Achievement Standard

Subject Reference	Digital Technologies and Hangarau Matihiko 3.7				
Title	Use complex programming techniques to develop a computer program				
Level	3	**Credits**	6	**Assessment**	Internal
Subfield	Technology				
Domain	Digital Technologies				
Status	Approved	**Status date**		September 2024	
Planned review date	December 2028	**Date version published**		December 2024	

This achievement standard involves using complex programming techniques to develop a computer program.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Use complex programming techniques to develop a computer program.	• Use complex programming techniques to develop an informed computer program.	• Use complex programming techniques to develop a refined computer program.

Explanatory Notes

1 This achievement standard is derived from the Technology Learning Area at level 8 of *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the Papa Whakaako for the relevant learning area.

2 *Use complex programming techniques to develop a computer program* involves:
- writing code for a program that performs a specified task
- using complex techniques in a suitable programming language
- setting out the program code clearly and documenting the program with comments
- testing and debugging the program to ensure that it works on a sample of expected cases.

Use complex programming techniques to develop an informed computer program involves:
- documenting the program with appropriate variable/module names and organised comments that describe code function and behaviour
- following conventions for the chosen programming language
- testing and debugging the program in an organised way to ensure that it works on a sample of both expected cases and boundary cases.

Use complex programming techniques to develop a refined computer program involves:
- ensuring that the program is a well-structured, logical response to the task
- making the program flexible and robust
- comprehensively testing and debugging the program.

3 The programming language chosen must support the required data types, control structures, complex programming techniques, and have good commenting facilities.

4 *A complex computer program*:
- uses variables storing at least two types of data (e.g. numeric, text, Boolean, object)
- uses sequence, selection and iteration control structures
- takes input from a user, file, sensors, or other external source
- produces output
- uses two or more complex programming techniques.

5 Examples of *complex programming techniques* include:
- programming or writing code for a graphical user interface (GUI)
- reading from, or writing to, files or other persistent storage
- object-oriented programming using class(es) and objects defined by the student
- using types defined by the student
- using third party or non-core API, library or framework
- using complex data structures (e.g. stacks, queues, trees).

6 Example of ways of *making a program flexible and robust* include:
- using actions, conditions, control structures and, methods, functions or procedures effectively
- checking input data for validity
- correctly handling expected, boundary and invalid cases
- using constants, variables and derived values in place of literals.

7 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Replacement Information

This Achievement Standard replaced AS91637.

Quality Assurance

1 Schools and institutions must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Schools and institutions with consent to assess must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233