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	Registered	**Status date**	29 November 2018		
Planned review date	31 December 2020	**Date version published**	29 November 2018		

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 in *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007; and is related to the material in the *Teaching and Learning Guide for Technology*, Ministry of Education at http://seniorsecondary.tki.org.nz.

Further information can be found at http://www.technology.tki.org.nz/.

Appropriate reference information is available in *Safety and Technology Education: A Guidance Manual for New Zealand Schools,* Ministry of Education at http://technology.tki.org.nz/Technology-in-the-NZC/Safety-in-Technology-Education-revised-2017, and the Health and Safety at Work Act 2015.

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

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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 relevant 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.

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Replacement Information
This Achievement Standard replaced AS91637.

Quality Assurance

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233

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