National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Exemplar for Internal Achievement Standard

Digital Technologies Level 3

This exemplar supports assessment against:

Achievement Standard 91904

Use complex techniques to develop an electronics outcome

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

	Grade: Excellence
1.	For Excellence, the student needs to use complex techniques to develop a refined electronics outcome. This involves: • undertaking iterative improvement throughout the design, development and testing process • justifying the choice of communication protocols • justifying the choice of components and subsystems There is no student work currently available at this grade. Iterative improvement has been shown by trialling and testing alternative components and software code and adding new features. This involved deliberate cycles focused on reliability and functionality, resulting in a high-quality electronics outcome. For example, the student showed evidence of ongoing design, development and testing within the process of constructing the electronics outcome. The student showed multiple instances of development and testing that led to a functional outcome. The student has justified the choice of communication protocols. For example, why they used RS232 serial data communication. They explained the advantages and disadvantages of using this over other communication protocols. The student has also justified the choice of components and subsystems used. For example, they compared competing components and interfaces for the same purpose and justified their decisions in using one over the other.

	Grade: Merit
2.	For Merit, the student needs to use complex techniques to develop an informed electronics outcome. This involves using information from testing and analysis to ensure the circuit(s) functions reliably. There is no student work currently available at this grade. Testing of the circuit showed the reliability of the electronics outcome. For example, the student: • improved analysis and performance of some of the sensors and outputs • averaged values and checked against unexpected/invalid inputs from sensors • had a well organised breadboard layout with no loose components, and showed that the system can function in a consistent manner in its intended location • soldered components on a board to improve reliability and robustness, and tested for consistency in its intended location.

	Grade: Achieved
3.	For Achieved, the student needs to use advanced techniques to develop an electronics outcome. This involves: • using appropriate resources and techniques to develop a functional electronics outcome • constructing, testing, and analysing functional circuits to ensure that the electronics outcome performs to specifications • testing, modifying, debugging the outcome • explaining the behaviour and function of the electronics outcome • explaining relevant communication protocols • addressing relevant implications. There is no student work currently available at this grade. The student has used appropriate resources and techniques to develop a functional electronics outcome. The outcome has used a programmable microprocessor and additional components. For example, resistors, sensors and input and output devices. The outcome meets specifications, each interface works, and the student can demonstrate a working system. They have used at least two complex techniques from the list in Explanatory Note 3. The student has constructed, tested, and analysed functional circuits to ensure that the electronics outcome performs to specifications. They have modified and debugged the electronics outcome. For example, they have: • analysed analogue data gained from sensors • constructed, tested and analysed functional circuits to ensure that the outcome performs to specifications, and made changes based on the testing • tested the input interfaces on expected sensor inputs and manual interrupts, and made changes as required • tested the output interfaces to show the display on an LCD • modified code beyond any template or teacher supplied code samples • debugged the code to ensure that it works as expected. The student has identified the behaviour and function of the electronics outcome. For example, the student explained what the system will do and how the components work together to make this happen. The student has explained relevant communication protocols. For example, they explain how the I2C protocol functions and how they used the I2C protocol to interface with a EEPROM IC. The student has also shown how their electronics outcome addresses at least two identified relevant implications. This could include how they have addressed functionality concerns and met end-user considerations.