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A LEVEL

Moderators' report

COMPUTER SCIENCE

H446

For first teaching in 2015

H446/03/04 Summer 2024 series

Contents

Introduction

Our moderators' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

Online courses

We have created online courses to build your confidence in delivering, marking and administering internal assessment for our qualifications. Courses are available for Cambridge Nationals, GCSE, A Level and Cambridge Technicals (2016).

Cambridge Nationals

All teachers delivering our redeveloped Cambridge Nationals suite from September 2022 are asked to complete the Essentials for the NEA course, which describes how to guide and support your students. You'll receive a certificate which you should retain.

Following this you can also complete a subject-specific Focus on Internal Assessment course for your individual Cambridge Nationals qualification, covering marking and delivery.

GCSE, A Level and Cambridge Technicals (2016)

We recommend all teachers complete the introductory module Building your Confidence in Internal Assessment, which covers key internal assessment and standardisation principles.

Following this you will find a subject-specific course for your individual qualification, covering marking criteria with examples and commentary, along with interactive marking practice.

Accessing our online courses

You can access all our online courses from our teacher support website Teach Cambridge.

You will find links relevant to your subject under Assessment, NEA/Coursework and then Online Courses from the left hand menu on your Subject page.

If you have any queries, please contact our Customer Support Centre on 01223 553998 or email support@ocr.org.uk.

Would you prefer a Word version?

Did you know that you can save this PDF as a Word file using Acrobat Professional?

Simply click on **File > Export to** and select **Microsoft Word**

(If you have opened this PDF in your browser you will need to save it first. Simply right click anywhere on the page and select **Save as . . .** to save the PDF. Then open the PDF in Acrobat Professional.)

If you do not have access to Acrobat Professional there are a number of **free** applications available that will also convert PDF to Word (search for PDF to Word converter).

General overview

This is the 9th year of the A Level Computer Science course. Many centres show that they have mastered the process, development and marking of the NEA. There were many excellent submissions, with candidates showing innovative and high-quality solutions. Some candidates produced solutions that would do well at degree level.

The range of solutions has been varied and interesting. Many candidates chose to create games. This showed many original ideas, quirky concepts and new takes on historical game ideas. The projects allow candidates to show innovation, and to create sophisticated solutions when programming for the first time. . Web applications have been popular as always, with candidates unafraid of embracing the latest frameworks and server-side languages. Mobile apps continue to be a source of innovation and candidates have thrived on the challenge of creating products across varying devices. And, of course, there is the weird, wonderful and esoteric: off-the-wall languages used, Arduino boards, machine learning and systems to monitor chicken coops.

It has been clear that the vast majority of centres have a firm understanding of the national standard and the mark scheme. The submitted marks have often been realistic and the project choices are pitched at the right level and fulfil both the requirements and the spirit of the course.

Candidates who did well generally:	Candidates who did less well generally:
• used evidence gained from researching existing products and/or stakeholders to form a distinct feature list and separate, measurable success criteria • designed the solution iteratively. Often the algorithms for candidates that were planned during each iterative cycle were focused, better explained and more credible • produced a detailed development journal that was clearly produced as the solution was being developed • showed evidence of testing during development during each iteration. The failed tests and remedial action often informed the goals of the next iteration • used separate evidence for evaluation testing and included distinct robustness testing that aimed to stress/performance test a system to destruction • began evaluations by using the evidence from the tests and mapped this to the original success criteria with a detailed, critical discussion • made their projects a work of passion, leaving no stone unturned and provided evidence of everything they did.	• confused requirements, features and success criteria, or had trivial success criteria that read more like functionality tests. This made critical evaluations difficult at the end of the project • attempted to write all the algorithms for the solution at the beginning, so they lacked the level of detail necessary. Or worse, wrote algorithms that were clearly reverse engineered from produced code • did not engage with producing evidence of development and instead created a solution then attempted to discuss it afterwards. This led to the evidence being patchy and less credible • showed little evidence of testing during development, or the evidence was clearly produced after the solution was fully built so there was little chance to highlight errors and remedial action • blurred the distinction between testing during development and evaluation testing. The evidence can only be counted once so separate tests are necessary • evaluated success criteria but without using evidence from tests • discussed whether or not the project was successful but did so in a descriptive manner rather than using critical evaluation skills • started the project well with strong analysis sections then motivation faded away over time and each section became less and less effective.

Most common causes of centres not passing

Analysis

When discussing features that make the problem solvable by computational methods, we are looking for candidates to describe how their solution is better as a computerised solution rather than as something paper based. Many centres choose to ask candidates to describe some of the computational methods on the course. This is fine, but they must be applied to the given problem and abstract, text-book responses should not be worthy of any credit.

The hardware requirements section is a chance for candidates to highlight their knowledge of computer hardware, e.g. CPUs, RAM. The candidates who do the best at this, research the requirements for specific programs and use this as a justification. Vague comments such as "any PC" are not worth credit at this level.

Design

The spirit is that algorithms should be designed at design time. Anything that is clearly reverse engineered should not be credited. Not all centres read the mark scheme carefully – to score in the higher mark bands it is expected that algorithms, problem decomposition and system overviews are fully explained and justified. It is no problem for design elements to become part of the iterative development diary and this is often more credible evidence than detailed design work all in one place towards the beginning.

Implementation

Should a candidate not engage with creating a development journal and just submit a code dump of their final solution this will not score more than the first couple of mark bands. The marks are for evidence of development rather than for the final solution.

Similarly, this project gives credit for code in high-level languages only. Many candidates choose web applications, which is an excellent choice, but there is no credit for HTML/CSS code as these are markup languages. Candidates taking the web development route should, of course, create user interfaces in HTML/CSS but credit can only be given for the JavaScript and server-side code that they write. It is recommended that candidates are guided on this concept when choosing the initial problem as static, front-end only sites are unlikely to score highly.

Testing during development

Marks for testing cannot be inferred from completed work and it is not enough evidence for a teacher to state they have witnessed testing in the classroom. Candidates should provide screenshots and/or video evidence of tests happening throughout the life cycle of the project. Major errors should be discussed and bug fixes/remedial action explained.

Testing for evaluation

Candidates should produce distinct testing that is separate from any development testing. For robustness testing, it is expected that the candidate produces some evidence they have tried to break the system or test its limits: this can be using a wide range of test data (boundary and erroneous) or with some stress/performance tests, tests on multiple devices, browsers, etc. Usability testing is often best evidenced by an end-user survey, interview or similar.

Evaluation

The number of marks available for evaluation is relatively high and so centres should expect that evaluations are detailed and extensive. Often, it can seem as though this section is an afterthought or candidates have run out of time and do not give this section the attention it deserves. Where candidates have not used the evidence from tests to evaluate success criteria, or have given limited descriptions of maintenance and limitations, marks in the high mark bands cannot be fully justified.

A note on machine learning projects

It won't be a surprise that more and more candidates are becoming interested in machine learning. However, it is important to recognise that the spirit of this component is for candidates to undertake a significant **software development** project. This should be distinct and different from the skills that a data scientist might employ, although they both might use programming code.

For instance, a data scientist might use Python to cleanse a CSV file of abnormalities before writing some Python script to feed the data into a model as a training test and finally comparing the results in a test set. Clearly, they will have used a high-level language to do this, but the script written is made of individual commands that do not form a complete solution.

In comparison, a software developer would create an application that would cleanse any given CSV file and automate the process of feeding data into a model. Such applications would be useful for data scientists time and again.

It is the second skillset that candidates should exhibit for success in this programming project.

Common misconceptions

There is no need for candidates to have a real-life end-user for this project. If they have one, it is fine, but candidates should not be penalised if they merely discuss a target audience group or the types of people who would make use of the system. Some candidates have felt the need to invent highly contrived end-users and this is not necessary. Similarly, there is no need for candidates to produce interviews or questionnaires with stakeholders, although this can be used as evidence of research if needed.

Many candidates choose to develop games using frameworks such as Unity and Unreal Engine. This is absolutely fine and many spectacular results have been seen. However, the marks for the course are for the programming code written only. Any time spent documenting features of the game engine is wasted and is not worth any credit.

Be wary of candidates that wish to embark on a project involving any kind of quiz. Very often, this type of project lacks the rigour for A Level study and candidates should be guided carefully to make sure that their final solution has enough depth to highlight the skills supported on the course.

The spirit of the component is that candidates should embark on a software development project using a high-level language that could be used in industry. Environments targeted at beginners (e.g. Scratch, Game Maker) are not accepted on the course. If in doubt, OCR have a free project checking service that should be consulted before projects begin.

Candidates should be steered away from any kind of template document and be free to create their own document format. Of course, it is sensible, and correct to guide candidates on suitable sections, headings and the content needed to be successful.

Due to the diligent and highly focused nature of some of the students who take the course, it isn't unusual for work to be submitted that is above A Level. When marking, bear in mind that candidates should be compared to the national standard, rather than to the odd exceptional candidate that may be at your centre, and this should prevent overly harsh marking in comparison.

Avoiding potential malpractice

The number of students who submit code that has been produced by following a tutorial and copying the code presented is a concern. The code that is submitted must be the student's own to receive credit and, should a student attempt to pass off code from elsewhere as their own, this is an example of plagiarism and is effectively cheating.

Teachers should be wary of any solutions that are examples of classic video games (e.g. Snake, Flappy Bird), particularly those written in JavaScript or Python as these are often found in tutorials. Work from tutorials lacks any kind of discussion of problems found during development and can follow best-practice coding standards that a teacher who knows their class would be suspicious of.

This is not to say that students cannot use tutorials at all. An acceptable use might be to get started with a new development environment while fully referencing the source of the code. Another might be that a problem was encountered that was insurmountable but a solution was found online, discussed and fully referenced. The point is that the use of others' code is openly acknowledged and forms a small part of the work only, with the vast majority of the candidate's work being their own.

Using artificial intelligence models is another source of potential malpractice and the guidance is identical to that given above for tutorials. AI can be used to generate code, but any code produced must be fully referenced and cannot be a source of credit for the candidate.

Teachers should note the JCQ guidance on producing NEAs. It is malpractice to write written feedback suggesting improvements on candidate work and any such evidence submitted to the moderation team will be flagged as a suspected malpractice event.

Helpful resources

The OCR website features a wealth of information including delivery guides, endorsed resources and reports from previous series.

OCR's teacher networks offer a chance to absorb new subject and curriculum knowledge while meeting likeminded professionals.

The Computer Science team can be contacted for project checking and any other qualification related query

The JCQ guidance on conducting non-exam assessments.

Additional comments

For many candidates, the Component 3 project is a learning experience that can kickstart successful and lucrative careers. It is normally the largest piece of work they have ever undertaken and fully supports the content in the examined parts of the course. When well-managed, it is the part of A Level study that candidates remember the most fondly.

Centres in which candidates perform strongly are those that recognise these facts and allow candidates a free choice of project in terms of both function and development language/environment. It is also apparent when centres have devoted a significant amount of the available guided learning hours to do the project justice.

Candidates are most engaged when they can see that their skills are modern and at the cutting edge rather than learning legacy technologies.

The moderation team appreciates digital submissions the most, whether that be through the Submit for Assessment system, or using postal submission on USB memory sticks. The best centres fully check URS forms for clerical errors and provide extensive, useful commentary that highlights the rationale behind submitted marks.

Supporting you

Teach Cambridge

Make sure you visit our secure website **Teach Cambridge** to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can forward them this link to help get you started.

Reviews of marking

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Access to Scripts

We've made it easier for Exams Officers to download copies of your candidates' completed papers or 'scripts'. Your centre can use these scripts to decide whether to request a review of marking and to support teaching and learning.

Our free, on-demand service, Access to Scripts is available via our single sign-on service, My Cambridge. Step-by-step instructions are on our website.

Keep up-to-date

We send a monthly bulletin to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular professional development courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

Signed up for ExamBuilder?

ExamBuilder is a free test-building platform, providing unlimited users exclusively for staff at OCR centres with an Interchange account.

Choose from a large bank of questions to build personalised tests and custom mark schemes, with the option to add custom cover pages to simulate real examinations. You can also edit and download complete past papers.

Find out more.

Active Results

Review students' exam performance with our free online results analysis tool. It is available for all GCSEs, AS and A Levels and Cambridge Nationals (examined units only).

Find out more.

You will need an Interchange account to access our digital products. If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Online courses

Enhance your skills and confidence in internal assessment

What are our online courses?

Our online courses are self-paced eLearning courses designed to help you deliver, mark and administer internal assessment for our qualifications. They are suitable for both new and experienced teachers who want to refresh their knowledge and practice.

Why should you use our online courses?

With these online courses you will:

- learn about the key principles and processes of internal assessment and standardisation
- gain a deeper understanding of the marking criteria and how to apply them consistently and accurately
- see examples of student work with commentary and feedback from OCR moderators
- have the opportunity to practise marking and compare your judgements with those of OCR moderators
- receive instant feedback and guidance on your marking and standardisation skills
- be able to track your progress and achievements through the courses.

How can you access our online courses?

Access courses from Teach Cambridge. Teach Cambridge is our secure teacher website, where you'll find all teacher support for your subject.

If you already have a Teach Cambridge account, you'll find available courses for your subject under Assessment - NEA/Coursework - Online courses. Click on the blue arrow to start the course.

If you don't have a Teach Cambridge account yet, ask your exams officer to set you up – just send them this link and ask them to add you as a Teacher.

Access the courses **anytime, anywhere and at your own pace**. You can also revisit the courses as many times as you need.

Which courses are available?

There are **two types** of online course: an **introductory module** and **subject-specific** courses.

The introductory module, Building your Confidence in Internal Assessment, is designed for all teachers who are involved in internal assessment for our qualifications. It covers the following topics:

- the purpose and benefits of internal assessment
- the roles and responsibilities of teachers, assessors, internal verifiers and moderators
- the principles and methods of standardisation
- the best practices for collecting, storing and submitting evidence
- the common issues and challenges in internal assessment and how to avoid them.

The subject-specific courses are tailored for each qualification that has non-exam assessment (NEA) units, except for AS Level and Entry Level. They cover the following topics:

- the structure and content of the NEA units
- the assessment objectives and marking criteria for the NEA units
- examples of student work with commentary and feedback for the NEA units
- interactive marking practice and feedback for the NEA units.

We are also developing courses for some of the examined units, which will be available soon.

How can you get support and feedback?

If you have any queries, please contact our Customer Support Centre on 01223 553998 or email support@ocr.org.uk.

We welcome your feedback and suggestions on how to improve the online courses and make them more useful and relevant for you. You can share your views by completing the evaluation form at the end of each course.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
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