• a <b>range</b> of points from <b>both</b> sides of the argument</li> <li>• a <b>detailed</b> analysis in the context of the question</li> <li>• a <b>clear</b> conclusion(s) with <b>detailed</b> reasons/justifications</li> <li>• <b>consistent</b> use of appropriate subject terminology.</li> </ul> <p><b>Level 2 (mid) 4-6 marks</b></p> <p>An <b>adequate</b> discussion which shows <b>sound</b> evaluation, which includes:</p> <ul style="list-style-type: none"> <li>• <b>some</b> points from <b>both</b> sides of the argument</li> <li>• <b>some</b> analysis in the context of the question</li> <li>• an <b>adequate</b> conclusion(s) with <b>relevant</b> reasons/justifications</li> <li>• <b>some</b> use of appropriate subject terminology.</li> </ul> <p><b>Level 1 (low) 1-3 marks</b></p> <p>A <b>basic</b> discussion which shows <b>limited</b> evaluation, which includes:</p> <ul style="list-style-type: none"> <li>• a <b>few</b> points from the argument</li> <li>• a <b>limited</b> analysis in the context of the question</li> <li>• a <b>brief</b> conclusion(s) with <b>limited</b> reasons/justifications</li> <li>• use of appropriate subject terminology is <b>limited</b>.</li> </ul> <p><b>0 marks</b></p> <p>Answer is <b>not</b> worthy of credit.</p>
<b>Indicative content</b>	<p>Answers can include some of the following:</p> <p>Advantages:</p> <ul style="list-style-type: none"> <li>• Accurate Results - Technical testing ensures the accuracy of results by testing the application's functionality and verifying that it is producing the correct output.</li> <li>• Better Performance - Technical testing can identify any performance issues, such as slow response times or memory leaks, and help to optimise the application's performance.</li> <li>• A range of devices can be tested - as schools do not all use the same manufacturer.</li> <li>• Different operating systems can be tested - to ensure the maths application can be used in a range of schools and on devices in schools or remotely.</li> <li>• Can ensure the application is compatible with a range of devices/operating systems/software - to ensure the maths application can be used by as many schools/students/teachers as possible to maximise product coverage.</li> <li>• Improved Quality- Technical testing helps to improve the quality of the application by identifying and eliminating any defects or bugs.</li> <li>• Errors/conflicts can be identified, and remedial action taken - so that the maths application will be error free when released without the need for constant patches being released.</li> <li>• Automated technical testing can be used - to limit the risk of human error which reduces the testing time required.</li> </ul>

	<ul style="list-style-type: none"> <li>• Increased Security - Technical testing can identify any security vulnerabilities in the application and help to ensure that sensitive data is protected.</li> <li>• Enhanced User Experience - Technical testing can identify any usability issues, such as confusing navigation or non-intuitive interfaces, and help to improve the user experience.</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>• Time-Consuming - Technical testing can be time-consuming, as it requires extensive testing of all the functions and features of the application.</li> <li>• Limited Scope - Technical testing is focused on the application's functionality and performance and may not address other important factors such as user experience, customer satisfaction, and marketability.</li> <li>• May not include all devices/operating systems/software – there may be some schools that use specialist devices such as assistive technology.</li> <li>• Will not take into account future vendor specific updates – hardware/software/operating system vendors regularly update which cannot be predicted by the developers.</li> <li>• Difficulty in Replication - Technical testing may be difficult to replicate in real-world scenarios, as it may not take into account real-world factors such as user behaviour, network conditions, and system compatibility.</li> <li>• If testing is carried out manually then human errors may occur – which means the final application may also contain errors which may not be located until it is being used.</li> <li>• If remedial action is taken on a specific device/operating system/software, then this could have an impact on different devices/operating systems/software – meaning that some, but not all, schools may have problems/issues using the application.</li> <li>• Costly - Technical testing can be expensive, as it requires specialised tools, hardware, and personnel with technical expertise.</li> <li>• False Sense of Security - Technical testing can give a false sense of security if it is not conducted comprehensively, as some vulnerabilities may go undetected.</li> </ul> <p><b>Credit other relevant conclusions, points and examples.</b></p>
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<b>9a (i)</b>	
<b>Max mark</b>	1
<b>Answer</b>	<p>Any <b>one</b> from e.g.:</p> <ul style="list-style-type: none"> <li>• What devices the application will run/can be successfully installed on (1)</li> <li>• The minimum hardware requirements that are needed to install and use the application (1)</li> <li>• List of operating systems &amp; version numbers (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	

<b>9a (ii)</b>	
<b>Max mark</b>	2
<b>Answer</b>	<p>Up to <b>two</b> marks <b>max</b> for an explanation of why the technical requirement in <b>9(a)(i)</b> should be included in the user guide.</p> <p><b>One</b> mark for identifying a reason why the technical requirement should be included.</p> <p><b>One</b> mark for the benefit to schools of including the technical requirement in the user guide</p> <ul style="list-style-type: none"> <li>• Schools can check devices before installing/buy new devices that are compatible (1) and be confident the install will be successful (1)</li> <li>• Devices can be checked/memory added by schools before installation to ensure the install/use will be successful and the application will work as intended (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<p><b>Two</b> marks <b>max</b> for explanation of why the technical requirement in <b>9(a)(i)</b> should be included in the user guide.</p> <p>Answer must link to the technical requirement identified in part <b>9(a)(i)</b>.</p>

<b>9b</b>	
<b>Max mark</b>	4
<b>Answer</b>	<p>Up to <b>two</b> marks <b>max</b> for each advantage.</p> <p><b>One</b> mark for identifying the advantage.</p> <p><b>One</b> mark for saying how the advantage benefits schools.</p> <p><b>Advantage:</b></p> <ul style="list-style-type: none"> <li>• The download can be accessed on a range of devices (1) so schools are not limited to specific devices/can install onto a network server (1)</li> <li>• The download can be set to install at a specified time (1) so the school can install the application when the school is closed/network is not being used to minimise disruption to learning (1)</li> <li>• The download can be quick depending on the broadband speed (1) so the application can be installed and used by students at a time convenient to the school (1)</li> <li>• The maths application may incorporate automatic updates/cloud-based downloads enable updates to be downloaded automatically (1) meaning the school will always have the latest version of the application without having to manually check for downloads and install updates (1)</li> <li>• Reduced bandwidth usage (1) cloud-based downloads use compression algorithms that reduce the size of the application, resulting in less bandwidth usage during the download process (1)</li> <li>• Cloud-based downloads can be more secure as they often include built-in security features/encryption/2FA (1). This will help protect the data stored by the school meaning legislative requirements are complied with (1)</li> </ul> <p><b>Credit any other appropriate response.</b></p>
<b>Guidance</b>	<p>Up to <b>two</b> marks <b>max</b> for an explanation of <b>each</b> advantage.</p> <p>Maximum <b>two</b> advantages.</p>

<b>9c</b>	
<b>Max mark</b>	1
<b>Answer</b>	Any <b>one</b> from: <ul style="list-style-type: none"><li>• Remote install (1)</li><li>• Unattended installation (1)</li><li>• Clean install (1)</li><li>• Mobile install (1)</li><li>• Network install (1)</li></ul>
<b>Guidance</b>	

Sample



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