2022 NCEA Assessment Report

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Subject: **Digital Technologies and Hangarau Matihiko**

Level: **3**

Standards: **91908, 91909**

Part A: Commentary

Candidates' knowledge and understanding of content, skills, and complexities must be at Level 8 of the New Zealand Curriculum.

Candidates who had a comprehensive understanding of computer science, or had completed an authentic and appropriately levelled project, were able to apply their knowledge and achieve well.

Candidates who lacked confidence with the material tended to either repeat their answers without adding information or were unable to provide a sufficient response.

Candidates who were able to give clear explanations and make links to examples, or who referenced their project work thoroughly, achieved higher grades than those who wrote indiscriminately or without precision.

Candidates who understood the content of their chosen topic, or who understood the intricacies of their decision-making processes, tended to write more succinct and relevant responses. Students who attempted to write as much as possible to answer a question often ended up demonstrating a lack of understanding or a lack of good decision-making in their workflows.

Part B: Report on standards

91908: Analyse an area of computer science

Examination

Candidates were required to choose a question on one of three areas of computer science (formal languages, computer graphics, and computer vision). Resource materials were provided to support the questions.

Candidates needed to understand the computer science components of the topic they intended to answer, and to be familiar with how to explain these computer science fundamentals.

Candidates who appeared unfamiliar with the underlying computer science struggled to understand or answer the questions at the level required.

Candidates that answered questions without specific reference to algorithms or techniques involved were unable to demonstrate understanding.

Each question followed the same general format:

- the initial part required candidates to accurately apply their understanding of the basic concepts of each topic, either by determining sequence outcomes or concisely explaining relevant concepts and then demonstrating how they determined their answer
- the later part required candidates to consider the impact of the concept on humans and perspectives around the concepts, using resource materials provided
- the final part asked candidates to answer in a more in-depth way and to provide justification or reasoning.

Teachers should refer to accurate guidance resources to support their candidates' learning. For example, The Computer Science Field Guide is an online interactive resource for high school candidates learning about computer science. https://www.csfieldguide.org.nz/.

Observations

Candidates are expected to know the information signposted in the Assessment Specifications.

The Computer Science Field Guide gives a good indication of the depth required in candidate responses and supports the signposted specifications.

Candidates need to ensure that they understand the fundamental concepts and algorithms and can explain them in an assessment environment.

Candidates should be aware of inadvertently showing generalised understanding. For example, when explaining a Canny algorithm some students' responses were too broad, e.g. "Canny uses an algorithm to find an edge by using a filter to detect an edge". These statements do not show understanding at Level 8 of the New Zealand Curriculum.

The questions required candidates to interact with the contexts provided within the examination paper in their answers. Candidates need to be prepared to look at an unfamiliar context and interpret it accurately – they were disadvantaged if they could not comment on a context they were specifically asked to.

Candidates needed to explain the computer science concept in terms of both their own and provided examples, so needed to be comfortable using examples covered in class.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- answered the knowledge-based questions clearly
- interpreted diagrams and sequenced information
- explained their responses using correct terminology
- accurately used key vocabulary
- applied answers to key concepts of the assessed topic accurately:
    - could determine whether a supplied string was valid and explained their reasoning
    - could plot out a transformation or calculate a line
    - could explain edge detection and associated problems.
- answered the questions and were able to refer to the underlying computer science fundamentals of:
    - key aspects
    - algorithms / techniques
    - an example of the area being used
    - key problems.

Candidates who were awarded **Not Achieved** commonly:

- did not clearly show understanding of the fundamental concepts, or could not accurately interpret the question or respond to prompts e.g.:
    - could not plot a transformation
    - could not explain edge detection
    - could not encode or decode a REGEX.
- did not specifically refer to the provided resource material in their responses
- did not relate their answer to inferences gained from the resource material when they were prompted / required to
- went off topic in their responses and / or used simplistic and very general knowledge
- did not answer the questions or parts of questions.

Candidates who were awarded **Achievement with Merit** commonly:

- provided in-depth responses, looked at limitations and benefits, and linked these back to the underlying concepts
- interpreted diagrams, graphs, or illustrations that were provided and could use these to support their responses
- drew accurate conclusions from the resource material provided and often compared this against examples that they had studied themselves. For example, students who

were doing formal languages could bring in examples of automata that they had used in class when learning the content
- showed clear understanding of limitations of the area studied, e.g., knowing limitations of FSM in formal languages
- clearly showed some contrast and comparison or perspectives within the area explicitly.

Candidates who were awarded **Achievement with Excellence** commonly:

- looked at unfamiliar examples, interpreted them correctly, and showed their wider understanding and reasoning in their responses
- used key vocabulary and concepts accurately and related this to their examples and the resources provided
- concisely explained the underlying computer science concepts and applied them to their responses
- succinctly responded to the questions, supplied responses that showed understanding, and did not have conflicting responses. For example, when explaining why an FSM cannot recognise palindromes (because FSMs cannot deterministically find this center point as they do not store additional information regarding to the center in a stack), attempting to draw a diagram of how it could be solved using a FSM (but not a push down automata)
- provided depth in responses which highlighted more innovative responses between student learning, example material, and across computer science areas.

91909: Present a reflective analysis of developing a digital outcome

Examination

The assessment comprises a single task in several parts, requiring candidates to present a summary and reflections on developing a digital outcome. This includes electronics outcomes.

Candidates need to have followed a rigorous and identifiable development process to create an outcome which meets the requirements of the New Zealand Curriculum at Level 8.

The outcome must involve sufficient complexity that requires candidates to have to consult authentic stakeholders and consider real end-users needs in as broader sense as possible. The decisions on tools and techniques must include complexity sufficient to require comprehensive explanations of how these were implemented in the final outcome.

Observations

Candidates are encouraged to test and evaluate their prototypes to gain feedback to further improve the outcome. Candidates must ensure that the outcomes they are developing allow

enough scope for personal decision-making, for example, using a drag-and-drop environment, such as WIX, to design a website minimises the scope of tools and techniques that can be effectively used.

Candidates whose outcome is not itself digital must focus on the digital components of the outcome. For 3D printing they must focus on the 3D modelling and design, rather than on material selections (unless these have a direct influence upon the digital design process). For electronics, responses on the programming and electronics circuits are valid, but responses on mechanisms or case materials are not (unless they can show how these influenced the software or circuits design).

Candidates must have been able to identify and effectively utilise stakeholder feedback and make clear how this contributed to the development process.

Candidates who developed a project in a team environment are not disadvantaged, but they must have identified and explained clearly and concisely which aspects of the project they contributed to. For example, if three candidates worked on an outcome, then each must explain their own input and not refer to the group. In that case, each candidate would have independent decisions to make, would seek and receive unique stakeholder feedback, and would be able to clearly show what development work they did themselves.

Grade awarding

Candidates who were awarded **Achievement** commonly:

- explained what they had done, but gave only a limited reflection on, or reasons for, why they had done it
- explained their work or decision-making without reflecting sufficiently on the information gathered
- if they had worked in a team environment, gave evidence of decisions and tasks for which they were individually responsible, along with evidence of their own decision-making
- demonstrated that they were working at Level 8 of the New Zealand Curriculum.

Candidates who were awarded **Not Achieved** commonly:

- worked on an outcome that was not at at Level 8 of the New Zealand Curriculum
- wrote about the importance of stakeholder feedback, how an outcome had to meet a need, or how important aesthetics were, but did not link this to their own outcome
- showed insufficient reasoning behind their decisions
- showed insufficient breadth or depth in their responses
- presented insufficient evidence of authentic stakeholders or their genuine needs, and consequently presented very shallow work
- did not explain their individual responsibility in a team environment, instead wrote about the team effort.

Candidates who were awarded **Achievement with Merit** commonly:

- demonstrated a deep knowledge of an authentic issue to be addressed
- communicated how they met a range of authentic end-user requirements
- explained the tools or techniques that made significant differences to their outcomes and discussed why these were important in terms of the issue / opportunity / need they dealt with
- were able to show the separation of tasks in a team environment and discuss those for which they were responsible.

Candidates who were awarded **Achievement with Excellence** commonly:

- discussed a non-trivial outcome which demanded significant development work and decision-making from them
- had a considered understanding of the stakeholders, often had strong relationships with them, and clearly communicated how these directed their work
- had a deep understanding of end-user needs for their specific outcome and communicated how they addressed them
- presented an insightful, reflective analysis of the development of the digital outcome
- had deep knowledge of practice and communicated insightful reasons for the decisions they made
- evaluated important decisions they made in fine detail, explaining not only what was done, but also the reasoning behind choices made, and how the outcome could have been improved
- if they had worked in a team environment, had clearly separate areas of responsibility, and were able to show how they worked effectively within that team regarding project management and decision-making.